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ECONOMIC- AND ECOHISTORY. INTRODUCTION FOR SPECIAL ISSUE ON HISTORY AND SUSTAINABILITY

Why publish a special issue on history and sustainability in this journal of economic and environmental history? Because the rapidly expanding field of »sustainability studies« is directly concerned with the relationship between economic development and the environment. When policy makers, scholars, and the public mention sustainability, they usually mean forms of economic production that are compatible with the preservation of healthy and resilient ecosystems and societies. Examining this important link between economy, environment, and society lies at the heart of this journal's scholarly mission.

Even though sustainability by definition implies continuation over time, the modern study of sustainability is too often ahistorical, too often focused on the immediate present and on short-term futures. Through this collection of essays, we hope to demonstrate why historical perspective is valuable and crucial when considering sustainability questions today. Even the concept of sustainability itself has a historiography, as contributors Caradonna and du Pisani each explore in this volume. All the essays collected here show how history and sustainability are as inseparable as economics and the environment.

This volume appropriately reflects the diversity and interdisciplinarity of historical and sustainability studies. Topics include agriculture, mining, tourism, governance, law, ecological change, the history of ideas, and the history of international development policy. For example, Thomas's essay evaluates whether the sustained livelihood success of certain island villages in the South Pacific can be attributed to conscious or unconscious applications of environmental conservation policies, or whether more material factors like population, technological sophistication, and resource use efficiency determined sustainability outcomes. Kah examines the environmental problems and social/political conflicts arising from illegal encroachment on a forest reserve in Cameroon by local villagers seeking food, shelter, and livelihood sufficiency. He argues for more participatory reforms in the governance of the reserve as a possible solution. Barry et al., focus on the sustainability of food and farm systems in northern Croatia in recent decades and propose a blueprint for improving the sustainability and livelihood sufficiency of family farms in the region. Zorn et al., examine 500 years of mercury mining and its associated pollution in the Idrija River Valley of Slovenia. They also trace the rather remarkable recent transition of the region into a tourist destination and nature protection area. Gross and Winiwarter examine the transition over 200 years from a more or less sustainable agrarian regime in the Damüls alps region of Austria into an unsustainable energy and capital intensive winter ski resort economy.

The diversity of topics is matched by a diversity of approaches. Some contributions in this volume emphasize theoretical approaches while others take a more empirical approach. Some contributions are primarily descriptive of historical changes and sustainability challenges while others offer critical evaluation and moral argumentation. The geographical scope of this collection is extensive, too, with studies focusing on Europe (Croatia, Slovenia, Austria), Africa (South Africa and Cameroon), North America, and Oceania. The ecosystems examined here range from coral atolls to river valleys, fertile plains, montane forests, and alpine peaks. Chronologically there is great diversity too. One study ranges back 2,000 years while another covers the last 200 years and another focuses on the period from the 1970s to the present. Taken together, this collection of essays from scholars around the world highlights the vibrancy, diversity, and relevancy of the historical study of sustainability.

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EKONOMSKA I EKOHISTORIJA. TEMATSKI BROJ »POVIJEST I ODRŽIVOST«

Zašto objavljujemo tematski broj časopisa Ekonomska i ekohistorija o povijesti i održivosti? Zato jer je brzo širenje »studija održivosti« izravno povezano s odnosom ekonomskog razvoja i okoliša. Kad političari, znanstvenici i javno mnijenje spominju održivost, obično misle na oblike ekonomske proizvodnje koja je usklađena s očuvanjem zdravih i otpornih ekosustava i društva. Razmatrajući ovu važnu poveznicu između ekonomije, okoliša i društva leži u samom središtu znanstvene misije ovog časopisa.

Iako održivost po definiciji podrazumijeva trajanje tijekom vremena, moderna studija održivosti prečesto je nepovijesna i prečesto usmjerena ka neposrednoj sadašnjosti i kratkoročnoj budućnosti. Kroz ovaj zbir radova se nadamo da ćemo pokazati zašto je povijesna perspektiva vrijedna i presudna pri razmatranju pitanja održivosti i danas. Čak i sam pojam održivosti ima svoju povijest, koji suradnici časopisa Caradonna i du Pisani svaki ponaosob istražuju te predstavljaju u ovom broju časopisa. Svi ovdje priloženi radovi pokazuju kako su povijest i održivost nerazdvojni kao i ekonomija i okoliš.

Ovaj tematski broj našeg časopisa na odgovarajući način odražava raznolikost i interdisciplinarnost studija povijesti i održivosti. Teme obuhvaćene u njemu uključuju poljoprivredu, rudarstvo, turizam, upravljanje, zakone, ekološke promjene, povijest ideja, te povijest međunarodne razvojne politike. Primjerice, Thomasov rad ocjenjuje može li se uspješna održivost nekih otočnih naselja u južnom Pacifiku pripisati svjesnim ili nesvjesnim primjenama politika zaštite okoliša, ili su više materijalni čimbenici poput stanovništva, tehnološke sofisticiranosti i korištenja resursa učinkovitosti odredili ishode održivosti. Kah istražuje ekološke probleme i društvene/ političke sukobe koji proizlaze iz ilegalnog zadiranja u šumskom rezervatu u Kamerunu od strane lokalnih mještana koji traže hranu, zaklon i sredstva za život. On se zalaže za više participativne reforme u upravljanju rezervatom u Kamerunu kao moguće rješenje. Barry i suradnici fokusiraju se na sustave prehrane i ratarstva u sjevernoj Hrvatskoj (na primjeru okolice Koprivnice) u posljednjih nekoliko desetljeća i predlažu plan za poboljšanje održivosti i životne dostatnosti obiteljskih poljoprivrednih gospodarstava u regiji. Zorn i suradnici ispituju 500 godina rudarenja žive i s njom povezano zagađenje u Idriji i riječnoj dolini Slovenije. Oni također prate prilično izuzetan nedavnu transformaciju regije u turističku destinaciju i područje zaštićene prirode. Gross i Winiwarter istražuju transformaciju tijekom 200 godina od više ili manje održivog agrarnog Damülsa u austrijskim Alpama u neodrživu intenzivnu ekonomiju energetsko i kapitalno intenzivnog zimskog skijališta.

Raznolikost tema prati i raznolikost pristupa. Neki radovi u ovom broju ističu teorijske pristupe, dok drugi poduzimaju više empirijski pristup. Neki prilozi su uglavnom opisi povijesnih promjena i izazova održivosti, dok drugi nude kritičku evaluaciju i moralnu argumentaciju. Geografski su teme istraživanja u ovom tematskom broju usmjerena na Europu (Hrvatska, Slovenija, Austrija), Afriku (Južna Afrika i Kamerun), Sjevernu Ameriku i Oceaniju.

Ekosustavi, koje ovdje obrađujemo, idu u rasponu od koraljnih atola do riječnih dolina, plodnih nizina, planinskih šuma i alpskih vrhova. Kronološki, također, postoji velika raznolikost. Jedna studija kreće unatrag 2000 godina, dok druga obuhvaća posljednjih 200 godina, a treća se fokusira na razdoblje od 1970. do danas. Uzevši zajedno, ova zbirka radova znanstvenika iz cijelog svijeta naglašava živost, raznolikost, i relevantnost istraživanja povijesti održivosti.

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THE HISTORIOGRAPHY OF SUSTAINABILITY: AN EMERGENT SUBFIELD

HISTORIOGRAFIJA ODRŽIVOSTI: NOVONASTALA DISCIPLINA

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Summary

The growing interest in sustainability in the present day has sparked interest in the concept's history. Numerous historians over the past two decades have sought to trace the conceptual origins of sustainability and sustainable development. This essay constitutes the first historiographical analysis of this emerging body of literature. The author shows that there are two main branches to the historiography, one focusing on intellectual and cultural origins, and the other focusing on the unsustainability of past, collapsed societies. The essay also offers normative ideas about how the historiography could further develop.

Key words: Sustainability, historiography, sustainable development, origins, collapse
Ključne riječi: održivost, historiografija, održivi razvoj, porijeklo, propast

Sustainability has become a ubiquitous buzzword in our society. We now see the concept publicized in grocery stores, on university campuses, in corporate headquarters, in governmental departments of environmental management, in natural resource harvesting industries, and in numerous other domains. Indeed, sustainability has been a standard feature of public and political discourse ever since the United Nations adopted the concept in a series of conventions and reports in the 1980s. By the 1990s it had become a familiar term in the world of policy wonkery—we might think of President Bill Clinton's Council on Sustainable Development, for example—but sustainability had also earned its first critics. In 1996, the environmentalist Bill McKibben called sustainability a »buzzless buzzword« that was »born partly in an effort to obfuscate« and which would never catch on in mainstream society: »…[It] has never made the leap to lingo—and never will. It's time to figure out why, and then figure out something else.« (McKibben, for his part, preferred the term »maturity.«)[1]

Sustainability has certainly been, at times, misused and greenwashed, but it is quite clear that McKibben was incorrect about its decline. Since the year 2000, over 5,000 published books have included either the words »sustainable« or »sustainability« in the title, compared to zero such books before about 1976.[2] A quick Google search for the word »sustainable« returns around 150,000,000 hits. Moreover, the sustainability movement, as we should now call it, has gained a level of respect and legitimacy that is difficult to dispute. The scholarly fields associated with sustainability have expanded dramatically, new tools and methods have appeared, such as Ecological Footprint Analysis, the Triple Bottom Line, and the Genuine Progress Indicator, which help define, measure, and assess sustainability, and a broad range of governments, businesses, NGOs, and communities have embraced the principles of sustainable living. Virtually every major institution in the industrialized world has either a department or office of

[1] McKibben, Bill. »Buzzless Buzzword.« *New York Times*, 10 April 1996.
[2] See the Hollis Catalog at Harvard University.

sustainability. In a sense, this environmental discourse has won out over rival conceptions of humanity's relationship to the natural world, even if industrial society remains, by any measure, far from sustainable.[3]

A growing consciousness about the pitfalls of industrialization has stimulated interest in sustainability. The developed world is 250 years into an ecological assault on the planet that was triggered by the Industrial Revolution and which has forced a serious reappraisal of the values of industrialism and growth-based capitalism. According to Jeffrey D. Sachs, we now live in a geological epoch called the Age of the Anthropocene, in which »human activity« has become the »dominant driver of the natural environment.«[4] We *are*, or have become, a kind of natural disaster. The Fifth Assessment Report (2014) from the Intergovernmental Panel on Climate Change (IPCC), a team of scientists whose job it is to sort through and summarize the state of climate science, makes it clear that Earth's climate system is warming steadily due to »anthropogenic greenhouse gas concentrations,« such as carbon dioxide, methane, and nitrous oxide, all of which trap and radiate heat (at infrared wavelengths) that would otherwise escape from the Earth's atmosphere. »It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century.«[5] Deforestation and the burning of long-buried fossil fuels are the primary culprits. Climate change has already begun to alter natural systems and the environment in troubling ways: Increasingly unpredictable temperatures and weather patterns, changes in the hydrological cycle that generate droughts and larger and more frequent storms, rising sea levels from melting ice caps, the die off of some species, and so on.

Furthermore, the mounting population of homo sapiens on the planet, which surpassed the 7 billion mark in 2012, combined with man-made pollutants and the appropriation of over 30 per cent of the net primary production of organic material—i.e. we use or alter much of what nature has to offer—has resulted in devastating consequences for the world's life-sustaining ecosystems. Here's Sachs again: »The Millennium Ecosystem Assessment (MEA), a comprehensive study of the state of the world's ecosystems carried out over several years with the input of more than two thousand scientists, found that during the past fifty years humans have degraded most of the world's ecosystems and driven down the abundance of other species, some to extinction.«[6] Finally, we're now dealing with a moribund economic system that has drained the world of many of its finite resources, including fresh water and crude oil, generated a meltdown in global financial systems, exacerbated social inequality in many parts of the world, and driven human civilization to the brink of catastrophe by unwisely advocating for economic growth at the expense of resources and essential ecosystem services.[7]

The growing interest in sustainability in the *present* and *future* has driven interest in the subject as an *historical* field. Historians now have an abundance of evidence to suggest that present-day cultural concerns dictate the kinds of historical events, discourses, and topics that strike scholars as relevant: Recent interest in gay rights and gay marriage has driven interest in the history of same-sex relationships; the reality of anthropogenic climate change has stimulated a rich exploration of past climate change and its effect on historical societies; in the 1970s, women's history and »history from below« were motivated in large part by contemporary concerns for gender and class equality. Likewise, the history of sustainability parallels, or perhaps grew out of, the explicit formulation of the sustainability *movement*, which took shape in the 1980s and 1990s, even if, as many have argued, the *concept* of sustainability stretches back at lest into the early modern period, and traces its lineage to several world cultures.

Around thirty years ago, sustainability became an identifiable and publicly discussed concept, and grew in large part out of the work of ecologists, such as Howard Odum and C. S. Holling, econo-

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3 See, for instance, the Ecological Footprint Analysis in Wackernagel, Mathis, et. al. »Tracking the Ecological Over-Shoot of the Human Economy.« *Proceedings of the National Academy of Sciences*. 9 July 2002: 9269

4 Sachs, Jeffrey D. *Common Wealth: Economics for a Crowded Planet*. Penguin, 2008.

5 IPCC. *The Synthesis Report of the Fifth Assessment Report*. 2014. It strengthens the language and findings of the IPCC's 2007 report, *Climate Change 2007: Synthesis Report*. For instance, the 2014 report found that there is a 95-100 percent chance that human actions are the primary cause of the warming of the past few decades, whereas the 2007 put the figure at 90-100%

6 Sachs, *Common Wealth*, 139. See also the *Millennium Ecosystem Assessment* (2005).

7 For instance, Mason, Paul. *Meltdown: The End of the Age of Greed*. Verso, 2010.

mists, such as E. F. Schumacher, E. J. Mishan. and Herman Daly, systems theorists, such as the Club of Rome, energy specialists, such as Amory Lovins, environmentalists, such as Paul Hawken and Lester Brown (and his Worldwatch Institute), biologists and other scientists, such as the International Union for Conservation of Nature (IUCN), and diplomats within the United Nations, the latter of whom transformed the concept of sustainability into »sustainable development,« and associated it with a new, more ecologically sensitive approach to development in the Third World.[8] The UN also sponsored a whole series of conferences and committees which brought the cause of sustainability to the forefront of the international community's attention: the 1972 Stockholm Conference (and the Stockholm Declaration) on environment and society, the 1980 report called *World Conservation Strategy*, which spoke of sustainable development, and which was written by the IUCN and backed by the United Nations Environment Program, the 1982 »World Charter for Nature« promulgated by the UN General Assembly, and perhaps most enduringly, the UN-backed World Commission on Environment and Development (1983-1987) that produced the so-called Brundtland Report (actually called *Our Common Future*), which popularized the notion that sustainability is about meeting current needs without jeopardizing the needs of future generations. This growing concern for the fate of humanity sparked, at the same time, an interest in tracing these concepts, practices, and discourses back in time. The sustainability movement thus established a need for a history of sustainability.[9]

This history, which has been written in an explicit manner only since the 1990s, has begun to differentiate itself from other, complementary approaches to history, the most important of which is environmental history. According to J. Donald Hughes, environmental history comprises three interlocking lines of historical inquiry: Humankind's impact on the natural world, the natural world's impact on humankind, and cultural values, attitudes, and conceptions of nature and the environment.[10] The history of sustainability borrows most heavily from the last of the three features of environmental history, but rarely incorporates the kind of empirical environmental emphasis that one might find in, say, histories of water management, floods, infectious disease, fire-based ecosystem modification, or soil erosion.[11]

The history of sustainability, as with environmental history, is a broadly interdisciplinary field that draws from numerous disciplines across the arts and sciences, but the former is most concerned with the history of »systems thinking,« or the ways in which human societies have conceptualized, dealt with, and responded to the relationship between the natural environment, human wellbeing, and economic systems. This approach mirrors the three Es of sustainability: Environment, economy, and equality (or social justice, or social *injustice*). As such, the history of sustainability draws from ecology, economics (and especially ecological economics), social justice and the study of human rights, population studies, urbanism, environmental science, climate science, sociology, engineering, energy studies, archaeology, and several branches of history—political, cultural, intellectual, and environmental. Its methods thus flow from the

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[8] Most of these authors are cited below in the notes. For more on the origins of sustainable development, see Redclift, Michael. *Sustainable Development: Exploring the Contradictions*. London, 1987. Note, also, that my own book discusses the conceptual differences between sustainability and sustainable development, but I won't dwell on the subject too much in this essay. See Caradonna, Jeremy. *Sustainability: A History*. Oxford: Oxford University Press, 2014. John A. Robinson, whose article is cited below, also contrasts sustainability and sustainable development. Finally, this paragraph merely evokes some of the major names and organizations associated with sustainability, but there's obviously much more to the story.

[9] There simply is not enough time or space to summarize the formation of and current practices of the sustainability movement. This history is discussed by myself, in *Sustainability: A History*, and in Dresner, Simon. *The Principles of Sustainability*. Earthscan, 2008. For the purposes of this essay, I will focus on the historiography of sustainability.

[10] Hughes, J. Donald. *What is Environmental History?* Polity Press, 2006. See also *Global Environmental History: An Introductory Reader*. Eds. J. R. McNeill and A. Roe. Routledge, 2012; McNeill, John R. *Something New Under the Sun: An Environmental History of the Twentieth-Century World*. W. W. Norton & Company, 2001.

[11] There are many examples to cite, but see, for instance: Soll, David. *Empire of Water: An Environmental and Political History of the New York City Water Supply*. Ithaca: Cornell Univ. Press, 2013; O'Gorman, Emily. *Flood Country: An Environmental History of the Murray-Darling Basin*. Collingwood: CSIRO Publishing, 2012; Pyne, Steven J. *Fire: A Brief History*. Seattle: Univ. of Washington Press, 2001; *Soils and Societies: Perspectives from Environmental History*. Eds. J.R. McNeil and V. Winiwarter. 2nd Revised Ed. White Horse Press, 2010.

fields from which it borrows, but discourse analysis, comparative analysis, and historical anthropology seem to be the most common methodological tools for sustainability historians.

In the same way that the current sustainability movement could not have existed without the classic environmental movement, an historical approach to sustainability would not have come into existence without environmental history. But the two subfields are not identical. Historians of sustainability are as interested, and necessarily so, in the history of social justice (and social movements) and economic history as they are in environmental history. Works such as Lynn Hunt's 2008 *Inventing Human Rights: A History* and Anthony Brewer's 2010 *The Making of the Classical Theory of Economic Growth* would be valuable references for a history of sustainability in eighteenth-century Europe, for instance, but neither work has any real relevance to environmental history narrowly defined. The challenge of writing the history of sustainability is to find linkages between environmental thought and practices, economic policy, and social wellbeing (which can incorporate equality, democracy, mental and physical health, life satisfaction, and so on).

To a certain extent, some environmental historians have been writing the history of sustainability for quite some time, even though they have not necessarily been using the explicit language of sustainability or sustainable development. It is obviously not the case that all environmental history focuses narrowly on the natural environment without discussing linkages to social and economic issues, but classic environmental history has often been accused of ignoring economics, in particular. That said, monographic studies such as Andrew Hurley's excellent *Environmental Inequalities: Class, Race, and Industrial Pollution in Gary, Indiana, 1945-1980*, for instance, could be seen as contributing to the history of sustainability (or in this case, *unsustainability*), since it pays such close attention to the interplay between economics, society, and environment.[12] But the history of sustainability differentiates itself from environmental history both in its explicit discussion of the history and concept of sustainability, in its awareness of and attention to systems thinking and the sustainability movement, and its standard interest in balancing social issues, environmental concerns, and economics. As an offspring of contemporary sustainability studies, it also stands out for its heavy emphasis on the *future wellbeing of human society*—historians of sustainability rarely hide their support for the sustainability movement and their interest in establishing a more sustainable society—and for its *cheery optimism*, in contradistinction to what many see as the gloom and doom of environmentalism (and even environmental history). But certainly the nuances can be quite subtle between the history of sustainability and some forms of environmental history, and, as noted above, placing sustainability in an historical framework is an exercise that simply could not have come into existence without the resources and model of environmental history.

One could divide the historiography of sustainability into two broad categories. The first category comprises works that analyze the genesis and development of the concept of sustainability, as well as the formation of the actual sustainability movement at the end of the 20th century. The second category, which we might call »historical sustainability,« brings together a range of scholarship that seeks to understand the fate of historical societies—that is, how and why some societies collapsed, such as Ancient Rome and the Maya, whereas other societies, such as the Highlanders of New Guinea, have thrived for thousands of years. Both branches of the historiography focus on the complex relationships between sustainability and social collapse—either the outright collapse of historical societies in the past, or the threat of collapse in the future. Scholars of sustainability are thus always interested in sustainability's binaried other: Unsustainability.

This first approach is clearly an attempt to historicize a set of ideas and a movement that exists in the present day. It addresses the following questions: »Where did sustainability come from?«; »What does the concept mean, necessitate, and imply?«; »When, how, and why did people come to see industrial society as unsustainable?« »How did an economic system based on growth and resource consumption come to dominate (or even create) modern industrial societies?« Defining sustainability, and therefore historiciz-

[12] Hurley, Andrew. *Environmental Inequalities: Class, Race, and Industrial Pollution in Gary, Indiana, 1945-1980*. Scholarly Book Service, 2002.

ing it, is no easy task, and theorists such as Richard Heinberg, David Holmgren, Albert A. Bartlett, John Dryzek, and others have formulated somewhat different definitions of sustainability.[13] Based on my own synthesis of the historiography, however, the four main ideas that historians of sustainability tend to analyze and historicize are these:

1. **The idea that human society, the economy, and the natural environment are necessarily interconnected.** This is an ecological idea that coalesced in the mid 20th century and which considers human society and economy as part of the broader ecosystem.[14]
2. **The contention that human societies must operate within ecological limits if they expect to persist over a long period of time**. Sustainability historians are always on the lookout for historical actors who express—either in words or in actions—and interest in living within the limits dictated by nature.[15]
3. **The notion that human society must engage in wise and sensible future-oriented planning**. The inter-generational component of sustainability has become an important part of the discourse in the present day, but its roots can be found in numerous world cultures, including some Native American societies.[16]
4. **The idea that industrial society, above all, needs to adopt the logic of the small and the local and move away from the logic of the big and the centralized if it hopes to survive and thrive long term**. The industrialized world has made things big and centralized, but how did this process unfold, who were its critics, and what alternatives does the study of history reveal?[17]

One of the pioneers of this branch of the historiography is the eminent historian Donald Worster, who discussed the history of sustainability in *The Wealth of Nature: Environmental History and the Ecological Imagination* (1994). This collection of essays includes a chapter called »The Shaky Grounds of Sustainable Development,« which addresses the conceptual roots of sustainability in forestry and resource economics before criticizing the ambiguity of the idea.[18] Worster also laid some important groundwork for studying historical conceptions of sustainability in his earlier work, *Nature's Economy: A History of Ecological Ideas* (1997/1994), which is an intellectual history of changing conceptions of humanity's relationship to the natural world.[19] He made it clear that both ecological »arcadians« and »imperialists« created the conditions, at least in European society, for seeing human society and economy as constituent parts of nature.

Worster is an historian of the »Western world,« and thus his work focuses almost exclusively on Europe and European settler societies in North America. The same goes for more recent historians of sustainability, who have generally been Europeanists, Americanists, or historians of the Atlantic world. Far less has been written on the discourse of sustainability in the non-Western world (at least in the Anglophone and Francophone scholarship), although Richard H. Grove's *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600-1860* (1995) represents an

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[13] See *The Post-Carbon Reader: Managing the 21st Century's Sustainability* Crisis. Eds. R. Heinberg and D. Lerch. Heraldsburg, CA: Watershed Media, 2010; Holmgren, David. *Permaculture: Principles and Pathways Beyond Sustainability*. Hepburn, Australia: Holmgren Design Services, 2002/2011; Bartlett, Albert A. »Reflections on Sustainability, Population Growth, and the Environment—Revisited.« *Renewable Resources Journal*. 15:4 (Winter 1997-1998): 6-23; Dryzek, John. *Politiics of the Earth: Environmental Discourses*, 2nd Edition. Oxford: Oxford University Press, 2005.

[14] This idea is seen, for instance, in the work of ecological economists from the 1960s and 1970s, discussed below in the text, from the Club of Rome and their approach to systems thinking, and in the historical work of Donald Worster, also cited later in the text.

[15] This idea is found in the Brundtland Report, or, as it is actually titled: World Commission on Environment and Development. *Report of the World Commission on Environment and Development: Our Common Future*. 1987. The idea is also present in the work of the Club of Rome and in Herman Daly's principle works, cited below.

[16] This idea is most commonly associated with the Brundtland Report, in addition to other UN and UN-backed documents, including the IUCN's 1980 *World Conservation Strategy: Living Resource Conservation for Sustainable Development*.

[17] This idea is forever associated with E. F. Schumacher, whose writings remain a crucial inspiration to the contemporary sustainability movement. His work is also cited below.

[18] Worster, Donald. *The Wealth of Nature: Environmental History and the Ecological Imagination*. Oxford University Press, 1994

[19] Worster, Donald. *Nature's Economy: A History of Ecological Ideas*. 2nd edit. Cambridge: Cambridge University Press, 1994

important contribution to a more globalized historiography. He argues that European-controlled islands in the Caribbean, the Atlantic Ocean, and the Indian Ocean had a major impact on the development of modern environmental consciousness and the idea of »sustainable development,« which he sees as a blend of East Asian, South Asian, and European ideas about managing the natural world.[20] But in terms of sources, most of what has been written about the history of sustainability has been based on printed sources written by social, intellectual, and political elites in Europe and North America.

John Robinson has added to the historiography with a helpful article called »Squaring the Circle? Some Thoughts on the Idea of Sustainable Development« (2004), which deals with the differences between »sustainability« and »sustainable development.« For Robinson, sustainability traces its roots back to John Muir's eco-centric »preservationist« movement, whereas sustainable development is an elaboration of Gifford Pinchot's pro-business and pro-growth conception of »conservationism.« He then goes on to criticize sustainable development as little more than business-as-usual economic development that does not value the idea of living within biophysical limits (a common critique of the UN's approach to sustainable development).[21] Robinson has historicized in a very helpful way the ongoing debate over whether sustainable development is merely a greenwashed approach to economics and resource exploitation in the developing world. William Cronon has also weighed in on the growing interest in the history of sustainability, and did so in an important plenary address that he gave at the 2011 conference of the American Society for Environmental History. Although not a published study, Cronon's insightful address argued that the concept of sustainability stretches back long before the word began to buzz. He also discussed the hopeful optimism of the concept and its shortcomings in the political arena.[22]

To be clear, and as Robinson indicates, there is something of a difference between the concepts of sustainability and sustainable development, and this distinction extends to the historiography as well. To write the history of sustainable development is ultimately to write about the history of sustainability, but the former is a more specialized endeavor that focuses only on the history of international development policy since the 1970s. Scholars such as Carl Mitcham (1995), Desta Mebratu (1998), Ann Dale (2001, 2012), Jacobus A. Du Pisani (2006), and Iris Borowy (2014), in her excellent work, *Defining Sustainable Development*, have each made significant contributions to a growing body of literature that investigates the conceptual origins, institutional history, and international policies of sustainable development.[23] Much of this literature centers on the United Nations, the Organisation for Economic Co-operation and Development, the World Bank, the International Institute of Environment and Development, the European Commission, and other international economic and political bodies that have helped craft and implement sustainable development initiatives since the 1980s. The most common sources in this branch of the historiography are the IUCN's *World Conservation Strategy*, which defined sustainable development in 1980, the World Commission on Environment and Development's *Our Common Future* (1987), which also, and more memorably, defined sustainable development, and the various documents, including *Agenda 21*, that emerged out of the 1992 Rio Earth Summit. In some ways, the short-term history of sustainable development has received greater treatment by historians than the long-term development of the concept of sustainability.

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[20] Grove, Richard H. *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600-1860.* Cambridge Univ. Press, 1995.

[21] John Robinson, »Squaring the Circle? Some Thoughts on the Idea of Sustainable Development,« *Ecological Economics* 48 (2004) 369-384.

[22] William Cronon, »Sustainability: A Short History of the Future,« Plenary Address, ASEH, Phoenix, 14 April 2011.

[23] Mitcham Carl. »The concept of sustainable development: its origins and ambivalence.« *Technological Society* (1995) 17:311–326; Mebratu, Desta. "Sustainability and Sustainable Development: Historical and Conceptual Review," *Environmental Impact Assessment Review* Vol. 18, Issue 6 (November 1998): 493-520; Dale, Ann. *At The Edge: Sustainable Development in the 21st Century.* Vancouver: UBC Press, 2001; *Urban Sustainability: Reconnecting Space and Place.* Eds. A. Dale, W. T. Dushenko, P. Robinson. Toronto: Univ. of Toronto Press, 2012; Du Pisani, Jacobus A. »Sustainable development – historical roots of the concept,« *Environmental Science* (2006) 3:2, 83-96; Borowy, Iris. *Defining Sustainable Development for Our Common Future: A History of the World Commission on Environment and Development (Brundtland Report).* NY: Earthscan, 2014.

Only in the past few years have historians begun to craft overarching narratives of sustainability in the European Atlantic world. Simon Dresner perhaps set this trend with his concise book of 2002, updated in 2008, called *The Principles of Sustainability*. It deals with the period from the late nineteenth century to the present, emphasizes the political aspects of sustainability, and argues, in part, that the collapse of Communism opened up new opportunities (and new challenges) for green values.[24] Ulrich Grober, the journalist and scholar, has written extensively on the origins of sustainability, which he traces back even earlier than the nineteenth century, to new forms of forest management in England, Germany, and France around 1700. In works such as »Der Erfinder der Nachhaltigkeit« (1999), »Deep Roots: A Conceptual History of Sustainability« (2007), and *Sustainability: A Cultural History* (2012), Grober argues that the history of sustainability begins with the forestry treatises produced by John Evelyn in England, Jean-Baptiste Colbert in France, and especially Hans Carl von Carlowitz in Saxony (Holy Roman Empire). It was the latter, in fact, who invented the word sustainability (*Nachhaltigkeit*) in his 1713 treatise on forestry called *Sylvicultura Oeconomica*.[25] Grober has argued persuasively that, in Europe, deforestation and subsequent timber shortages drove interest in creating what was later called sustainable yield forestry.

Grober shows that trees were to early modern European society what fossil fuels are to industrial society: Utterly foundational. The decline of available forest resources spelt disaster both for the poor, who faced higher wood prices, and social elites who managed wood-reliant industries, including mining and metallurgy, which happened to be Carlowitz's domain in Saxony. Although Grober's book moves forward to the present day, his real emphasis, and contribution, is situating the origins of sustainability in forestry. Sustainability in the 18th century was not yet a blanket critique of a particular mode of existence so much as it was a technical recalibration of governmental policy by a social elite with the training and influence to make that determination. But Carlowitz and others nonetheless laid the conceptual foundation for a more explicit sustainability movement, especially after sustainable yield forestry began to dominate forestry schools in Germany, France, and elsewhere.

My own overview of sustainability in Europe and North America, *Sustainability: A History* (2014), covers the period from the late 17th century to the present day, and also discusses the future challenges of the sustainability movement. It draws on the work of historians, such as Worster and Grober, but also makes significant use of economic history and ecological economics. It analyzes the development of sustainable yield forestry and early »systems thinking« in the eighteenth century, but focuses primarily on the period from the nineteenth century to the present. It shows that there were widespread critiques of environmental destruction, resource overconsumption, population growth, and growth-based economics throughout the Industrial Revolution. It makes significant use of the writings of Thomas Malthus, William Stanley Jevons, John Stuart Mill, David Ricardo, Friedrich Engels, and others on the Right, Left, and Center who criticized the myth of industrial progress, or aspects of it, which became *the* metanarrative of Western society in the modern era. It then moves on the environmental movement and the growth of ecological economics in the 1960s and 1970s, and shows the extent to which the modern sustainability movement grew out of activism and steady-state economics.

The culmination of *Sustainability: A History* is three chapters that deal with recent history, the present day, and the future. The explicit objective is to untangle the complex strands of thought that created the conditions for the emergence of the modern sustainability movement. Chapter 5 investigates the formation of an explicit sustainability movement in the 1980s and 1990s, with particular attention paid to the politics, treaties, and reports of the United Nations. Chapter 6 profiles the different ways in which sustainability has become integrated into contemporary society: Sustainable design and green building; methods and measurement tools; energy; transportation; housing; higher education; business and finance; economics; urbanism; food systems and localism; and government planning and policymaking.[26] The

[24] Dresner, *Principles of Sustainability*. See Second Edition from 2008, Ch. 9.

[25] Ulrich Grober: »Der Erfinder der Nachhaltigkeit,« in *DIE ZEIT* Nr. 48/ 25.11.1999, S. 98; idem, »Deep Roots: A Conceptual History of 'Sustainability.'« Wissenschaftszentrum Berlin für Sozialforschung (WZB), February 2007; idem, *Sustainability: A Cultural History*. Trans. Ray Cunningham. Totnes: Green Books, 2012.

[26] Caradonna, *Sustainability: A History*.

final chapter discusses ten challenges for the future of the sustainability. The goal for both Caradonna and Grober is to demonstrate the extent to which modern sustainability traces back its lineage at least to the 18th century. The Enlightenment is, at once, the origin of unsustainable industrialism *as well as* ideas and practices that shaped sustainability.

Although the historiography on sustainability is fairly new, and dates only to the 1990s, it is important to note that much of the recent historical work draws on the historical forays of first-wave ecological economics (late 1960s and 1970s).[27] That is, it is not just environmental history but also economic history—and especially the work of ecological economists—that has served as a crucial source base for historians of sustainability, who have made extensive use of E. J. Mishan's 1967 *The Cost of Economic Growth*, the Club of Rome's 1972 *The Limits to Growth*, E. F. Schumacher's 1973 *Small is Beautiful*, Herman Daly's 1973 *Toward a Steady-State Economy*, Daly's 1977 *Steady-State Economics*, E. J. Mishan's 1977 *The Economic Growth Debate*, Amory Lovins' 1977 *Soft Energy Paths: Toward a Durable Peace*, in addition to works by Kenneth Boulding, Howard T. Odum, and Nicholas Georgescu-Roegen. These economic thinkers are invoked not only to discuss ecological economics as it existed in the 1970s, but because all of these economists and systems thinkers incorporated historical analyses into their respective economic arguments.[28] In short, they wrote their own economic histories that challenged the hegemonic economic discourse of the 20th century. They were all aware that neoclassical economists had crafted a narrative that made a certain mode of capitalist economics seem »natural,« »normal,« and »inevitable.« This ubiquitous narrative of economic progress begins with Adam Smith, A.-R.-J. Turgot, Jean-Baptiste Say, and William Huskisson in the Industrial Revolution, passes through Friedrich Hayek, Milton Friedman, and, to a lesser extent, John Maynard Keynes in the middle 20th century, and on to the post-war period.

By contrast, the ecological economists not only rejected the fundamental tenets of neoclassical economics, with its apathy for the natural world, its adoration of growth, and its ignorance about biophysical limits, but they also revived historical interest in past economic thinkers who had challenged endless economic and population growth, privatization, and industrial pollution: Rousseau, Malthus, Ricardo, Jevons, Mill, Engels, and so on.[29] It becomes clear in reading these economists that there are at least two economic traditions in the Western world: the pro-growth, laissez-faire tradition, on the one hand, and the steady-state, ecological tradition on the other (with some figures, such as Mill and Ricardo, playing a role in both). The economics of sustainability, which is today practiced by William E. Rees, Mathis Wackernagel, Peter Victor, Tim Jackson, Richard Heinberg, and many others, is itself the heir of a long economic tradition that runs from Rousseau, Malthus, and Mill, through to the ecological economics and systems thinking of the 1970s, and up to the present day.[30] Classic ecological economics provides an

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[27] See, for instance, Caradonna, *Sustainability* and Grober, *Sustainability*.

[28] See, for instance, the following works: Meadows, Donella H., Dennis L. Meadows, Jørgen Randers and William W. Behrens III (The Club of Rome). *The Limits to Growth*. New York: Universe Books, 1972; Schumacher, E.F. *Small is Beautiful: Economics as If People Mattered*. HarperCollins Publishers, 1973; *Toward a Steady-State Economy*. Ed. Herman E. Daly. W.H. Freeman and Company, 1973; Daly, Herman E. *Steady-State Economics*. Freeman, 1977; Mishan, E.J. *The Cost of Economic Growth*. Staples, 1967; idem, *Economic Growth Debate: An Assessment*. Allen & Unwin, 1977; Lovins, Amory. *Soft Energy Paths: Toward a Durable Peace*. Penguin, 1977; Boulding, Kenneth. »The Economics of the Coming Spaceship Earth.« Reproduced in Daly, *Toward a Steady-State Economy*. Originally published in *Environmental Quality in a Growing Economy*. Baltimore: JHU Press, 1966; Odum, Howard T. and Elisabeth C. Odum. *Energy Basis for Man and Nature*. NY: McGraw-Hill Book Company, 1976; Georgescu-Roegen, Nicholas. *The Entropy Law and the Economic Process*. Cambridge: Harvard Univ. Press, 1971.

[29] All of these thinkers remain important figures in the sustainability movement. Historians such as Nick Cullather, Matthew J. Connelly, Thomas Robertson, and Jared Diamond, in various writings, continue to engage directly with Malthus and his concerns about resource consumption and overpopulation. Mill has been recast as economist of sustainability ever since Herman Daly revived interest in Mill's work in the 1970s. Rousseau, Jevons, Engels, and Ricardo are also common referents for ecological economists and other defenders of the green economy.

[30] See, for instance: Rees, William E. »Ecological Footprints and Appropriated Carrying Capacity: What Urban Economics Leaves Out.« *Environment and Urbanization*. 4.2 (October 1992): 121-130; Wackernagel, Mathis and William E. Rees. *Our Ecological Footprint: Reducing Human Impact on the Earth*. New Society, 1996; Victor, Peter. *Managing Without Growth: Slower By Design, not Disaster*. Edward Elgar Publishing, Inc., 2008; Jackson, Tim. *Prosperity Without Growth: Economics For a Finite Planet*. London: Earthscan, 2009; Heinberg, Richard. *The End of Growth: Adapting to Our New Economic Reality*. New Society Publishers, 2011.

indispensable set of sources for historians of sustainability, not to mention those in the present working on building a green economy.

The second branch of the historiography is what we might refer to as »historical sustainability,« and is, in a sense, an older, more geographically, and more temporally diverse approach to history. The most emblematic books in this branch are Joseph A. Tainter's *The Collapse of Complex Societies* (1988/2003) and Jared Diamond's best-selling *Collapse: How Societies Choose to Fail or Succeed* (2005). Diamond's earlier best-seller, *Guns, Germs, and Steel: The Fates of Human Societies* (1997) also finds a place in the historiography, as does Daron Acemoglu's and James Robinson's *Why Nations Fail: The Origins of Power, Prosperity, and Poverty* (2012), Ian Morris' *Why the West Rules—For Now: The Patterns of History, and What They Reveal about the Future* (2010), and Ian Morris' *The Measure of Civilization: How Social Development Decides the Fate of Nations* (2013).[31] These books, and the many others like them, are not interested in tracing the origins and development of the sustainability movement in the modern world, although most of these authors, and certainly Tainter and Diamond, are concerned for the fate of modern industrial society. It seems clear, however, that both this branch of the historiography and the one discussed above are »presentist« and reflect deep-seated anxieties about the world's current ecological crisis.

But whereas Worster, Cronon, Dresner, Grober, Robinson, and Caradonna are historicists who focus on context, concepts, and culture, the historical sustainability of Tainter, Diamond, Morris, and others tends to employ either structuralist techniques, overarching theories or typologies of collapse, and/or arguments by analogy. (Diamond, in fact, responds to accusations that he's a determinist and a structuralist in the opening pages of *Collapse*.[32]) Both Tainter, who is an anthropologist and historian, and Diamond, who is a scientist and historian, undertook their respective studies of failed societies because they fear that similar forms of social collapse could occur in the 21st century—indeed, for Diamond, collapses have already occurred. Tainter and Diamond are, in a sense, more interested in unsustainability and collapse than they are in identifying the secrets and strategies of successful long-standing societies. The idea in these works is that we (in the present) should not make the same mistakes made by those in the past. These scholars tend to make these arguments by returning to a grand, sweeping brand of History that a) is infused by oft-criticized empiricist and social scientific methods, b) tends to reduce complex societies and events to types with fungible units, c) employs, at times, Whiggish and Eurocentric ideas about the rise and fall of »civilizations,« and d) is only sporadically »ecological« in orientation. It is reminiscent of traditional humanist historiography, which treated historical events as *exempla* to be followed or avoided.

But I don't want to get too preoccupied with the methodological shortcomings of this return to grandiose storytelling. What is most salient about this branch of the historiography, for the purposes of this essay, is the assumption that modern society is »vulnerable« (Tainter's term) to Roman- or Mayan-style social collapse. The implication is that we should learn from the shipwrecks of history because our own world is structurally similar to—or at least subject to the same problems as—the failed experiments in civilization that were Norse Greenland, pre-Colombian Maya, the Native American Anasazi, Easter Island, and so on. Here, Tainter discusses his methods and his concern for the present:

The concern [with collapse] crosses the social and intellectual spectrum, from the responsible scientists and business leaders who make up the Club of Rome, to the more extreme fringes of the 'survivalist'

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[31] Diamond, Jared. *Guns, Germs, and Steel: The Fates of Human Societies*. W.W. Norton, 1997; Acemoglu, Daron and James Robinson. *Why Nations Fail: The Origins of Power, Prosperity, and Poverty*. Crown Business, 2012; Morris, Ian. *Why the West Rules—For Now: The Patterns of History, and What they Reveal about the Future*. Picador, 2010; idem, *The Measure of Civilization: How Social Development Decides the Fate of Nations*. Princeton Univ. Press, 2013.

[32] See the opening chapter in Diamond, Jared. *Collapse: How Societies Choose to Fail or Succeed*. NY: Viking Press, 2005. Moreover, there has been a fair bit of testy exchange between Diamond and his historical critics. In 2003 Diamond spoke at the American Society for Environmental History, and faced major criticisms from environmental historians for his methods and conclusions. See, also, William H. McNeil's earlier critique of *Guns, Germs, and Steel* in the *New York Review of Books*, »History Upside Down« May 15, 1997, and also John R. McNeil's »The World According to Jared Diamond,« *The History Teacher*, v. 34, n.2: 1-8, in addition to Diamond's various responses to McNeill and other critics.

movement. In between one finds a variety of serious, well-meaning persons: environmentalists, no-growth advocates, nuclear-freeze proponents, and others. All fear, for one reason or another, that industrial civilization is in danger. Such fears are frequently based on historical analogy with past civilizations that have disappeared (and indeed it is sometimes suggested that we are about to go the way of the dinosaurs).[33]

Tainter makes it clear that he is creating a »general explanation of collapse, applicable in a variety of contexts.«[34] Even though his book is ostensibly about the decline of the Roman Empire, the Western Chou Empire, the Egyptian Old Kingdom, the Hittite Empire, and so on, including many »simpler societies« (24), the book is *really* meant as a warning about the vulnerabilities and perils of our own industrial order.

Similarly, Diamond is interested in collapse because he fears that industrial society is headed for the same fate as the Greenland Vikings and the Anasazi. His strategy is to extrapolate lessons from a wide variety of contexts, and then use these lessons, inductively, as the basis for a general theory of failed societies. The idea here is that we should not assume that industrial society invented unsustainable living. Indeed, many societies before the 19th century dealt with deforestation, desertification, soil erosion, silted rivers, urban air pollution, drought, crop failure, resource shortages, and population pressures. In *Collapse*, Diamond formulates a five-point framework to understand the collapse of such historical societies as those living on Easter Island, Pitcairn Island, and Henderson Island (all located in the South Pacific), the Anasazi Native Americans who lived in present-day New Mexico, the Maya Civilization of the Yucatán and surrounding areas, and the Vikings who once lived in Southern Greenland. The five factors are as follows: 1) Environmental damage; 2) climate change; 3) hostile neighbors; 4) friendly trade partners (or lack thereof); and 5) social responses to environmental problems.[35] Diamond argues that modern industrial societies face these problems, too, and that an inability to prevent them—or cope resiliently—will lead to population decline and disintegration of the social order.

Of course, not all of the work on societal collapse is comparative, typological, or grandiose, and many more localized studies have appeared in recent years. Examples include the archaeologist Arthur Demarest's *Ancient Maya: The Rise and Fall of a Rainforest Civilization* (2005), the historian Charles C. Mann's *1491: New Revelations of the Americas Before Columbus* (2006) and *1493: Uncovering the New World Columbus Created* (2011), and the article »Climate Change During and After the Roman Empire: Reconstructing the Past from Scientific and Historical Evidence,« published by Michael McCormick, et. al., which draws largely from scientific data to understand the climatic context during the demise of the Roman Empire in the West.[36] The latter article uses a range of data sets to show that Rome enjoyed surprising climatic stability during the rise of the Empire and that Egypt, which became Rome's bread basket in this period, benefitted from favorable growing conditions. But then the climate became more erratic toward the end of the Empire—it became cooler and drier in the 200s AD, possibly as a result of several volcanic eruptions in the period, before eventually returning to a period of sustained warming. »Such rapid short-term changes,« the author's argue, »would have had a great capacity to disrupt food production during the most difficult decades that the Roman Empire had faced so far; the political, military, and monetary crisis peaked between c. 250 and 290.«[37]

Although significant differences exist between the two branches of the historiography—the first is historicist, conceptual, and cultural; the second is often structuralist, comparative, typological, and empiricist—each approach has added to our understanding of the past, and perhaps more importantly, our relationship to it. The presentism that characterizes the history of sustainability has created a knowledge base that is practical, relevant, and informative, and which can empower the citizens, leaders, and deci-

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33 Joseph Tainter, *The Collapse of Complex Societies*. Cambridge Univ. Press, 1988/2003. 2-3.

34 Ibid., 3

35 Diamond, *Collapse*, 11.

36 Demarest, Arthur. *Ancient Maya: The Rise and Fall of a Rainforest Civilization*. Cambridge Univ. Press, 2005; Mann, Charles C. *1491: New Revelations of the Americas Before Columbus*. Vintage, 2006; idem, *1493: Uncovering the New World Columbus Created*. Vintage, 2011; McCormick, Michael, et. al. »Climate Change During and After the Roman Empire: Reconstructing the Past from Scientific and Historical Evidence.« *Journal of Interdisciplinary History*. Vol. 43, No. 2 (August 2012): 169-220.

37 McCormick, et. al., »Climate Change,« 186.

sion-makers who confront the ecological challenges of the present day. The body of knowledge that is in the process of forming provides helpful answers to the following questions: »How did the sustainability movement come about and what does it criticize and counteract?« »How did industrial society become so unsustainable—why are we living in 'global overshoot'«? »What kinds of alternative economic models does history offer us?« »How can our own society avoid the fate of collapsed societies?« »How do social, economic, and environmental factors interrelate?« By addressing these and similar questions, the history of sustainability has become a culturally and politically charged subfield of the historical discipline, akin to gender history, labor history, race history, and other approaches that eschew a pretense of detached neutrality. The raving success of Jared Diamond's books is just one indicator that the public is deeply interested in this growing body of knowledge.

How can this subfield improve? Where will it go from here? The history of sustainability could develop in a range of ways in the coming years. First, it needs to establish its own professional and academic identity separate from both environmental history and economic history. Even though sustainability (and sustainable development) is in the process of becoming a set of identifiable academic disciplines, replete with scholarly experts, university courses, degree programs (the College of Sustainability at Dalhousie University, the BA in Environment and Sustainability at the University of British Columbia, the PhD program in Sustainable Development at Columbia University, etc.), journals (too many to list), and so on, the development within the *history* of sustainability has been rather slow going. There is still no academic journal, for instance, that is dedicated uniquely to the subject, and as a result, works that fit within this body of knowledge often end up in journals such as *Environmental History*, *Environment and History*, and even *Ecological Economics*. Clearly, the history of sustainability needs its own journal—and probably its own conferences and/or panels—if it expects to develop its own academic and professional identity. There also needs to be more university courses on the subject. My own seminar on the history of sustainability at the University of Alberta is still something of an anomaly.

Second, the field needs greater specialization. The relative lack of work on the subject has meant that pioneering historians have had little in the way of historiographical baggage to weigh them down. As a result, studies such as Grober's and Caradonna's have ranged over time and space. But the broader narratives need to rely on microhistories and monographical analyses, which will hopefully emerge in the next decade. Greater attention to local conditions and histories will help nuance the broader understanding that we have about sustainability, its past, its present, and probably even its future. To a certain extent, though, academic publishing houses have begun to take note of the history of sustainability. Michael Egan, for instance, is editing a book series for MIT Press called »History for a Sustainable Future« that has already begun to publish monographs.[38] Also, it seems clear that at least some of the work on the origins and structures of sustainability is being done outside of traditional history departments—in peace studies, environmental studies, ecology, resource economics, food studies, environmental sociology, and, indeed, »sustainability studies« (a new interdisciplinary academic field), meaning that historians should collaborate with and learn from colleagues outside of history.[39]

Third, with specialization will come a diversification of sources. Although the historical sustainability of Tainter, Diamond, and others has dealt with non-Western societies and archaeological sources, the bulk of sustainability histories have relied on fairly »traditional,« printed sources produced by intellectuals, politicians, bureaucrats, economists, ecologists, and so on. Moreover, relatively little attention

[38] See Michael Egan's webpage on the series: http://eganhistory.com/book-series/.

[39] The literature on sustainability and sustainable development is vast and I don't intend to invoke all of it here. My book, *Sustainability: A History*, discusses the current state of the literature and current practices associated with the movement. For the purposes of this essay, I'll mention but a few titles. Adams, Bill. *Green Development: Environment and Sustainability in a Developing World*. Routledge, 2008; *The Future of Nature*. Eds. S. Sorlin and P. Warde. New Haven: Yale University Press, 2013; Wackernagel, Mathis, et. al. »Tracking the Ecological Over-Shoot of the Human Economy.« *Proceedings of the National Academy of Sciences*. 9 July 2002; Heinberg, Richard. *The End of Growth: Adapting to Our New Economic Reality*. New Society Publishers, 2011; Gehl, Jan. *Cities for People*. Island Press, 2010; Ehrenfeld, John. *Sustainability by Design: A Subversive Strategy for Transforming Our Consumer Culture*. New Haven: Yale University Press, 2009.

has been paid to how such countries as China, India, and Japan contributed to the global sustainability movement, and if such studies are being written in those respective countries, then there has not been enough in the way of cross-cultural exchange. Many of the world's indigenous societies appear only sporadically, or not at all, in the current literature (except when they suffer collapse). I hope to see the history of sustainability become more globalized, less Eurocentric, and more nuanced in the years to come.

Fourth, historians of sustainability need to identify and refine their methods. Currently, as noted, there's a split between the more culturally oriented historians and those that rely on comparative, typological history. But how will the field develop from here? Will this division remain or could it be collapsed? It seems clear that whatever happens, the history of sustainability needs to build an interdisciplinary framework that accommodates economic, social, and environmental perspectives.

Fifth, there needs to be a comparative history of resilience. Thus far, both branches of the historiography have focused on either collapse or the rise (and critique) of an unsustainable industrial society. But why is there so much more of an emphasis on failure, decline, and collapse than there is on success, resilience, and survival? This bias is most recognizable in the examination of indigenous societies in historical sustainability, in which societies such as the Maya and the Anasazi enter the story only when they undergo precipitous decline. Why not, at the same time, attempt to understand why some pre-industrial societies *survived* for so long and under such difficult circumstances? We shouldn't only fear collapse; we should also admire resilience. Indeed, virtually nothing has been written about the dynamic endurance of (at least some) indigenous societies.[40]

Sixth and finally, the role of economic and social history must remain central to the study of sustainability, just as economics and social justice constitute two of the three Es of sustainability. There has been a tendency, understandable to a certain extent, to cast sustainability as an »environmental« discourse appropriate only for environmental historians. But systems thinking and its history—along with the history of collapse and resilience—requires a dynamic understanding of how society, environment, and economics interrelate and contribute to the successes and failures of human societies.

As the sustainability movement continues to grow, and as our world sinks deeper into ecological crisis, the history of sustainability will continue to expand and develop. It seems like only a matter of time until the field possesses its own journals, its own experts, its own PhD students, its own identity. It's exciting, and relatively rare these days, to be involved in the formation of a new academic arena. Just as those who work in the world of sustainability have an opportunity to impact the future of industrial society, so too do historians of sustainability have the opportunity to influence how we in the present view our relationship to the past, and where we want our society to go in the future.

SAŽETAK

Rastući interes za održivost u današnjem vremenu izaziva interes u koncept povijesti. U protekla dva desetljeća su brojni povjesničari nastojali otkriti konceptualno podrijetlo održivosti i održivog razvoja. Ovaj rad predstavlja prvu historiografsku analize novonastale grane literature. Autor pokazuje da postoje dvije glavne grane historiografije, jedna usmjerena na intelektualne i kulturne korijene, a druga s naglaskom na neodrživost prošlih, propalih društava. Rad također nudi normativne ideje o tome kako bi se historiografija mogla dalje razvijati.

[40] Resilience is a domain of ecology that looks at the ability of ecosystems and species to respond to disturbance and change. C. S. Holling developed the approach in the 1970s, and since then it has become a growing component of ecology. However, virtually nothing has been written on the history of social resilience. For the important contemporary studies, see Holling, C.S. »Resilience and Stability of Ecological Systems.« *Annual Review of Ecology and Systematics*. 4 (November 1973): 1-23; Lewis, Michael and Pat Conaty. *The Resilience Imperative: Cooperative Transitions to a Steady State Economy*. New Society Publishers, 2012; Walker, Brian, C.S. Holling, Stephen R. Carpenter, and Ann Kinzig. »Resilience, Adaptability and Transformability in Social-Ecological Systems.« *Ecology and Society*. 9 (2): Article 5; Zolli, Andrew and Ann Marie Healy. *Resilience: Why Things Bounce Back*. NY: Free Press, 2012.

SUSTAINING SUSTAINABLE DEVELOPMENT: THE SHIFTING MORAL BASE OF THE CONCEPT, 1972-2002

ODRŽAVANJE ODRŽIVOG RAZVOJA: PREMJEŠTANJE MORALNOG TEMELJA KONCEPTA, U PERIODU IZMEĐU 1972.-2002. GODINE

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Summary

This article traces the shift in the moral arguments in the sustainable development discourse, which occurred between 1972 and 2002. In the early 1970s ecological considerations were dominant and the zero-growth option had strong support. By the end of the 1980s the influential report of the Brundtland Commission recommended that the balance between the ecological, economic and social aspects of sustainable development ought to be maintained. From the 1990s there was a shift to poverty alleviation as the main focus of the sustainable development discourse. Representatives of the developing countries started making contributions to the evolution of the concept of sustainable development and succeeded in merging the sustainable development discourse into the wider North-South debates. A decrease in wealth rather than a decrease in poverty would be the correct approach to the achievement of sustainable development. However, such a radical change of direction would only be possible once considerable progress has been made towards redressing the imbalances in the gloabal distribution of wealth.

Key words: sustainable development, environmental conservation, poverty alleviation, African perspective
Ključne riječi: održivi razvoj, očuvanje okoliša, ublažavanje siromaštva, afričke perspektive

1. INTRODUCTION

Moral considerations featured prominently in the evolution of the concept of sustainable development since the 1970s and revolved around:

- Humankind's moral responsibilities towards the physical environment (especially the biosphere's ecosystems), and
- Affluent societies' moral responsibilities towards poor societies.

Thus there was both an ecological and a socio-economic component in the moral discourses associated with sustainable development. My argument in this article is that in the thirty years from 1972 to 2002 the ecological motivation for sustainable development lost ground to the socio-economic motivation. In the context of North-South debates the voice of Africa made a contribution to this shift. However, I also contend that, despite this change, it would be incorrect to deduce that the moral justification for the necessity of sustainable development simultaneously shifted from a mainly ecocentric base to a mainly anthropocentric base. The evolution of the concept of sustainable development is much more complex. It involved the interaction of many considerations with regard to the interrelationship of ecological, eco-

nomic and social factors in the moral discourse concerning sustainable development. Seminal texts and pronouncements in the different phases of the evolution of the concept of sustainable development, ranging from the zero-growth option of *Limits to Growth* to the poverty alleviation focus of the Millennium Development Goals, are analysed here to indicate shifts in emphasis and approach.

2. NOTHING NEW UNDER THE SUN: THE HISTORICAL ROOTS OF THE CONCEPT OF SUSTAINABLE DEVELOPMENT

To gain a better understanding of the moral content of the concept of sustainable development it is necessary to go back to its historical roots. I made a detailed analysis of these roots in another article (Du Pisani, 2006).

The idea of progress

Thinking about the economic development aspect of sustainable development has its roots in earlier conceptions of progress, growth and development. Ideas about human progress, which has come to mean forward movement in a desired direction in terms of scientific and technological knowledge, material wealth and moral improvement, were already articulated in the Greco-Roman civilisation. More attention was given to it in Judeo-Christian thinking. Augustine made path-breaking contributions in this regard. Eventually progress became almost synonymous with Western modernity. Fontenelle, Turgot, Condorcet, Saint-Simon, Comte, Hegel, Marx, Kant and Spencer all made significant inputs into the evolution of the Great Idea of Progress, the positivistic view that a »law of progress« exists, which makes an unstoppable and irreversible step by step upward trend towards a golden age on earth inevitable. The idea of progress was secularised, it moved away from the Christian notion of progression in a divinely ordained direction to a promised land beyond the grave to the ideal of a better life on earth made possible by scientific and technological advancement. This process of evolution of the idea of progress has been thoroughly analysed by many authors (Bury, 1932; Edelstein, 1967; Dodds, 1973; Nisbet, 1980; Burgen, McLaughlin & Mittelstrass, 1997).

It has been argued for centuries, as far as the human-environment relationship is concerned, that science has provided humankind with mastery over nature and that humankind is entitled to use this mastery to tame the planet and exploit its resources for human benefit. Since the Industrial Revolution the idea of human progress has been linked to economic growth and material enrichment. The notion gained ground that it is acceptable and necessary for humans to exploit natural resources to the utmost in the pursuit of increased economic production (Worster, 1993: 178-180). The negative consequence of the exploitation of natural resources on an unprecedented scale was massive damage to the physical environment while, at the same time, the gap between rich and poor societies widened.

Emergence of the concept of sustainability

Between the idea of progress and its antithesis, the threat of decline, a new concept emerged, as people became increasingly aware of the vulnerability of natural resources. This was sustainability, which rejected both the progressive (growth) paradigm and the declension paradigm and posited the steady state model. Throughout human history the impact of the demand for raw materials on the environment has been at issue. Ancient civilisations wrestled with this challenge. In the writings of Plato, Strabo, Columella, Pliny the Elder and Varro we see evidence of this. From the 18th century concern about possible shortages of the primary resources in energy supply - wood, coal and oil - mounted. As scientific knowledge increased more attention has been given to the sustainable use of resources. A scientific approach to »sustainable yield« was being developed in German forestry from the 18th century. In the course of the 19th century W. Stanley Jevons, Rudolf Clausius, John Stuart Mill, George Perkins Marsh,

Alfred Russell Wallace and others wrote about what would, a century later, be called sustainable development. In the 20th century their work was supplemented by that of scientists such as Gifford Pinchot, G.A. Brender à Brandis, F.M. Jaeger, Thorstein Veblen, A.C. Pigou, Egbert de Vries, William Vogt, Henry Fairfield Osborn and K.W. Kapp (see Van Zon, 2002).

Expectations of unlimited economic growth

Between 1800 and 1970 the longest period of continuous economic growth in the world's history occurred, with the highest growth rates in the period after World War II. This caused optimism that unlimited economic growth and ever-increasing affluence might be possible. At the same time the growing gap between rich and poor in the colonial and postcolonial period became a burning economic and moral issue. In the economic sphere the high global growth rates could be sustained only if world markets continued expanding. This in turn could be achieved only if wealth could be distributed more evenly across the globe to stimulate the demand for products in the developing regions. On a moral level philanthropically-minded persons and groups were asking the question how people in the developed world, with its ever-increasing living standards, could be at peace with their conscience when growing numbers of poor people in the developing world endured miserable living conditions.

Development theories

In an attempt to understand the dynamics of the world system in the second half of the 20th century different theories of development emerged to try and explain the sharp division between the rich »North« and the poor »South«.

Modernisation theory held forth the argument that the developing countries would develop by emulating the developed countries in following the route of free enterprise and a market economy. By opening up markets, privatising economies as much as possible and allowing the unfettered growth of international capital the less developed regions of the world would eventually also share in increasing prosperity and poverty would be reduced (See Peet, 1999; So, 1990).

Contrary to this line of thinking dependency theory held that the continued dominance of the developed »core« was built on control over and exploitation of the less developed »periphery«. Western development depended on the deliberate underdevelopment of the non-Western world and maintaining the inequalities between North and South. For this reason developing countries could escape from the spiral of poverty only by breaking free from capitalist bonds and moving in the direction of socialist autonomy (Frank, 1966 and 1978; Wallerstein, 1974, 1980, 1989 and 2011. See also Peet, 1999; So, 1990).

These opposing development theories shaped the context in which sustainable development as an alternative paradigm of development was born.

3. SAVE THE PLANET: THE ECOLOGICAL DISCOURSE

Progress exposed as a myth

In the late 1960s and early 1970s the crucible of ideas around progress, sustainability, growth and development, which through the centuries had moved through many permutations, started pointing towards a new paradigm, which would become known as sustainable development. At that stage the Great Idea of Progress was reinterpreted as the Myth of Progress. Many scholars argued that the high hopes of a possible linear and continued improvement of the human condition were misguided, because they had not taken human or environmental limitations into consideration. Progress in science and technology still seemed to be unstoppable, but in terms of material and moral welfare human societies everywhere continually experienced a mix of progress and decline. The destruction caused by two world wars, the

colonial exploitation of non-Western people and the plundering of the earth's biosphere painfully demonstrated that a lasting golden age of humanity was a mere pipedream.

Awareness of the ecological crisis

An acute awareness of the enormous damage caused by scientific, technological and economic progress to the physical environment of the planet necessitated a new approach to development. Rachel Carson's *Silent Spring* (1962) is regarded as the book which triggered, especially in the USA, the emergence of the green movement. Many other publications, including Paul Ehrlich's *The population bomb* (1968), Edward Goldsmith's *A blueprint for survival* (1972) and E.F. Schumacher's *Small is beautiful* (1973), sounded the alarm about an imminent ecological crisis, which could even result in the destruction by humans of the earth's capacity to sustain life and which endangered their own survival. One of the best books in this genre was William Catton's *Overshoot: The ecological basis of revolutionary change* (1980).

These authors identified population explosion, pollution and the depletion of non-renewable natural resources as the major environmental challenges. Environmental concerns appeared more prominently in the media and popular culture. In various guises, including anti-nuclear activists, environmental non-governmental organisations and green political parties, the green movement attracted public attention. Ecologism was recognised as an ideology in its own right. The greens, within the networks of leftist movements, made their presence felt in Western societies. Fears with regard to an imminent ecological catastrophe paved the way for sustainable development as an alternative for economic growth.

Coining the term »sustainable development«

In the early 1970s the term »sustainable development« started surfacing in texts (Goldsmith, 1972: 23; Meadows et al., 1972: 24, 158. See Coomer, 1979; Allen, 1980). Barabara Ward (Lady Jackson), founder of the International Institute for Environment and Development, allegedly coined the term. Several publications laid the conceptual foundation of sustainable development in that period. In essence sustainable development amounted to the creation in the world of a dispensation where provision would be made for the basic material needs of all people on a level of development that could be sustained into the distant future without depleting the earth's natural resources to a level where irreparable damage would be done. Previously development, the use of resources, and conservation, the protection of resources, had been regarded as conflicting and irreconcilable processes. Now sustainable development tried to facilitate a compromise, by focusing on the interdependence of development and environmental conservation.

Acknowledging the limits to growth

The oil crisis of 1973 dramatically demonstrated the potential consequences of shortages of resources. Shortly thereafter a worldwide economic recession set in. Analysis of the causes of the recession brought an awareness of the limits to growth. Idealistic economists continued advocating steady growth. They argued that the human race was capable of overcoming the threatening environmental challenges, that inhibited further development, through new scientific discoveries and the development of improved technologies. A more realistic economic point of view emerged, which started from the assumption that the overoptimistic expectations of rapid industrial development and high growth rates were no longer attainable. Experts of different disciplines realised that it was impossible for all societies to reach the same level of development as in the developed countries, because sufficient resources did not exist to sustain such a level of consumption. Development objectives for the developing societies had to be limited to a level that would provide for the basic needs of people, but that would be sensitive to the vulnerability of the environment. Many economists argued for qualitative development rather than quantitative growth (see Rostow, 1978: 580-1; Paxton, 1993: 2; Viedermann, 1993: 181).

This awareness linked up with a seminal text from that period, *The limits to growth*. This publication was the product of a research project commissioned by the Club of Rome, a group of prominent economists and scientists. Computer simulations were used to investigate the environmental impact of resource use in the world. The authors of the research report warned that the earth possessed a limited store of natural resources. Their almost apocalyptic conclusion was that, should the growth in population, industrialisation, pollution, food production and the depletion of resources be maintained at the same levels, the limits to growth on the planet would be reached in less than a century, which would cause a sudden uncontrollable decrease in population and industrial capacity (Meadows et al., 1972: 23).

Because *Limits to growth* started an intense debate concerning the impossibility and infeasibility of unlimited economic growth and the necessity to find an alternative, it is regarded as a key trigger in the birth of the concept of sustainable development (Kenny, 1994: 229; Rostow, 1978: 571).

At that stage, when policy makers still lacked a comprehensive understanding of the full extent of the postcolonial socio-economic dilemmas of the Third World, the ecological discourse was dominant in debates about sustainable development. Some of the core issues in this debate were: Can the insistence on humankind's mastery of nature be justified? Up to what point can people be allowed to exploit natural resources? At what point does use become unsustainable overexploitation and abuse?

Debate on the role of Christianity in the ecological crisis

From a Christian perspective significant inputs were made in the sustainable development discourse in response to criticism dealing with the Christian religion's alleged role in plundering nature. Early in the 20th century Max Weber made an association between Calvin's doctrine of predestination and the Western capitalistic spirit, suggesting that Christianity played a leading part in environmental degradation (Weber, 1990).

Lynn White, in a controversial article that appeared in the late 1960s, blamed Judeo-Christian anthropocentrism, associated with the doctrine of human exceptionalism, for plundering the earth's natural resources. He argued that the destructive powers of science, capitalism, technology and democracy all stemmed from the same religious root, Medieval Christianity. White contended that Christianity's triumph over heathen animism overturned the respect for nature as something sacred. By doing so the restrictions that stopped people from abusing nature were removed. The idea that humans, in line with Genesis 1:28 in the Bible, had to subjugate and control nature sanctioned an attitude of arrogance underlying the plundering of nature. White's opinion was that a religious solution had to be found. He suggested that the Franciscan acknowledgement of the spiritual autonomy of all parts of nature, which was rejected as a heresy in some Christian circles, needed to be taken as the point of departure for a new direction (White, 1967. See also Young, 1994: 10).

White's apportioning of blame started a lively debate. On the one hand it was conceded that there was indeed a tradition in Christianity that supported the notion that God had given humankind an absolute mandate to assume mastery over nature. This tradition saw humans as the crown of God's creation and nature as being made for the benefit of humans. The naturalism of »heathen« societies was resisted as idolatry. Christian thinkers, including Anselm, Augustine and Thomas of Aquinas, did not regard nature as sacred and viewed the use of technology for the sake of production as legitimate. This anthropocentric approach caused Western thinking, in contrast to Eastern views, to develop in the direction of positivist ideas about progress (as discussed above) and laid the ideological, educational and administrative foundation for a society geared towards economic growth. The scientific revolution and the emergence of capitalism heightened human awareness of power and resulted in »a breathtaking anthropocentrism, based on his power over nature, unmatched by anything in the past« (Glacken, 1967: 494). Participants in the debate who supported White's criticism of Christian attitudes and behaviour argued that Christianity paved the way for the rise of modern science and technology, which resulted in the unrestricted subjugation of nature. They pointed out that eschatological expectations of the destruction of the earth blunted

concern for the state of the planet. They also accused Christian churches of not collaborating fully in regulating population growth by birth control (Young, 1994: 12-17).

Defenders of Christian ethical thinking conceded that there were anomalies in the way that churches interpreted teachings in the Bible on the human-nature relationship. They responded by emphasising that next to the tradition that regarded humans as the masters of nature there existed another growing Christian tradition, based on Genesis 2:15. This tradition regards nature as God's property and humans as stewards that have to account to God for their stewardship. Christians who endorse this tradition are not arrogant towards nature, but support the ethics of care for the earth. Many Christians feel that religion should play its role in dealing with the ecological crisis and actively participate in environmental conservation (see Worster, 1993: 187-9; Pepper, 1986: 44-46; Young, 1990: 54ff).

This debate in Christian circles since the 1970s has spawned a comprehensive literature on Christian stewardship of nature (see Wilkinson, 1980 and 1991; Vorster, 1987; Vos & Muller, 1991; Basney, 1994; Young, 1994; Northcott, 1996; Van Dyke, 1996; Gousmett & Chimuyka, 1997). »Earthkeeping« is identified by Wilkinson et al. (1991: 2, 254, 306, 325, 350-359) as an important task of Christianity on which Christians should focus individually and collectively. Reconciliation is regarded by these authors as not limited to the relationships between God and humankind and between humans, but also between humans and the rest of God's creation. Scriptural visions of heaven include the idea of harmony between humans and nature. They distinguish a number of principles of Christian stewardship and supply guidelines for action in implementing stewardship.

The first international environmental conference

Many recommendations were made in the 1970s to counter the approaching ecological crisis. *Limits to growth* suggested a state of equilibrium, basically a zero-growth option in terms of population and capital (Meadows et al., 1972: 170-184). *Small is beautiful* reasoned that escape from the pressures of modern industrial society was possible by living in smaller-scale communities and practising a self-sufficient lifestyle in harmony with other people and nature. The author formulated plans to restructure the ownership of big enterprises in the public interest (Schumacher, 1973: 68, 264-273).

The idea that a structural transformation of the world's economic system was needed to save the planet, also surfaced at the first international environmental conference organised by the UN. It was the United Nations Conference on the Human Environment (UNCHE) that was held in 1972 in Stockholm. The declaration formulated at the conference foregrounded environmental conservation in the following introductory statement:

- To defend and improve the human environment for present and future generations has become an imperative goal for mankind.
- The declaration mentioned the enormous capability of humans to transform the environment and the damage already done to nature. It emphasised the imperative to protect natural resources for present and future generations through careful planning and management. Individuals, communites and governments had to share the responsibilty for this. Much in the declaration dealt with specific environmental challenges (UNEP, 2007a).
- The emergence of the green movement and radical recommendations for saving the planet from ecological disaster typified the *Zeitgeist* of the late 1960s and early 1970s. It was a time when radical left-wing thinking and political movements (such as the »New Left« in the USA) gained ground in Western societies. More conventional viewpoints soon eclipsed this left-wing tendency, which was quite dominant in many of the moral discourses of the time, specifically also on the human-environment relationship.

4. SAVE THE POOR: THE SOCIO-ECONOMIC DISCOURSE

Scepticism over sustainable development in the developing world

It is clear, when studying the text of the UNCHE declaration in 1972, that intense North-South debates behind the scenes influenced its formulation. Developing countries prioritised other issues than developed countries. For the developing countries economic growth was imperative, because it was essential for the generation of wealth, the improvement of living standards and catching up with the developed countries. Consequently some leaders of developing countries were sceptical about the concept of sustainable development, especially the notion that growth needed to be limited, because they suspected that it might be employed by the North as a strategy to stem growth in the South. At that stage, with the political process of decolonisation almost at an end, the Third World was prone to challenging any sign of continuing economic and ecological colonialism.

At the UNCHE poorer nations blamed the rich countries for the destruction of the environment and the impoverishment of the peoples in the developing countries. They argued that it would be extremely unfair to punish the poor countries for the planet's environmental problems, which had been caused by the developed countries. Should economic growth be restricted, it would make it impossible for the developing world to improve the living conditions of its inhabitants. The delegates from the developing countries raised concern that the conference was paying so much attention to the physical environment and so little to the social environment, while the most urgent tasks were to lessen poverty, malnutrition and illiteracy among two thirds of the world's population. Third World representatives endorsed the idea that action for the sake of environmental conservation should not be used as an excuse to reduce development. On the contrary, development aid needed to be drastically stepped up. There was consensus among them that a zero-growth philosophy, as proposed in *Limits to growth*, was absolutely unacceptable. They called upon developed countries to change their attitude by scrapping protective trade tariffs (UNEP, 2007b).

World leaders needed to seek compromises to try and reconcile the opposing views of the developed and developing countries. This is evident in several elements of the text of the UNCHE declaration, which confirmed the right of all people, especially those in the developing world, to development and the improvement of their quality of life, and emphasised the importance of human needs and aspirations. Several of the 26 principles of the declaration refer specifically to the developing countries. The document propagated matters such as increased technical and financial assistance to developing societies to empower them to protect the environment and stable prices for raw materials exported from the developing to the developed countries (see UNEP, 2007a).

The subtext of the outcomes of the UNCHE was that in principle the participants acknowledged the needs of the developing world, but made no solemn commitment to implement concrete measures to satisfy those needs.

It is clear that as early as at the 1972 conference in Stockholm another discourse appeared on the agenda, parallel to the existing ecocentric discourse which dominated the *Limits to growth* debates. In forums where the developing countries had the opportunity to make inputs, e.g. meetings organised by the UN, this parallel discourse, aimed at seeking solutions to the socio-economic challenges facing the Third World, started becoming more influential in international agenda-setting and policy-making. The central moral issue in this context was: To what extent do the rich societies have an obligation to help poor societies to improve the living conditions of their people?

Role of the Brundtland Commission

During the 1980s publicity in the media to environmental disasters and threats kept the spectre of imminent ecological doom alive. Disturbing scientific data about the potentially negative consequences of issues such as the greenhouse effect and the hole in the ozone layer were released and kept the public aware of environmental challenges. At the same time the full scope of the humanitarian crisis associ-

ated with the poverty spiral in Africa, as a result of the continent's dramatic economic decline from the 1970s, started unfolding. In this context new permutations around the concept of sustainable development evolved, flowing from the interactions between economic, social and ecological discourses.

Again the UN, through the Brundtland process, gave direction. By a resolution of the General Assembly in 1983 the UN established the World Commission on the Environment and Development, the so-called Brundtland Commission, to develop an environmental perspective for the period to the year 2000 and beyond. From the outset the commission sought compromises to try to reconcile the interests of the developed and developing countries and facilitate collaboration in the sphere of environmental challenges, seeking to formulate common objectives in dealing with these challenges. The UN resolution hoped that shared perspectives on environmental issues and consensus regarding suitable actions would resolve environmental and development conflicts (UN General Assembly, 1983). The Brundtland Commission was structured and its activities planned in such a way that both developed and developing societies would have the opportunity to give input (UN General Assembly, 1987).

Our common future, the report of the Brundtland Commission, completed in 1987, juxtaposed the unsustainable consumer patterns in the North to the enormous poverty in the South. It concluded that economic growth was imperative, especially in the developing world, but that it needed to be achieved in a sustainable way without further destroying the physical environment. The report emphasised that the ecological, social and economic components of sustainable development should always be kept in mind (UN General Assembly, 1987: 19-25).

Our common future sent a clear signal that the zero-growth option was not acceptable and that ecological considerations did not override social and economic development goals.

Poverty alleviation foregrounded

Leading studies from this period, including the *World Conservation Strategy* (IUCN, 1980) and *Caring for the Earth* (IUCN, 1991), linked sustainable development to poverty alleviation. The underlying assumption was that local people were often forced to destroy their environment because they had no other choice in their struggle for survival. Poverty had to be reduced both for social and ecological reasons. This sentiment was expressed in the *World Conservation Strategy*:

- Hundreds of millions of rural people in developing countries, including 500 million malnourished and 800 million destitute, are compelled to destroy the resources necessary to free them from starvation and poverty (IUCN, 1980: 6).

The South African version of *Caring for the Earth* stated:

- Poverty is one side of the coin of environmental destruction … impoverished and over-crowded communities are battling to survive. In such circumstances, environmental ethics are often considered irrelevant and conservation concerns written off as an unnecessary luxury in the never-ending struggle for survival (Yeld, 1997: 17. See also Singhal and Shrivastava, 2004: 330, 334.).

Ideas associated with poverty alleviation merged with a concept stemming from the sustainable development discourse, i.e. intra-generational equity. Its premise was that in both the local and global spheres resources had to be utilised in a way that was fair to all people of the current generation (see Center for International Environmental Law, 2007).

The Rio Earth Summit

During the 1990s the emphasis in sustainable development discourses shifted to poverty alleviation as priority number one. This was evident at the Rio Earth Summit in 1992. The two main documents approved at the summit, the Rio Declaration on Environment and Development (UN Department of Economic and Social Affairs, 1992b – particularly principle 5) and Agenda 21 (UN Department of

Economic and Social Affairs, 1992a – in particular chapter 3), emphasised that a strategy to fight poverty was a basic prerequisite for sustainable development.

The toughest negotiations at Rio dealt with financial resources and mechanisms as set out in chapter 33 of Agenda 21. The G77 states (the developing countries) insisted on assurances that they would receive additional funds to perform their responsibilities in terms of Agenda 21 and that the developed countries commit themselves to increase official development aid to 0.7 per cent of their GNP by the year 2000. On the very last day of the summit the developed countries agreed to expand their development assistance programmes (IISD, 1992).

The approved texts of the Rio Declaration and Agenda 21 tried to balance the interests of the developed and developing worlds. These documents identified economic growth, social development and povery reduction as priorities and held forth the promise of a more open international economic system. Commentators interpreted their content as the adoption of key principles to promote rather than stem economic development in the developing world (see Anon., 1995).

Africa, poverty and sustainable development

At that stage poverty increased in Africa and assumed crisis proportions. Two thirds of the world's poorest countries were in Sub-Sahara Africa. GDP per capita growth rates in Africa were very low and it appeared as if the continent was sinking away in an ocean of poverty. GDP statistics showed that the average African in 1992 was 20 to 25 per cent worse off than in 1979 (Seidman and Anang, 1992: 1; World Bank, 2004: 26-27).

For Africa poverty as a moral issue was a lever to get development aid in the international dispensation after the end of the Cold War. The continent had lost its strategic significance for the superpowers and its leaders feared that it would be marginalised. As the link between poverty alleviation and sustainable development became stronger African leaders abandoned their scepticism towards the motives behind sustainable development and started appropriating the concept as a bargaining chip in the North-South debates.

The leaders of the developing countries managed to occupy the moral high ground in North-South debates. They argued that the colonies had been plundered and exploited in colonial times by their European colonial masters and that the developed countries were partly responsible for the poverty in the developing countries. Therefore they had an obligation to compensate the developing countries, which they had not yet honoured in the postcolonial world while they even continued to exploit the former colonies through neocolonialism.

At one big UN conference after another in the 1990s the delegates made a strong moral commitment to the alleviation of the plight of the world's poor. Resolutions in international forums reflected the spirit of compromise between the conflicting development priorities of the developed and developing countries. In an effort to facilitate global progress in the direction of sustainable development these forums identified the need for shared values. The two Africans who in this period occupied the hot chair of the secretary general of the UN, Boutros Boutros-Ghali (1991-1996) and Kofi Annan (1997-2006), placed special emphasis on poverty alleviation as a global priority (UN Economic and Social Council, 1996; UN Economic and Social Council, 1997). It came as no surprise when the reduction of poverty was made priority number one in the list of Millennium Development Goals (MDGs) adopted by 189 countries at the UN's Millennium Summit in September 2000 (UNDP, 2007).

The World Summit on Sustainable Development, Johannesburg 2002

At the World Summit on Sustainable Development (WSSD), held in Johannesburg from 26 August to 4 September 2002, the spotlight inevitably fell on the interests of the developing world and specifically poverty alleviation.

Before that time African leaders formulated a common statement about the summit. They reconfirmed their commitment to sustainable development. Furthermore they expressed concern about the slow progress with the implementation of Agenda 21, particularly as a result of the failure of the developed countries to make good their commitments agreed upon at Rio. They argued that the phasing out of poverty was an indispensible prerequisite for sustainable development and deserved the highest priority. The African leaders highlighted the inequalities in the relationship between the developed and developing states. They insisted on acknowledging the legitimate development priorities of the developing countries and the »differentiated responsibilites« of rich and poor nations with regard to sustainable development. They argued that it was the joint responsibility of North and South to transform the global relations underlying poverty in Africa (UNEP, 2001).

The elimination of poverty, the protection of natural resources which served as basis for economic and social development, and changes in unsustainable patterns of production and consumption were the three overarching themes of the WSSD. In his opening speech President Thabo Mbeki said:

A global human society based on poverty for many and prosperity for a few, characterized by islands of wealth surrounded by a sea of poverty, is unsustainable.

He appealed to the rich countries to accept their responsibilies to help combat poverty and underdevelopment (cited in Anon., 2002a).

At the WSSD discussions the divergent priorities of the developed and developing countries were underlined. Representatives of the poor countries demanded the right to development and criticised the unsustainable consumption and production in the rich countries. On the other hand representatives of the developed countries emphasised the inability of developing countries to meet standards of good governance (Anon., 2002b).

Eventually the delegates considerably watered down the texts of the two official documents of the WSSD, the Johannesburg Plan of Implementation and the Johannesburg Declaration on Sustainable Development, to reach consensus. Both documents highlighted poverty alleviation as the world's biggest challenge. An appeal was made for a great effort at all levels to help the developing world to reach its poverty-related MDG targets (cited in Strachan et al., 2005: 177).

The Johannesburg summit continued the trend at international environmental forums to place equal emphasis on the welfare of humans and the environment. It elicited mixed reaction. Critics claimed that the summit failed the poor and vulnerable people of the world by its inability to reach solemn agreements about the drastic measures needed to effectively deal with the planet's environmental challenges. Supporters of the process expressed the opinion that the WSSD and the series of UN conferences that preceded it fulfilled the requirements of conference diplomacy by keeping the relevant issues on the agenda, making a broad public aware of the issues at stake, generating new data, working towards consensus and administrative reform, and promoting mass participation (Baker, 2006: 66, 73).

5. MORAL SHIFT: FROM ZERO-GROWTH TO POVERTY ALLEVIATION

In this article I have argued that between 1972 and 2002 a discernable shift occurred in the discourse of sustainable development. In the 1970s the main focus was on ecological considerations and there was strong support from some scientists for the zero-growth option. Late in the 1980s the influential Brundtland report called for the balancing of ecological, economic and social considerations. In the 1990s the sustainable development discourse within the UN's Agenda 21 framework was dominated by the challenge of poverty and how it should be addressed to achieve sustainable development on a global scale.

Initially the representatives of the developing countries were skeptical of the concept of sustainable development, because potentially it could thwart the desire for economic growth and social development in the poor societies. During and after the Brundtland process, however, they started embracing sustainable development. With the assistance of more radical civil society elements in the West they succeeded in merging the sustainable development discourse with the broader North-South debate on economic inequality. Undoubtedly the moral force of the arguments of those who spoke for the poor of the world,

supported by a growing knowlege-base of the realities of the Global South, made a significant contribution to the evolution of the concept of sustainable development.

At face value the focus on the needs of the poor seems altruistic and morally appropriate. But should the increasing emphasis on poverty alleviation be regarded in a positive or negative light from an ecological sustainability perspective?

The concept of sustainable development brought an awareness of the interdependence of social, economic and environmental factors and created a platform from where the existing global power relations could be challenged in international forums. It created a space for representatives of developing countries to make their views audible to an international audience. Because the consequences of poverty is such an emotional issue this space provided the opportunity to make a moral demand on the affluent societies of the North.

It would be naive to think that this moral impact would have sufficient weight to quickly redress global inequalities.

Observers should keep in mind that the priority that was given in international forums to poverty happened in a context where the developed world continued its efforts to maintain the global system with its unequal distribution of wealth. To give prominence to poverty alleviation suited the leaders of the developed world. The bickering over which percentage of the GNP of the rich countries ought to be earmarked for development aid amounted to a discussion on the size of the alms the wealthy were prepared to dish out to the poor on their own terms. It did not directly challenge the existing Bretton Woods regime, where the World Bank, International Monetary Fund and World Trade Organisation play the central role in the global economic order to maintain the *status quo* of inequality. It circumvented the demand for a radical restructuring of the economic power balance in the world.

Ironically, the poverty alleviation approach focuses on the symptoms rather than the real causes of the ecological dilemma. In the Brundtland report the unsustainable consumer culture in the rich North was identified as the main culprit responsible for the world's environmental problems. Other studies found that the ecological footprint of people in prosperous urban communities in the Western metropoles was much larger than that of poor people in rural areas in the developing world (see Wackernagel and Rees, 1996). Rich and powerful people contribute much more to the destruction of the environment than the poor and miserable. But often the poor, who are seldom in a position to defend themselves, are blamed for environmental degradation.

The logical approach to dealing with the ecological crisis of the planet would be to focus on the reduction of wealth rather than the reduction of poverty. After the Rio Earth Summit *The Ecologist* stated that the regime of environmental conservation created at the summit rested on a flawed foundation, because Western-style wealth, rather than poverty, was the main cause of environmental decline (cited in Baker, 2006: 60).

There was an alternative, more radical, stance in the developed countries, that gave support to the position of the developing countries in the sustainable development discourse. It featured at the meetings of the WSF (World Social Forum). Supporters of this alternative stance blamed the obsession with markets and consumption in terms of »neo-liberal globalisation« for ecological unsustainability. They alleged that control and power over natural resources were centralised by states and multinational corporations. The natural democratic right of ordinary people to access to resources (the so-called »commons«) needed to be restored. Participants in the WSF made appeals to the wealthy societies to lower levels of production and consumption and by doing so creating an opportunity for the poorer societies to improve their quality of life. Pleas were made for a fundamental restructuring of the international political and economic order by replacing the dispensation of the World Bank, IMF en WTO with multilateral environmental agreements (Horton, 2002; Fisher and Ponniah, 2003: 126-8).

Idealists who believe that sustainable development will pave the way to a better future, can endorse the hopeful conclusion of the Johannesburg Declaration on Sustainable Development:

We commit ourselves to act together, united by a common determination to save our planet, promote human development and achieve universal prosperity and peace … From the African continent, the cradle

of humankind, we solemnly pledge to the peoples of the world and the generations that will surely inherit this Earth that we are determined to ensure that our collective hope for sustainable development is realized (UN Department of Economic and Social Affairs, 2002).

Divergent opinions about sustainable development have existed ever since the term came into general use in the early 1970s. Although sustainable development has never succeeded in reconciling extreme viewpoints on development and sustainability and probably never will, the discourse around sustainable development has been successful in the sense that it has made people aware of the alternative perspectives and possibilities. Over decades this discourse has created a wealth of data that have made people worldwide aware of threats to the environment, the social and economic needs of developing societies, the interdependence of ecological, economic and social considerations, and the challenges facing leaders who try to balance these considerations. Awareness-raising has helped in changing people's perceptions, especially perceptions about the relationship between economic growth and the need to care for the environment.

Most inhabitants of the Global North will not easily accede to the demands for the reduction of wealth or the radical restructuring of the world economic system. Economists conventionally view it as not feasible and undesirable to try and persuade rich people to reduce their wealth. That which is regarded as the norm, in this case wealth, usually does not come under the spotlight, but rather that which is regarded as deviating from the norm, in this case poverty.

At the WSSD the unsustainable patterns of production and consumption were one of the main themes on the aganda. More than a decade down the line from there very little has been done to redress the structural inequality of the global system or to stop the depletion of natural resources. The world economic crisis since 2008 has made it even more difficult to put pressure on the most powerful to make a substantial contribution to environmental conservation and poverty alleviation.

Real sustainable development still seems to be a mirage on the horizon. However, hopes for a more sustainable future dispensation must never be abandoned. The dismantling of apartheid in South Africa demonstrated that continued moral pressure can in the long term have a decisive influence, even in the case of extremely unequal power relations. In the sphere of sustainable development a breakthrough may also lead to real progress for the planet and its people.

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SAŽETAK

Ovaj članak prati pomak u moralnim argumentima u diskursu održivog razvoja, koji se dogodio između 1972. i 2002. godine. U ranim sedamdesetima su bili dominantni ekološki razlozi,a nulta stopa razvoja imala je snažnu potporu. Do kraja osamdesetih, utjecajno izvješće UN komisije na čelu s Gro Harlem Brundtland preporučuje održavanje ravnoteže između ekoloških, ekonomskih i društvenih aspekata održivog razvoja. Od devedesetih, došlo je do promjene diskursa održivog razvoja u pravcu ublažavanja siromaštva. Predstavnici zemalja u razvoju počeli su doprinositi da koncept održivog razvoja evoluira i uspjeli spajanjem diskursa održivog razvoja u širu raspravu odnosa Sjevera i Juga. Pravilan pristup održivom razvoju sada je rad na smanjenju bogaćenja, a ne pukom smanjenju siromaštva. Međutim, takva radikalna promjena smjera će biti moguća tek nakon što se postigne značajan napredak u preraspodjeli neravnoteže u globalnoj raspodjeli bogatstva.

TEACHING SUSTAINABILITY USING A FOCUSED MULTI-DISCIPLINARY APPROACH

PODUČAVANJE ODRŽIVOG RAZVOJA KORIŠTENJEM USMJERENOG MULTIDISCIPLINARNOG PRISTUPA

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Summary

The myriad definitions and measures of sustainability complicate the development and teaching of an introductory sustainability course. The United Nations' Brundtland Report provided a definition for sustainable development and John Elkington and others modified the concept with the Triple Bottom Line, which sought to balance environmental stewardship, economic growth and social responsibility. Sustainability's growing popularity and relevance to many academic majors compelled course developers to create multi-disciplinary courses that are relevant to many academic disciplines. During the development of a course on sustainability, University of Houston and Colby College course developers believed the main challenge for effective pedagogy involved effectively intertwining the complexity of sustainability with an applied focus in a multi-disciplinary classroom. In this case, the course developers choose a specific policy focus – energy in this case – to explore sustainability's complex and multi-disciplinary nature. With this specific analysis, the students were then able to apply these new skills to other sustainable policy programs. Additionally, the explicit multi-disciplinary character of the classroom allowed the professors and the students to bring their strengths and use them to increase the awareness of the importance of the multi-disciplinary approach to solve problems.

Key words: Sustainability, Energy, Multidisciplinary, Sustainability Pedagogy
Ključne riječi: održivost, energija, multidisciplinarnost, pedagogija održivosti

When preparing a course on sustainability, course developers must consider the complicated nature of the term sustainability. Sustainability or sustainable development can be thought of as a radial category, a term philosophers use to characterize a word or idea that has an imprecise definition categorized by a range of concepts rather than universally accepted, explicit rule.[1] The word sustain originated in the 13th century and sustainable can be traced to the 17th century; therefore to tie sustainability to a single meaning proves problematic. The introduction of the term in the Brundtland Report and its inclusion in corporate governance documents as an integral part of the Triple Bottom Line further problematizes the term.[2] With the inexact nature of sustainability and sustainable development, myriad indices have been created to measure and compare sustainability actions performed by governments, non-governmental organizations and corporations. These indices incorporate measurements from other radial categories including health,

[1] Lakoff, George and Mark Johnson. *Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought*. New York: Basic Books, 1999. print.

[2] United Nations. *Our Common Future*. Ed. World Commission on Environment and Development. Oxford: Oxford University Press, 1987.

poverty and environmental protection. The imprecision and immensity of sustainability and its measures challenges teachers as they develop courses that give students from myriad disciplines the ability to make and analyze sound assessments of sustainability. The paper will explore the process, successes and challenges encountered during the development and teaching of an introductory sustainability course.

In 2004, the United Nations declared the next ten years as the Decade of Education for Sustainable Development. Additionally, in the last ten years, corporations have established extensive sustainability programs based on the Triple Bottom Line. With this increased attention, more academic institutions created courses and academic programs with sustainability education as one of the core objectives. The Association for the Advancement of Sustainability in Higher Education (AASHE) Academic Program database contains 1,415 sustainability-focused academic programs at 465 campuses in the United States and Canada.[3] In one example, the University of Illinois created a massive open online course (MOOC) that covered general aspects of sustainability and its intersection with natural resource and pollution abatement policies.[4] The MOOC included Brundtland Report policy areas such as ecosystem services, energy and agriculture while covering the Triple Bottom Line. Other universities directed their sustainability curriculum primarily to science and engineering students.[5] We wanted to create a multi-disciplinary sustainability course that would be relevant to many, if not all, academic disciplines but also allowed the students to look deeply at a specific aspect of sustainability so they could learn how to effectively assess sustainability measurements, statements and actions. This paper will concentrate on the development of content and assignments since the newness of the course has not allowed for a consistent method of assessing student learning.

Our main pedagogical challenge involved effectively intertwining the complexity of sustainability with an applied focus in a multi-disciplinary classroom.[6] We met the challenge by narrowing the focus of the course to review and analyze sustainability from a specific policy category. A specific focus allowed the students and professors to consider one policy category and investigate its definable concepts while exploring sustainability's complex and multi-disciplinary nature. We chose energy as our policy category and named the course, Energy & Sustainability. Additionally, choosing one policy category reduced the number of concepts introduced to the students and gave them the ability to defensibly make and analyze assessments of sustainability. The specific policy we analyzed was based on students' interests and the strengths of the university and college and the professors leading the course.

With energy chosen as the specific category, we determined that it was important to situate the concepts of sustainability and sustainable development into recent history since most students enter the classroom with some knowledge of sustainability from their respective disciplines. We provided a common foundation for the students beginning with a chronology of its formation from pre-*World Conservation Strategy* concerns about natural resources depletion and pollution abatement through the attempts to create a unified definition to its myriad measures and uses in the 21st century. This introduction allowed the students to understand that sustainability has myriad definitions and measures, which makes the analysis of outcomes complex.

Third, we believed that introducing concepts from a specific policy category would give the students a basis for recognizing the complex interconnections within the definition of sustainability but in a focused manner. Sustainability transcends individual disciplines and requires social scientific and scientific tools;

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3 These data were accessed from the Association for the Advancement of Sustainability in Higher Education website on June 18, 2014. (http://www.aashe.org/resources/academic-programs/)

4 Information on the course developed by the School of Earth, Society and Environment at the University of Illinois can be found at http://www.earth.illinois.edu/class.html.

5 Littledyke, Michael, and Evangelos Manolas. "Ideology, Epistemology and Pedagogy: Barriers and Drivers to Education for Sustainability in Science Education." *Journal of Baltic Science Education* 9.4 (2010): 285-301. Print.

6 Sustainability has been described as a multi-disciplinary, interdisciplinary or trans-disciplinary subject. The use of the multi-disciplinary is intentional since the instructors' goal was to address the methods each discipline with minimal discussion on each discipline's methods. See Remington-Doucette, Sonya M, et al. "Assessing Sustainability Education in a Transdisciplinary Undergraduate Course Focused on Real-World Problem Solving. A Case for Disciplinary Grounding." *International Journal of Sustainability in Higher Education* 14.4 (2012). for a discussion of the terms.

therefore, introducing energy-related concepts allowed the students to understand energy policy's language and gave them the ability to converse with decision makers and critically analyze their decisions. Although the course concentrated on one policy category, it provided the students with the tools needed to approach the problematic nature of sustainability while recognizing that many disciplines took part in the development of our present understanding of sustainability. Therefore, having a multi-disciplinary classroom with students from economics, political science, ecology, biology, sociology, anthropology, history, chemistry and myriad other disciplines broadened and deepened the analysis. Whether addressing sustainability using energy or clean water or a livable wage as the focus, the challenge to meet present and future human needs in a sustainable manner must be analyzed from many perspectives. Introducing the concepts of the chosen policy focus permitted the students to use their background and opened the students to a multi-disciplinary perspective. We decided that the introduction to energy consumption and use must be a stand-alone, in-depth description and explanation of energy concepts. Since sustainability analysis tends to be comparative, an extensive primer on basic concepts of the chosen policy provided the student the tools to analyze how organizations have worked through their decision making processes to chose a specific sustainable energy program or policy.

Fourth, we understood that describing the course as a multi-disciplinary course that required learning new concepts allowed students at all levels to acknowledge that they will be studying concepts that their colleagues may not consider as new. Moreover, it gave students license to ask basic questions and gain insight into how other disciplines approach and solve problems.[7] With a multi-disciplinary approach, students took these new ideas and incorporated them into critically analyzing and developing ideas to create more comprehensive solutions to sustainability policy.

CREATING ENERGY & SUSTAINABILITY: A CASE STUDY

When the University of Houston (UH) considered developing a minor that covered sustainability, its majors, departments and schools came together to create a minor that combined sustainability with one of Houston's strengths – energy. Texas, Houston and UH is embedded in the prevailing international fossil fuel industry and emerging renewable energies including solar and wind energy.[8] Additionally, many UH students major in petroleum engineering or have connections to the energy sector through family, work or internships. As part of the minor, UH developed a multi-disciplinary introductory sustainability course on energy and sustainability. The course design revolved around the closely related issues involving energy, the environment, society and the economy. More importantly, with global warming becoming the primary environmental concern, UH believed that its content would be beneficial for students interested in professional and academic careers in almost every discipline. In addition, the course could be taught at other universities and colleges.[9] The course analyzed the far-reaching choices the world community faces, including the types of energy we use, the quality of the environment in which we live, and the global economy in which we work. The course examined these choices and their long-term implications. Finally, it provided the students tools to analyze the current and emerging global energy industry and examine the challenges to the creation of a sustainable energy future. The course introduced issues important to the future of energy, including energy consumption patterns, current and emerging energy sources, conservation, and climate change. The course had the following learning outcomes:

- Explain the history of energy production and use
- Understand emerging energy sources
- Integrate energy's role with global economic, social and political issues

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[7] Marinova, Dora and Natalie McGrath. A transdisciplinary approach to teaching and learning sustainability: A pedagogy for life. In *Seeking Educational Excellence.* Proceedings of the 13th Annual Teaching Learning Forum, 9-10 February 2004. Perth: Murdoch University. http://lsn.curtin.edu.au/tlf/tlf2004/marinova.html.

[8] Brannstrom, Christian, Wendy Jepson, and Nicole Persons. "Social Perspectives on Wind-Power Development in West Texas." *Annals of the Association of American Geographers* 101.14 (2011): 839-51. http://dx.doi.org/10.1080/00045608.2011.568871.

[9] I was hired as a visiting faculty to assist in its development and to then take the course and modify it for other institutions.

- Analyze patterns of energy consumption
- Analyze connections between energy use and environmental issues, including climate change
- Develop and communicate strategies to create a sustainable energy future

The course stressed the history of energy consumption and production, the concepts underpinning energy use and conversion and the importance of finding multi-disciplinary solutions to creating a more sustainable future. The course continues to be taught to UH and was taught at Colby College in fall semester 2013. The two versions of the course brought students from many academic disciplines and countries together in the classroom. Economics, chemistry, biology, ecology, environmental studies, petroleum and civil engineering, business, anthropology, history, geology, physics and political science among others have been represented in the course. Additionally, UH and Colby College students had familial and cultural connections to Asia, Europe, Africa, South and Central America, the United States and Canada. The challenge for course developers included creating content and assignments to achieve learning outcomes and developing assessments to determine key competencies in a diverse and multi-disciplinary classroom.

COURSE CONTENT

The course content flowed from the learning outcomes. Beginning with the need to create a foundation for effective analysis of conventional and emerging energy sources, we considered what concepts were needed for the students to defensibly make and analyze the sustainability of energy sources. Understanding that calculating energy consumption and transfer has standard formulas and concepts, we concluded that the students should be introduced to the forms and types of energy and the basic principles of thermodynamics. For a course on agriculture or biodiversity, other social science or natural science concepts should be identified and introduced. Since many students had not taken a college chemistry course, we focused the concepts on defining, measuring, and identifying the forms (thermal, nuclear, mechanical etc.) and types (kinetic and potential) of energy. This information proved useful when determining why heating is a more efficient use of fuel than electricity generation. Electricity generation requires additional transfers of thermal energy into mechanical energy and electrical energy.

Using the principles of thermodynamics the students were able to recognize that the transfer of energy from one form to another form always involved energy losses. The first and second laws of thermodynamics showed the students that understanding specific concepts from other disciplines could provide insight to making policy decision. Specifically, knowing that energy can be neither created nor destroyed; just transferred to other forms of energy and comprehending that the transfer of energy cannot be 100 percent efficient provided new tools for the students. The knowledge allowed the students to reject pronouncements about potential energy sources that boast they generate more power than were put into them. Additionally, students could discuss the relative inefficiencies of electricity and heat transfer while analyzing emerging energy sources. At first, non-science based students were skeptical of the basic chemistry instruction but as they began in-depth analyses of nuclear energy, fuel cells and other aspects of energy consumption and production some students suggested we add additional chemistry modules.

As we reviewed thermodynamics, the chemistry, physics, biology and engineering majors assisted in making the science applicable to the other majors. But more importantly, the non-science majors asked questions about the primacy of science in decision making, which showed the science students that energy policy decisions should include non-science based information and analysis. With a multi-disciplinary classroom, the students stressed through their questions and critical thinking that each discipline provided information for better evaluation. They agreed that knowing the science behind the energy choices helped with the articulation and assessment of alternative energy sources but the multi-disciplinary approach provided the better analysis.

After we introduced the basics of energy, we provided the students with a primer on sustainability and its uses in the late 20th and early 21st century. We used the Brundtland definition as a starting point. But we also wanted the students to understand that although the Brundtland Commission worked to create a useable definition, the report contains myriad information collected and synthesized during the commis-

sion's existence. We noted that from 1984 to 1987, the Commission held thirteen public hearings on five continents and received over 800 written submissions. With these disparate and numerous stakeholders weighing in, the students began to understand that developing a definition of sustainable development or sustainability proved challenging.[10] Regardless, the commission did create a definition of sustainable development and a report that detailed the policy challenges and solutions to address natural resource deterioration and pollution abatement using international, regional and national governance approaches. The history allowed the students to recognize how the imprecise definition of sustainability problematized the goals and outcomes of the Conference on Environment and Development in Rio de Janeiro in 1992 and subsequent meetings in 1997, 2002 and 2012.

Moreover, we wanted the students to recognize that corporations also took up the challenge of defining and measuring sustainability. We explained that as governments began to strengthen environmental protection laws and regulations, corporations began to consider sustainability issues in conjunction with their desire to limit environmental regulation.[11] John Elkington's Triple Bottom Line recognized that corporate success should not only be measured by the traditional bottom line of financial performance but also by its effect on the local, regional and global economy, environment, and society. The Triple Bottom Line provided framework for corporations to balance the dimensions of environmental stewardship, economic growth and social responsibility.[12] We provided the students with two sustainability plans so they could critically analyze how corporations have developed and created sustainability and corporate responsibility programs to promote their sustainability successes.[13] With these examples, the students were able to understand that the Triple Bottom Line provided a vague and almost immeasurable definition of sustainability.

With the students beginning to appreciate the inexact nature of sustainability and sustainable development, we introduced myriad indices used to measure and compare sustainability actions performed by governments, non-governmental organizations and corporations. These indices incorporated measurements from other radial categories including health, poverty and environmental protection. Some indices attempted to create a numerical standard to gauge the success or progress of an organization's sustainability activities. We used Christian Böhringer and Patrick Jochem analysis of eleven indices. In their study, they showed that each index attempts to provide a one-dimensional metric (a single number) that incorporates the three categories of sustainability – economic progress, environmental protection and societal conditions.[14] The paper showed that more than 500 individual indicators, such as access to clean water, life expectancy, etc. could be included in measuring sustainability.[15] With this complexity, Böhringer and Jochem analysis revealed that the eleven indices failed to provide an adequate sustainability measure. In addition to failing to calculate coherent numerical standards, the students noted that the indices only use between three and seventy-six individual indicators. For example, the Ecological Footprint used primarily water and energy consumption data to determine the quantitative land and water requirements to sustain a specified living standard, ignoring the social aspects of sustainability. On the

[10] When the course was taught, a history of the Brundtland Commission had not been written. In January 2014, the first history of the Commission was published. Borowy, Iris. *Defining Sustainable Development for Our Commons Future: A History of the World Commission on Environment and Development*. New York: Routledge, 2014.

[11] Sale, Kirkpatrick. *The Green Revolution: The American Environmental Movement, 1962-1992*. New York: Hill & Wang, 1993. Print. Rothman, Hal K. *The Greening of a Nation? Environmentalism in the United States since 1945*. Fort Worth: Harcourt Brace College Publishers, 1998. Print. Gottlieb, Robert. *Forcing the Spring: The Transformation of the American Environmental Movement*. Washington DC: Island Press, 2005. Print. Hays, Samuel P. *Beauty, Health and Permanence: Environmental Politics in the United States, 1955-1985*. Cambridge: Cambridge University Press, 1987. Print.

[12] Elkington, John. *Cannibals with Forks: The Triple Bottom Line of 21st Century Business*. New Society Publishers, 1998.

[13] The author has authored and co-authored Sustainability Reports for both corporate and government organizations using the Triple Bottom Line. Two examples of sustainability reports include *Royal Dutch Shell PLC Sustainability Report 2012*: Royal Dutch Shell PLC, 2012. and *Corporate Citizenship Report*: ExxonMobil, 2012.

[14] Böhringer, Christoph, and Patrick E. P. Jochem. "Measuring the Immeasurable — a Survey of Sustainability Indices." *Ecological Economics* 63.1 (2007): 1-8. Print.

[15] Babcicky, Philipp. "Rethinking the Foundations of Sustainability Measurement: The Limitations of the Environmental Sustainability Index (ESI)." *Social Indicators Research* 113.1 (2013): 133-57. Print.

other hand, the Human Development Index compiles societal data on life expectancy, education and gross national product to develop its values.

We stressed that the measures tend to be comparative in nature; therefore, the numbers need to be reviewed critically in the context of their chosen indicators. The scores are weighted and aggregated to determine a cumulative score; the higher the score the more sustainable the organization compared to other organizations.[16] We also introduced another more straightforward and comparative strategy that involved calculating per capita reductions in energy consumption, water use and hazardous waste disposal or per capita increases in recycling, wages and access to health care based on a baseline year. The students were able to discern that each of these examples did not take into account the wide range of sustainability nor did they create a standard to achieve. Instead they revealed the problems with sustainability measures that attempt to quantify sustainability based on established standards and data. In effect, an absolute number cannot be calculated for any sustainability indicator. Sustainability indices can only compare decisions, actions and organizations to other decisions, actions and organizations to determine greater or lesser sustainability success. In the classroom, students easily saw the limitations of the measures, which caused them to express frustration and question their legitimacy for measuring and understanding sustainability. Introducing the multiple definitions of sustainable development and sustainability and sustainability metrics gave the students the tools to critically analyze the concepts introduced throughout the remainder of the course. Like with the energy concept introduction, the students comprehended that understanding the specifics of the measure used could be more important than the actual results.

After introducing the general history and basic concepts of sustainability and thermodynamics, we searched for a central text for the course. Because it was a fairly new course of study and its reach was extensive, we found few sustainability textbooks that were applicable for course use. For an introductory class, we thought that having a central document that assists the professor in guiding the narrative and provides basic material could be helpful. The University of Illinois Sustainability MOOC had a free online textbook but we considered it too general and broad in scope. In the course's first incarnation, we did not have a central text for the students since few general textbooks had been published at that time. In their evaluations, UH students reflected that a central text would have helped with organizing and understanding the trajectory of the classroom instruction. Therefore, in its second incarnation at Colby College finding a central text became an important objective. By summer 2013, many textbooks had been published on sustainability but we were unable to find one that met the objectives of the course. After reviewing textbooks, we chose the documentary, *Switch*, created by University of Texas Geology Professor Scott Tinker. The film reviewed current and future energy sources and considered their sustainability for the future. Specifically, the documentary asked the question, »Just as it did in the West, coal will power the development of China and India, but it will not be clean, oil demand will increase and so will risk and so will price. The challenge then is not to just adopt alternatives but to maintain the benefits of oil and coal without their disadvantages and at a price we all can afford. Can it be done?« From this question, Tinker examined energy sources by visiting Texas wind farms, the Alberta Oil Sands, California solar arrays and Dubai natural gas installations and asks questions about their future. The visual introduction to open pit coal mines, geothermal installations and offshore oil platforms along with other energy source locations gave the students insight into the reality of 21st century energy production.[17]

From this central film, we created the structure of the course and determined the additional readings. With the plethora of new textbooks and the increasing media attention on energy and sustainability issues, we knew that situating the present energy situation in history was the an important next step for the students. Questions included; how did oil and coal become primary energy sources? What is the current status of alternative or non-traditional energy sources in the United States and the world? What infrastructure is needed for the existing energy sources? Again, the multi-disciplinary classroom guided

[16] Böhringer, Christoph, and Patrick E. P. Jochem. "Measuring the Immeasurable — a Survey of Sustainability Indices." *Ecological Economics* 63.1 (2007): 1-8. Print.

[17] *Switch*. Dir. Harry Lynch. Arcos Films, 2013. Film.

our decisions. The students read primary and synthetic history journal articles on domestic coal and international oil production and highway construction.[18] Since we wanted the students to gain the ability to understand policy and scientific documents, we used publications from the US Environmental Protection Agency (USEPA) on coal and oil pollution control technology and from the US Energy Information Agency (USEIA) on current and future domestic and international energy use. Finally, to help the students understand that energy regulation has a rapidly changing landscape, we spent an entire day on the revised regulations for greenhouse gas emissions from fossil fuel based electrical generation stations and the media attention surrounding them.[19] We reviewed the technical requirements of the standards and the process of developing regulations from established laws and court decisions while evaluating the criticism from the coal industry and the effectiveness of the revised regulations. We believed that this exercise allowed the students to see in real time how energy policy is created and shaped by the media, lobbyists, and the government. The students agreed and were appreciative of the in depth introduction to carbon sequestration and the federal register.

Table 1: Emerging Energy Sources and Energy Uses

Energy Sources	Hydropower
	Biofuels
	Conventional Natural Gas
	Non-conventional Natural Gas (Fracking)
	Oil Sands
	Geothermal
	Nuclear
	Wind
	Solar
	Tidal
	Fuel Cells
Energy Uses	Transportation
	Buildings

Source: ES 297 Energy & Sustainability Syllabus Colby College, 2013.

From basic energy and sustainability concepts and the history and present status of energy policy in the United States and the world, we then moved to an thorough analysis of emerging energy sources and energy uses (Table 1). For each of the topics, we covered the following aspects; technology basics, history, economic, environmental and social costs, case studies, regional issues and US government policy, if applicable. Readings ranged from social scientific articles reviewing biofuel production in Brazil to promotional material from the Alberta Treasury Board on oil sands to a history of atomic energy from 1945 to 1985 to a Leadership in Energy & Environmental Design (LEED) Checklist. Invariably, we used information created by the USEIA assisted in creating the story for each energy topic. Although, we confronted the criticisms of the projections and analysis of the USEIA-produced information, we could not argue with the collected data on international energy production and domestic consumption. This government agency gave the students raw data for their presentations and other assignments.

Moreover, the variety and age of the assigned readings gave the students insight into the history of alternative energy policy. For example, the use of a Saturday Night Live skit from April 1979 entitled »The Pepsi Syndrome« pertaining to the Three Mile Island accident and an August 2013 Colbert Report segment on non-disclosure agreements for fracking lawsuits showed the students that these questions and solutions have been the subject of satire for decades. Looking at the growth of solar power in Germany, we explored popular media's critique of how the high cost of its expansion falls primarily on the poor. This analysis gave the students a chance to ponder the some of negative social aspects of emerging energy sources. In another case, on the 50th anniversary of the assassination of John F Kennedy, we read his remarks on the potential use of tidal power for electricity production in Maine. Kennedy's enthusiasm for tidal power mirrored the enthusiasm for this energy source in today's media.[20] It forced the students

[18] The ability to find an accessible article on the history of the grid proved challenging. We used a National Public Radio series on the electricity and a promotional piece from the North American Electric Reliability Corporation. We believe that *Technology & Culture* or *Environmental History* should commission a piece on the development of the grid in the United States.

[19] The EPA published the draft Standards Of Performance For Greenhouse Gas Emissions From New Stationary Sources: Electric Utility Generating Stations in September 2013.

[20] In Maine, tidal power is seen as a way for Maine to move away from wood as the primary energy source. Kennedy, John F. "Remarks in Response to a Report on the Passamaquoddy Tidal Power Project.," July 16, 1963. Online by Gerhard Peters and

to realize that we have been promised a solution to the hegemony of oil and coal for energy for over 50 years. Therefore, they realized that sustained research and development funds and subsidies for alternative energy sources may assist in the transition from oil and coal to other energy sources.

In each of the sections on specific energy sources and topics, the learning outcomes were the guiding principles. We took an applied approach for analysis. We wanted the students to integrate and analyze the energy sources and their costs and benefits. In the case of hydropower, we used an established sustainability assessment protocol developed by the International Hydropower Association. This tool allowed the students to investigate how an industry created its own tools and to consider how other energy industry groups develop tools. Specifically, we covered the different stages of energy generation in hydropower development. The protocol covered planning, design, construction and operation, which gave the students the ability to grasp that traditional energy sources like oil, coal and hydropower can increase their sustainability indices long after infrastructure construction.

COURSE ASSIGNMENTS

We found the biggest challenge was the speed of new discoveries and information on energy sources including technology changes and social costs. Although this is true for most courses, the amount of new research and papers on energy and sustainability meant that the reading list changed substantially from semester to semester. The reading lists for the two versions of the courses contained little duplication. When teaching sustainability, it is important to keep the information as up to date as possible. To keep the students aware of the changing nature of energy and sustainability, we instituted an assignment that was met with considerable enthusiasm from the students. We asked the students to search journals, newspaper, government agency, energy industry and think tank websites and other information sources to find articles relevant to the topic covered during each particular class period. Students received credit for articles submitted with a synopsis and extra credit for the most relevant submitted article. The articles were required to be submitted before midnight on the day after the class. Of course, reviewing articles on a regular basis (and just prior to class) required a substantial time commitment on the professors; we found that reviewing the articles and discussing them at the beginning of the next class enhanced the multi-disciplinary nature of the classroom. We also published a list of articles on the course's website with the student generated synopsis. We learned that the students tended to search within their discipline, which provided additional details on how each discipline analyzed energy and sustainability. This was especially important since it introduced the professors and students to different points of view. For example, two economic students submitted articles detailing that additional US production of natural gas would not necessarily provide energy independence and less reliance on foreign energy sources. Their articles showed that natural gas companies would expand their export amounts because of better profits from exporting natural gas in the short term. Because of time constraints, this issue was not discussed in class but we were able to cover it the next day. Many conversations between the students originated from these articles. It also allowed students who were actively involved with climate change issues to submit articles from a variety of groups, including climate change skeptics.

Since we wanted the students to be able to communicate to the general public, policy makers and others, we incorporated the presentation of information as an integral part of the course. In the 21st century with the advent of YouTube and other video based platforms, we wanted the students to have a chance to convey their knowledge to the public and decision makers in a public space. Since we understood that the students needed to do more than just present information, in its incarnation at Colby College we asked the students to teach on a particular energy topic. We formed groups of two students and required them to create an informal lesson plan for approval. The lesson plan needed to be connected to the course's learning outcomes and the required aspects – technology basics, history, case studies, regional issues and US government policy. We made certain that the students were from different disciplines so that they

John T. Woolley, *The American Presidency Project*. http://www.presidency.ucsb.edu/ws/?pid=9344.

could provide different viewpoints while incorporating multi-disciplinary ideas. As one of the first student groups noted, »giving a presentation is easier than teaching a class. Teaching is a different skill set.« Of course, the students brought their disciplinary strengths and own interests to the lesson. For example, when covering non-conventional natural gas (fracking), the student group used a personal experience as the case study. One member grew up in central Pennsylvania over the Marcellus Shale Formation that is now being exploited for natural gas production. She discussed how her family had complicated views of the fracking. In an area of high unemployment, the fracking brought jobs to some family members but other members believed that the fracking would be harmful to the area in the long term. She and her partner asked the students to take part in a debate on the pros and cons of fracking. She was able to incorporate viewpoints that had been articulated during public hearings in her community.

Because of the prescriptive nature of the presentation, the students incorporated basic thermodynamic principles when discussing the energy sources' technologies. This forced the students to acknowledge that understanding energy consumption and production required computational skills along with the ability to compare the economic, environmental and social issues. To this end, the students acknowledged why so many leaders consider nuclear energy a viable option for a sustainable energy future. Its energy density and the small footprint of a nuclear power plant can overshadow the catastrophic aspects of a malfunction and the long-term problems with waste disposal. For example, they stressed that uranium has 580 gigajoules per kilogram compared to 29 megajoules per kilogram of coal. This fact along with large reductions in greenhouse gas emissions and other pollutants when compared to oil and coal can make nuclear power a more sustainable choice when compared to the status quo. Of course, they commented on the problems with nuclear plant accidents specifically discussing the issues of transparency in the government responses to Three Mile Island, Chernobyl and Fukushima.

To assist the students with their lessons, we also created an active participant assignment for two additional students. The active participants were required to work with the presenters and provide assistance, if needed. We found that this lessened the stress for the student presenters since they had students they could point to for clarification or to help lead any discussions. Students used the active participants in many ways. For the fracking debate, the active participants were the organizers for the debate. Others spoke up when the presentation lagged or added additional information not included in the presentation. Also, it showed that having a knowledgeable audience can make for better transmission of information and better analysis.

CONCLUSION

Developing an introductory sustainability course requires planning and focus because of the radial nature of sustainability. When preparing the course *Energy & Sustainability*, we determined that that narrowing the focus to one policy category and introducing and reviewing concepts from the policy category gave the students the ability to defensively make, analyze and assess sustainability decisions. With this experience, we believe the students will be able to take the new skill and apply it to other sustainable policy programs such as clean water or living wage policy. Additionally, we worked to create assignments that incorporated the multi-disciplinary nature of the students and the changing ideas of both our chosen policy category and sustainability. The assignments gave the students the ability to converse and engage with the emerging literature, opinion and science. Finally, we embraced the explicit multi-disciplinary character of the classroom, which allowed both the professors and the students to bring their strengths into the classroom and use them to increase the awareness of the importance of the multi-disciplinary approach to solve problems. [21]

[21] I would like to thank Joseph Pratt and Ognjen Miljanić who co-taught the Energy & Sustainability course with me at the University of Houston. I also want to acknowledge the assistance of Frank Kelley, Associate Dean of UH's Bauer Business School who supplied classroom space and administrative assistance during the development of the course and the Energy & Sustainability minor.

SAŽETAK

Bezbrojne definicije i mjere održivosti kompliciraju razvoj i podučavanje osnova održivog razvoja. Izvješće posebne izaslanice Ujedinjenih naroda Gro Harlem Brundtland daje definiciju održivog razvoja, ali su John Elkington i drugi taj koncept modificirali kao trostruku ravnotežu upravljanja okolišem, gospodarskim rastom i društvenom odgovornosti. Rastuća popularnost održivosti i relevantnost u mnogim akademskim disciplinama primorala je tvorce kurikuluma na stvaranje multidisciplinarnih studija, važnih u mnogim akademskim disciplinama. Tijekom razvoja studija o održivosti, tvorci kurikuluma na sveučilištima Houston i Colby College shvatili su da je glavni izazov za učinkovito podučavanje o ovome kako uspješno spojiti kompleksnost održivosti sa ciljanim obrazovnim sadržajima nekog multidisciplinarnog predavanja. U ovom su slučaju tvorci kurikuluma izabrali ciljani smjer, usmjeravajući fokus na istraživanje kompleksne prirode i multidisciplinarnost održivosti razvoja. Učeći o ovakvoj usmjerenoj analizi održivosti, studenti su naučili kako primijeniti ova nova znanja i vještine u drugim nastavnim predmetima koji se bave politikom održivog razvoja. Osim toga, eksplicitni multidisciplinarni karakter ove nastave omogućio je profesorima i studentima da otkriju svoje unutarnje vrijednosti i prednosti, te ih iskoriste za povećanje svijesti o važnosti multidisciplinarnog pristupa u rješavanju problema.

HOW WINTER TOURISM TRANSFORMED AGRARIAN LIVELIHOODS IN AN ALPINE VILLAGE. THE CASE OF DAMÜLS IN VORARLBERG/AUSTRIA

KAKO JE ZIMSKI TURIZAM PREOBRAZIO POLJOPRIVREDNU EGZISTENCIJU ALPSKOG SELA, NA PRIMJERU MJESTA DAMÜLS U POKRAJINI VORARLBERG (AUSTRIJA)

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Summary

Winter after winter, hundreds of thousands of skiers visit Alpine communities to experience bodily-mediated landscape sensations. Studying Damüls, a well-known ski resort in Austria's westernmost province Vorarlberg, we can show that both massive economic growth and massive interventions into Alpine landscapes accompanied winter tourism development. We narrate the environmental history of Damüls over 200 years by analysing strategies of commodification of »nature« and property rights, shedding light on the potentials and pitfalls of sustainable development of remote Alpine communities when they draw their income from winter tourism. The paper investigates how inhabitants dealt with changing environmental and economic conditions in a pre-industrial era. Settlers experienced resource limitations typical for an agrarian society. When the valleys were industrialized, Damüls nearly vanished as a permanent settlement. Then, tourists entered the stage, turning the wheel of local development into a different direction in several steps. Travel writers and photographers had integrated Damüls into the mental topography of urban leisure seekers in the 19th century. A romantic tourist gaze of Damüls developed. From the 1930s onwards, federal authorities discovered the economic power of tourism to improve national trade balances and fostered the tourism transformation. While the impact of tourism was modest in the interwar years due to limited capital and energy availability, these limitations were lifted when the '1950s syndrome' arrived. This third step was characterized by a massive building boom, influencing even inherited property rights. Ski lifts, hotels, roads and later snow systems and ski slope-buildings mushroomed, providing comfortable access to snow-secure Alpine landscapes. The maintenance of this infrastructure requires energy and capital investments, leading to material and energy flows that depend on the availability of cheap energy in large amounts. Agrarian Damüls produced a very modest surplus, depending on available labour input. Touristic Damüls gobbles up energy to provide for tourists leading to a much greater economic gain, but with a considerable impact on natural systems. A sustainable future of Alpine settlements requires new forms of dealing with Alpine nature, forms that are less dependent on the industrialized, globalized system of mobility of people, energy and matter that leads to greenhouse gas emissions, pollution and habitat destruction.

Key words: Damüls / Austria, Environmental History, Sustainability, Long-Term-Socio-Ecological-Research, Winter Sports, Alpine History

Ključne riječi: Damüls / Austrija, povijest okoliša, dugoročna društveno-ekološka istraživanja, povijest zimskih sportova, alpska povijest

INTRODUCTION

John K. Walton has convincingly labelled tourism as »an outstandingly significant current phenomenon, the world's largest and most dynamic industry, a leading sector both in continuing globalisation and the generation of cultural resistance to its implications, with the capacity to create enormous environmental footprints and to transform cultures in ways that are hard to predict (…).«[1] Tourism moves global flows of capital, people, and knowledge and thus fundamentally transforms materiality, social relations, communities and life-worlds. Tourism can stimulate exceptional local economic growth. This in turn has often a pronounced impact on the environment, especially since tourists tend to visit exotic, rural, remote places with large ecological diversity and picturesque cultural and natural landscapes, potentially endangering the landscapes they come to see and enjoy by doing so.

From an environmental historian's point of view, the increased commodification of natural and social resources is the essence, the very nature of economic growth.[2] As Donald Worster argues, commodification goes hand in hand with the social transformation of »nature« into »land« which is afterwards »rationally and systemically reshaped in order to intensify […] the accumulation of personal wealth.«[3] Commodified agroecosystems show »a movement towards the radical simplification of the natural ecological order […].«[4] The same is true for the commodification of social resources.[5] Industrialization and economic growth progressively transform socio-natural limitations of places.[6] In this paper, we study the processes of delimitation caused by tourism in the mountain village of Damüls in Austria's westernmost province Vorarlberg over 200 years. Damüls is located in a valley and its borders are either mountain peaks, passes and high plateaus or the steep ravines of alpine creeks. The community has been permanently inhabited for over 700 years despite the harsh environmental conditions. Figure 1 depicts the study area.

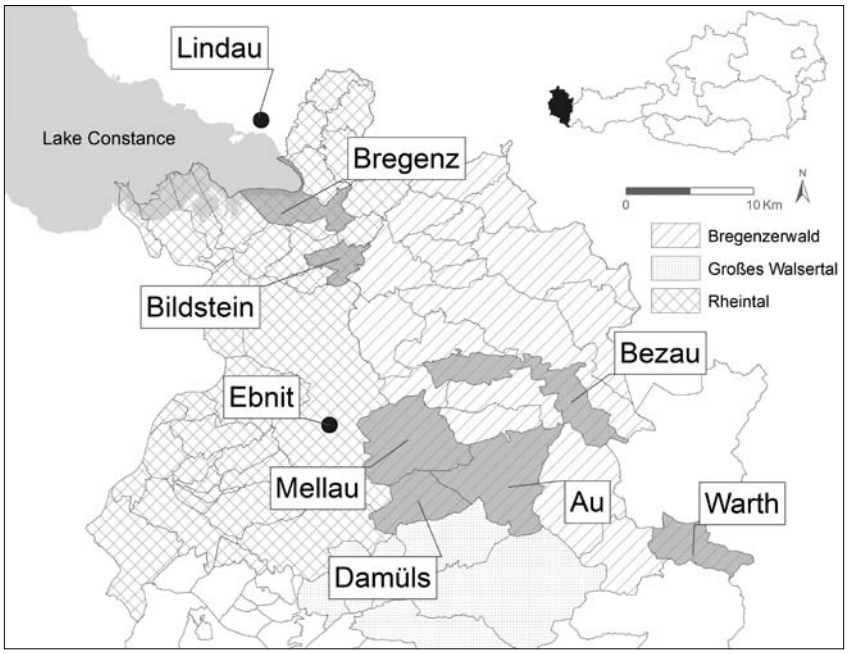

Figure 1: *Map of the study region Damüls and its surroundings. Original work by Tamara Fetzel.*

[1] Walton, John K. 2006. *Transport, travel, tourism and mobility: a cultural turn?* In: The Journal of Transport History 27/2, 129-134.
[2] Worster, Donald. 1993. *The Wealth of Nature. Environmental History and the Ecological Imagination.* Oxford, 203-219.
[3] Worster, Donald. 1990. *Transformation of the Earth. Toward an Agroecological Perspective in History.* In: The Journal of American History 76/4, 1101.
[4] Ibid.
[5] Harvey, David. 2003. *The New Imperialism.* Oxford, 141-156.
[6] Prudham, Scott. 2003. *Taming Trees: Capital, Science, and Nature in Pacific Slope Tree Improvement.* In: Annals of the Association of American Geographers 93/3, 640.

The village area of 20,9 km² covers altitudes from 1150 to 2095 meters and is accessible from »Bregenzerwald« and »Großes Walsertal« by road. The area is characterized by a complex geology of marl, chalk, flysch- and sandstone with steep north-facing ravines and undulating south-facing slopes.[7] Damüls receives plentiful precipitation. Winter lasts up to six months and snow cover reaches up to three meters. This is likely one reason for the transformation of Damüls from an alpine farming community into the third largest winter sport destination of Vorarlberg over the 20th century.

We analyze the village's transformation between 1810 and 2010, using a mix of qualitative and quantitative methods and various sources typical for environmental history.[8] We follow the transformation of a peripheral Alpine village into a tourism hub from the 1920s onwards, looking at the political and economic ramifications of interventions into Alpine nature as well as at changes in the perception of this nature. Long-term research in a micro region can reveal how humans were confronted with external forces threatening the sustainability of their livelihood. Inhabitants mediated external pressures by transforming their social structures and infrastructures. While the scope of their actions was limited by scarcity of energy and capital until the 1940s, the post-war boom delimitated their potential to cope with change.[9] Any process of commodification in mountainous regions »inevitably results in changes […] of the identity of mountain communities […] that have promoted the current forms of territorial and cultural appropriation.«[10] The visible transformation of landscape aesthetics and tangible remodeling of ecosystem compositions resulting from processes of touristic commodification were accompanied by a shift in land use and property patterns in Damüls. Land was formerly predominantly utilized collectively as a common-pool resource, regulated by complex social institutions.[11] The touristic commodification of landscapes in Damüls led to a revision of this social pattern after WWII. Novel capital and energy availability enabled livelihoods that broke with the older subsistence pattern of socio-economic reproduction. We do not wish to suggest that all subsistence patterns are sustainable. But in this case, the difference between a low input-low output subsistence-oriented agricultural livelihood and the material and energy flows of winter tourism are clearly visible, the latter being a much greater challenge to sustainability.[12] A winter tourism-based livelihood entails heavy use of fossil energy and far-ranging interventions into fragile alpine ecosystems, therefore it poses a structural challenge to local and regional sustainable development. The following analysis will shed light on this development.

AGRARIAN LIVELIHOODS IN THE ALPINE VILLAGE OF DAMÜLS IN THE 19TH CENTURY

When the 'Walser' settlers from Switzerland reached Damüls during the 13th century, they cleared the high Alpine forest and used the resulting grassland for dairy farming and the cultivation of rye. To complement the local resource base, they drew income from providing transportation services by mule tracking and carrying loads over Alpine paths.[13]

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7 Staudinger, Markus. 2009. *Biotop. Aktualisierung des Biotopinventars Vorarlberg. Gemeinde Damüls.* Vorarlberger Landesregierung, 9.

8 In particular text and image analysis, descriptive statistics, as well as GIS to analyze historical records, demographic censuses, tourism advertising brochures, travel literature, maps and aerial images. The article in part summarizes results from a study published in 2012 in the book »Wie das 1950er Syndrom in die Täler kam. Umwelthistorische Überlegungen zur Konstruktion von Wintersportlandschaften«.

9 Pfister, Christian. 2010. *The "1950s Syndrome" and the Transition from a Slow-Going to a Rapid Loss of Global Sustainability.* In: Uekoetter, Frank (ed.). 2010. *The Turning Points of Environmental History.* Pittsburgh, 90-119.

10 Vaccaro, Ismael and Beltran, Oriol. 2009. *The mountainous space as a commodity: The Pyrenees at the age of globalization.* In: Journal of Alpine Research/Revue de géographie alpine 97/3, 2.

11 McC. Netting, Robert. 1981. *Balancing on an Alp. Ecological change and continuity in a Swiss mountain community.* Cambridge, 10-41.

12 Krausmann, Fridolin. 2004. *Milk, manure, and muscle power. Livestock and the transformation of preindustrial agriculture in Central Europe.* Human Ecology 32/6, 735–772.

13 Feuerstein, Arnold. 1929. *Damüls - die höchste ständige Siedlung im Bregenzerwald.* Geographischer Jahresbericht aus Österreich XIV/XV, 16.

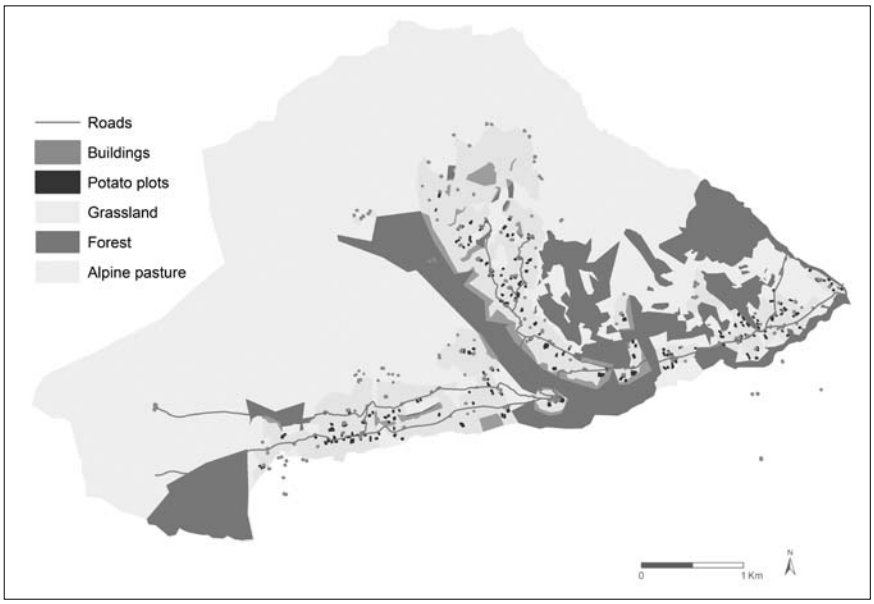

Figure 2: *Land Cover in Damüls in 1857. Map based on: Vorarlberger Landesarchiv, Österr. Grundkataster, Bauparzellen Protokoll 1857, 91006 KG Damüls, Hs 1, Map by Tamara Fetzel.*

In 1810, when the province Vorarlberg was under the authority of Bavaria, its topography was mapped for the first time. These maps reveal that the village was characterized by grassland and meadows. Almost 75 percent of the area consisted of grassland, of which around 50 percent was characterized as 'less productive common pasture'. Grassland in Damüls was mainly used as collective mountain pasture. Each farmer possessed inheritable grazing rights, regulated by complex legal arrangements. Forests were also treated as common property in Damüls, each inhabitant held rights to lumber.[14] Trees grew mainly in shadowy valleys and ravines. These parts of the village were hardly fertile enough for other forms of land use.[15] Notably, the Bavarian land register does not give any hint of cropland. In 1886, historian Josef Grabher reported that the inhabitants of Damüls cultivated barley, which grew only feebly.[16] According to Grabher, cropland and barley cultivation ceased, when local weather and climate changed in Damüls due to deforestation.[17]

Grabher did not take into consideration that the first half of the 19th century was very cold all over Europe. In 1810, a series of volcanic eruptions had ejected ash into the atmosphere, which led to widespread cooling. The event was enforced by declining sun activity, the so-called Dalton Minimum. The resulting global climate change had a severe impact on Damüls. All seasons became colder and drier. Temperatures plunged to a minimum in 1816, followed by increased precipitation in summer and autumn. People all over Europe experienced years without summers and agriculture fell into a deep crisis. Rain spoiled the hay harvest, the wet grass lost its fodder value. Snowfall on mountain pastures decreased milk yields and the number of resulting cheese wheels. Crops putrefied in the fields.[18] In 1810, Peter Biechele, the parish priest of Warth, a neighboring village, complained about the 'Siberian climate'[19] and in 1836, Kreishauptmann Johann Nepomuk Ebner reported that crops could not be grown in Damüls anymore. [20]

[14] Vorarlberger Landesarchiv (VLA). Bayerischer Steuerkataster 1/18. LG Sonnenberg: Damüls.

[15] Grabher, Josef. 1886. *Damüls einst und jetzt. Eine historisch-statistische Studie.* Vorarlberger Museumsverein XXVI. Bregenz, 7.

[16] Ibid., 8.

[17] Ibid.

[18] Wanner, Heinz and Pfister, Christian. 1999. *Klimavariation und Anomalien.* In: Pfister, Christian. *Wetternachhersage. 500 Jahre Klimavariationen und Naturkatastrophen (1696–1995).* Bern, 76 and 154.

[19] Bilgeri, Benedikt. 1949. *Der Getreideanbau im Lande Vorarlberg. Ein Beitrag zur Wirtschafts-, Siedlungs- und Stammesgeschichte.* Sonderdruck aus der Zeitschrift Montfort 1/3, 102.

[20] Ibid.

Two decades after 1836, when the climate slowly warmed up, the land use pattern in Damüls had changed considerably. Figure 2 is based on a taxation-oriented land survey by authorities of the Austrian-Hungarian monarchy and shows the situation in Damüls in 1857. The survey reveals that fields were spread all over the village.

In 1857, cropland was mainly used for the cultivation of potatoes, which had been introduced in reaction to the cooler and wetter climate.[21] This crop is adapted to disadvantageous soils and cold. The potato plant is also resistant to hailstorms and snowfall during the summer.[22] While introducing potatoes can be considered a form of agricultural modernization, their cultivation fit perfectly within traditional hoe farming widespread in the area.[23] The cultivation required a large labor force. Children and women bore the main work burden.[24] In total, the land survey of 1857 documents 226 potato plots close to dwellings. 4,9 hectares were used, all plots were located on the south-facing slopes and terraces of Damüls, where snow melted earlier, providing favorable conditions. Using Robert McC. Netting's numbers for the Alpine village of Törbel/Switzerland, we infer that farmers were able to produce between 87 and 104 tons of potatoes a year, varying with natural conditions as well as with the availability of labor input on the plots.[25] Since about 20 percent of the harvest needs to be saved for the following season, we conclude that each inhabitant – including the aged and children – could consume between 0,5 and 0,6 kilogram potatoes per day. While these figures are estimates, their plausibility is supported by local sources providing evidence that farmers in Damüls produced a surplus sold to other villages as »Damülser Vieläugler«.[26]

The history of potato cultivation is important, because inhabitants saved money otherwise necessary for the import of bread, cereals and even potatoes from the valley.[27] Potatoes improved the diet of villagers when eaten in combination with cheese, milk, meat, and eggs produced on their farms. Furthermore, people cultivated turnip, radish, red currants, and lettuce in their gardens. Alpine creeks were rich in fish.[28] Villagers collected and preserved wild blueberry and mountain cranberry, rowanberry, blackberry, raspberry and elderberry.[29] Despite this portfolio, the sparse contemporary written sources perceived the Alpine livelihood thus created as poor and dreary: »Die Damülser sind wahrhaftig sehr arm und leben kümmerlich von Mehlmus und Kartoffeln, trinken auch nur am Sonntag ein Gläschen Schnaps.«[30] [The inhabitants are really very poor and sustain themselves poorly on flour-pap and potatoes, only on Sundays they drink a tot of schnapps. Transl. by R.G.] While there is no doubt that the inhabitants of Damüls lived a rather simple life, people managed more than just to survive on their subsistence-based living. If they earned money, e.g. by selling calves, milk, cheese or potatoes, they improved their dwellings, haystacks, stables, or invested money in livestock, meeting the four criteria of agricultural sustainability that McC Netting has suggested.[31] He suggested to view relatively stable production per unit of land, stable or increasing yields, and resilience to short-term or seasonal perturbations as one criterion. Predictable and relatively stable inputs of energy to achieve this goal are the second criterion, because a situation is not sustainable when the return upon energy investment decreases. The fourth criterion are economically favorable rates of return between inputs and outputs, both in energy and in monetary terms,

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21 Ibid., 49.

22 McC. Netting, *Balancing,* 1981, 159–160.

23 Bilgeri, *Getreideanbau,* 1949, 111.

24 Sandgruber, Roman. 1982. *Die Anfänge der Konsumgesellschaft. Konsumgüterverbrauch, Lebensstandard und Alltagskultur in Österreich im 18. und 19. Jahrhundert.* Wien, 51.

25 Robert McC. Netting Netting estimated harvests of 150–180 kilogram potato on 0,1 hectare. See: McC. Netting, *Balancing,* 1981, 39.

26 Feuerstein, *Damüls,* 1929, 22-23.

27 Authors interview with BERTSCH, Regina, Damüls, 1/10/2008.

28 Ibid.

29 Ibid.

30 Steub, Ludwig. 1871. *Drei Sommer in Tirol.* Stuttgart, 96.

31 McC. Netting, *Balancing,* 1981, 38., see also the discussion in: Verena Winiwarter, Agro-Ecological History – Intrinsic Resource Problems of Solar Based Societies. In: Brigitta Benzing, Bernd Herrmann (eds.) 2003, Exploitation and Overexploitation in Societies Past and Present (= IUAES-Series), Münster, 81-100.

plus a diversity of crops and agricultural operations that limits risk and strengthens stability. Finally, for an agro-ecological systems sustainability, returns to labor and other energy inputs must be sufficient to provide an acceptable livelihood to the producers. Sufficient income includes also sufficient savings to meet contingencies and to be able to make the investments necessary for long-term productivity, which is what the villagers were able to do.[32]

While it is true that social systems need to have some degree of stability in order to be feasible, the notion of stability overshadows the importance of dynamics and change in agriculture in order to obtain feasible conditions with stable outcome. Population dynamic is one possible indication of successful resource exploitation, but not necessarily of sustainability. Let us look into the issue in Damüls: Were pre-industrial living conditions in Damüls dreary or favorable? Population development in the second half of the 19th century supports a positive view. Church registers show that between 1830 and 1890, the population of Damüls increased from 365 to 408 inhabitants.[33] In 1869, the first Austrian census counted 383 inhabitants.[34] The sources document that the number of births increased and child mortality decreased, [35] which we can interpret as an indication for improved living conditions.[36] According to Robert McC. Netting, potatoes were responsible for a decline in child mortality and population growth in Törbel/Switzerland. He held that a nutritious meal of cooked, mashed potato with butter or milk could be prepared with less labor investment than grain pulp or bread, yielding a more favorable return on investment.[37]

A growing population under agrarian conditions meant a growing number of working hands and allowed agricultural intensification. Agricultural work under pre-industrial conditions was mostly manual work, and labor availability was at least seasonally a severe constraint. Considerable manual labor was needed for the improvement of soil by manuring or for »schwenden« (uprooting tree sprouts on the grassland). Potato plots had to be plowed and hoed. The abundant stones had to be collected from all land to improve it. A network of wooden fences had to be erected and maintained. Furthermore, grass had to be cut, dried and stored for the winter as hay. Cows had to be milked and the milk processed into cheese. More young, healthy members of the village population meant that the community could produce more potatoes, milk, cheese and meat and thus improve their living conditions. The growing population in the second half of the 19th century can be considered as a sign of better living conditions. Better conditions, in turn, resulted from the larger available work force due to population growth. This important feedback loop has been discussed widely in the literature on agricultural intensification, with Ester Boserup and her followers arguing that such a feedbacked dynamic could be sustainable for humans as long as intensification brought increased nutrition directly or via more marketable goods.[38]

But while intensification was beneficial for the villagers, the growing population increased the pressure on natural resources. Under pre-industrial conditions, inhabitants used wood and timber for multiple purposes from building to heating. Forests consisted mainly of spruce and fir trees, some beeches grew in lower areas of the village. They had been utilized intensively over centuries. In 1857, forests covered 485 hectares, only about 23 percent of the total area, because the major share of the village had already been cleared earlier. Toponyms such as »Schwende« (rooting tree sprouts) and »Brand« (clearing with fire) hint at a long tradition of clearing but point also at a place-based culture of remembrance for clearing activities of ancestors.[39] Forest area was reduced by about 106 hectares between 1857 and 1924 (from 23

[32] McC. Netting, Robert. 1993. *Smallholders, Householders. Farm families and the ecology of intensive, sustainable agriculture.* Stanford, 136-137.

[33] Hackspiel, Kurt. 1947. *Heimatkundliche Stoffsammlung für die Volksschule Damüls.* Damüls, 28.

[34] URL: http://http://www.statistik.at/blickgem/blick1/g80209.pdf (7/5/2013).

[35] Hackspiel, *Heimatkundliche Stoffsammlung*, 1949, 28.

[36] Höpflinger, Francoise. 1997. *Bevölkerungssoziologie. Eine Einführung in bevölkerungssoziologische Ansätze und demographische Prozesse.* München, 15-17.

[37] McC. Netting, *Balancing,* 1981, 159.

[38] Fischer-Kowalski, Marina et al., 2014. *Ester Boserup's Legacy on Sustainability. Orientations for Contemporary Research. Dordrecht.*

[39] Feuerstein, *Damüls,* 1929, 10.

to 18 percent of the total area). Geographer Arnold Feuerstein argued in 1924 that the specialization on dairy farming and the expansion of the grassland had pushed back forests. Furthermore, grazing rights in some forests hampered regeneration.[40]

When investigating sustainability, scale is a very important issue. It has to be taken into account that the situation of Damüls during the second half of the 19th and the beginning of the 20th century is the result of the co-development of a mountain village and the surrounding valleys. Industrialization in the major valley of the province, the Rhine Valley started as early as 1853, when the railway connected cities in South Germany with Lindau at Lake Constance. The second railway was built in 1857, connecting Swiss cities with Vorarlberg. In 1872, the »Vorarlberg Bahn« was built, and in 1884, the province moved closer to the Austro-Hungarian Empire via the »Arlbergtunnel«, a railway connection from Vorarlberg to Vienna.[41]

The connection of the Rhine Valley to the industrialized centers in Germany, Switzerland and the Austro-Hungarian Empire considerably transformed ways of living and modes of production in Vorarlberg. Cheap imports such as cotton, grain and potato reached the province. Exporting manufactured goods, primarily textiles, became easier. In the industrial transformation of the Rhine Valley, textile manufacturing expanded. More and more farmers from alpine villages such as Damüls were attracted to jobs in the factories and left their homes. The demographic impact was severe. Villages close to the Rhine Valley, e.g. Damüls, Ebnit, and Bildstein were the worst affected, while the villages in the Rhine Valley grew by about 40 percent between 1880 and 1924.[42] Between 1880 and 1924, 27 families left Damüls. The population decreased from 383 to 204 inhabitants.[43] Mostly young people migrated, dramatically reducing the available labor force for agriculture. The out-migration had considerable impact on land use in Damüls. Labor-intensive potato plots vanished completely. From then on, people had to import the basics of their daily diet. Meadows diminished due to the reduced livestock, and marginal agricultural land was not cultivated anymore. Farmhouses, barns, storehouses, haystacks and stables were either sold or decayed. At the turn of the century, the remaining population of Damüls was desperately seeking new income possibilities.[44] This development contributed in important ways to the villager's positive attitude towards the growing number of tourists.

CREATING AN ATTRACTION: TOURISTIC REPRESENTATIONS OF DAMÜLS IN THE LATE 19TH AND THE EARLY 20TH CENTURIES

While farmers left Damüls, the village became part of the mental topography of urban middle-class tourists from southern German cities. They entered the province by railway and brought a novel perspective to peripheral, alpine villages. Initially, tourists had visited Lake Constance and the picturesque towns of Bregenz and Feldkirch in the Rhine Valley. By and by, they began to discover even the remotest places in the Alps, following the romantic connotations the literary routes of travel writers had laid.[45] Ludwig Steub's famous book »Drei Sommer in Tirol« (Three Summers in the Tyrol) guided an entire generation of alpinists and tourists on their explorations of the periphery. Steub wrote about his journey from Au/Bregenzerwald to the »Große Walsertal« whereby he passed Damüls. In 1849, he described Damüls as an isolated civilization, separated by mountains from the Bregenzerwald, which was itself quite remote. Coaches could reach Bezau, the principal village of the Bregenzerwald from Bregenz in six hours. The

40 Ibid., 21.
41 URL: http://www.arlbergbahn.at/bahnbau.html (7/5/2013).
42 Baur, Andrä. 1939. *Entvölkerung und Existenzverhältnisse in Vorarlberger Berglagen.* Beiträge zur Wirtschaftskunde der Alpenländer der Gegenwart. Bregenz, 43.
43 Gross, Robert. 2012. *Wie das 1950er-Syndrom in die Täler kam. Umwelthistorische Überlegungen zur Konstruktion von Wintersportlandschaften am Beispiel Damüls in Vorarlberg.* Regensburg, 37.
44 Feuerstein, *Damüls,* 1929, 25.
45 Tschofen, Bernhard. 1999. *Berg – Kultur – Moderne. Volkskundliches aus den Alpen.* Wien, 77.

distance between Bezau and Damüls required another five to six hours.[46] Steub reached the village via a steep and stony mule track over deep ravines and canyons.[47] The landscape was »ernst und einfach«[48] [solemn and frugal, transl. by R.G.], with cleared forests and cultivation limited to little gardens. Dairy farming was the main activity; framed by wooden fences, widely dispersed barnyards and homesteads littered the green slopes.[49]

Ludwig Steub used the flowery metaphors of his time to describe the narrowness and remoteness of the alpine village. In Damüls, »dreht sich alles um Gottesdienst und Tageswerk, und dies selbst kennt keinen anderen Wechsel als Arbeit in den Hütten und Arbeit auf den nahen Wiesen […], das geräuschvollste Ding in der Runde ist das Meßglöcklein, das im Kirchturm hängt. Der Lebenslauf scheidet sich in die Langeweile der endlosen Schneezeit und die kargen Freuden des winterlichen Sommers.« [50] [Everyday life in Damüls revolves around divine service and work, and work does not know any change other than between work in the alpine cabins or on meadows, the loudest sound being that of the small bell in the church tower. Life in Damüls consists of boredom in the endless snowy time and the meager pleasures of a wintery summer, transl. by R.G] However, when Steub described the panorama from the highest mountain peak in the Damüls, the »Mittagspitze«, he rhapsodized about the majestic gaze on the Alps: »Der Erklimmer der Spitze genießt eine unermessliche Aussicht. Es ist ein wunderherrlicher Anblick, wenn die ersten Strahlen der Morgensonne auf den Kranz von glänzenden Fernern fallen, die mit ewigem Eis und Schnee bekleidet, schroff und unnahbar, stolz und schweigend in die blauen Lüfte steigen. […] Steil unter der Spitze liegt das Dörfchen Mellau an der Ache und an dieser hin die schmalen Thalgaue des Bregenzerwaldes, eingeschlossen von weidereichen Höhen und über den Wald hinaus liegt der Bodensee und alle die Städte und Flecken die das schwäbische Meer bespült, winken weiß und zierlich hinauf.«[51] [Any climber of the peak of the Mittagspitze enjoys a boundless view. It is a wonderful sight when the first beams of the morning sun fall on the rim of shiny glaciers, which, clad in everlasting ice and snow, cragged and aloof, proud and silent, rise into the blue air. […] Steep under this peak lies the village Mellau at the Ache and along it, the narrow valleys of the Bregenzerwald, encased by meadow-laden heights; and across the forest lies Lake Constance and all the towns and places the along the »Swabian Sea« beckon upwards white and gracefully, transl. by R.G.]

Despite the ambivalent description of Damüls in the travel literature, more and more tourists visited the village at the end of the 19th century. Books like Steub's work guided tourist perception and created a difference between the lowly-regarded industrialized valleys and the agrarian periphery styled into a pittoresque scenery. In 1907 Ludwig Hörmann von Hörbach followed Ludwig Steubs walking tours. Hörmann von Hörbach was born in the province in lowland Feldkirch in 1837. He was a folklorist, cultural historian and travel writer. He travelled all over the Alps and wrote essays for newspapers and the journals of Alpine associations, as well as monographs.[52] He recorded his impressions of the village in his essay »Über Damüls ins Laternsertal«. By then, a road to the valley connected Damüls to the outside world, sparing hikers the exhausting ascent to the village. Hörmann von Hörbach observed farmers scattered on steep slopes, collecting flavorsome hay in heavy hay bales[53] carried on their heads and backs. While Ludwig Steub depicted the farmhouses of Damüls as »miserable dwellings«, Hörmann von Hörbach praised them as stately farmsteads,[54] topped by the mountain peak »Mittagsspitze«. Alike Steub, Hörmann von Hörbach emphasized the panorama from »Mittagsspitze« with an exaggerated listing of

46 Gross, *Wie das 1950er Syndrom,* 2012, 68.
47 Steub, *Drei Sommer in Tirol,* 1871, 71.
48 Ibid.
49 Ibid., 85.
50 Ibid., 99.
51 Ibid., 98–99.
52 Österreichisches Biographisches Lexikon (ÖBL) 1815–1950, 2/9, 1959, 366. See: URL://http://www.biographien.ac.at/oebl (7/5/2013).
53 von Hörmann, Ludwig. 1907. *Über Damüls ins Laternsertal.* In: Mitteilungen des Deutschen und Österreichischen Alpenvereins 20, 250.
54 Ibid.

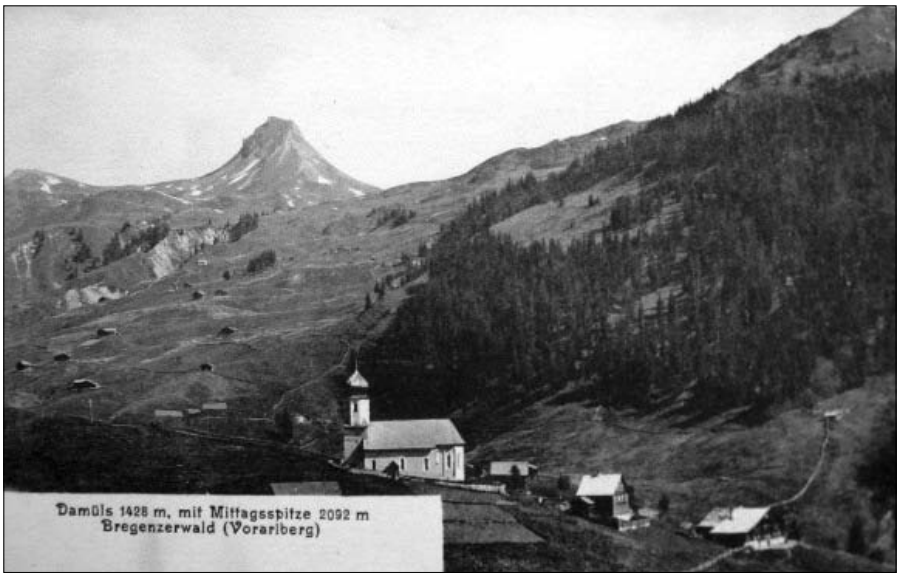

Figure 3: *Picture postcard of Damüls church, the Alpe Uga and mountain peak »Mittagsspitze«. Publisher Herm. Steck, Feldkirch 1903. With permission of Vorarlberger Landesbibliothek.*

all glaciers, mountain peaks, lakes, villages and valleys perceivable from the top of Damüls. As early as 1904, picture postcards depicting Damüls were produced. Figure 3 shows such a postcard portraying the village.

The photograph displays the church, the presbytery to its right side, and the guesthouse Adler on the far right. In front of the church, a potato plot is visible. The left part of the background is dominated by the area called »Uga«, the »Alpe Uga« and the »Mittagsspitze«. In the background, the scattered dwellings of the inhabitants are visible. The picture was probably taken in spring, as the base of »Mittagsspitze« is partly covered with snow. The composition is classic, the »Mittagsspitze«, the old church, meadows and the forest taken together produce a romantic landscape that invites the beholder to visit Damüls. The essays of Ludwig Steub and Ludwig Hörbach von Hörmann described Damüls from the perspective of tourists who visited the village during spring, summer and autumn. Skiing and winter tourism played only a marginal role in Damüls before 1925.

Visual perception is central for tourism. Tourism development and the growing importance of visual consumption of Alpine topography as »beautiful landscape« were coupled to early forms of tourism commodification in Damüls. The appearance of a »romantic tourist gaze« in picture postcards but also in texts of travel writers points to a considerable societal shift. Damüls was now perceived rather as landscape of consumption than of production.[55] The highly differentiated cultural landscapes of Damüls had formed over centuries due to farming practices. The tourist gaze projected romantic ideas of nature and culture onto agriculturally productive landscapes. Tourists followed the stereotypes of individual writers conceptualizing the Alps as ideally suited hide-away of the prototypically Germanic individual. The basic idea was appealingly simple: the higher one climbs the mountain, the more pristine and unaffected by industrialized white-bread lifestyles are the land and its people.[56] Culturally homogenized stereotypes amalgamated with a re-evaluation of mountain landscapes, which were now bestowed with meanings of healing and cleansing. The physical ascent from the valley to the mountain was seen as a healing process.[57] In those days, Damüls was imbued the status of a high alpine convalescent home, benefiting urbanites distressed by modern lifestyle. This new image, mediated by photographs and texts, was consequential for Damüls. The owner of the guesthouse »Adler« reported in 1907 that he had sold more than

[55] Urry, John. 1995. *The Tourist Gaze and the Environment.* In: Urry, John, Consuming Places. New York, 180.
[56] Tschofen, *Berg,* 1999, 53.
[57] Stremlow, Matthias. 1998. *Die Alpen aus der Untersicht. Von der Verheißung der nahen Fremde zur Sportarena. Kontinuität und Wandel von Alpenbildern seit 1700.* Wien, 160.

thousand picture postcards during the summer and that the number of tourists increased year after year.[58] Land use patterns and property rights were not transformed in Damüls in the early 20th century, because WWI broke out. But the headstone for commodification of the socio-natural features of Damüls had been laid by incorporating the community into the mental topography of urban middle class leisure seekers. Mountain climbers and hiker's demands on local resources had remained modest. They used mule tracks and were basically content with local resources for their food needs. Winter showshoeing did not harm the landscape, as it remained a pastime for few. The early winter tourism still met the basic criteria of sustainable tourism. According to the influential UNWTO/UNEP guidelines, sustainable tourism should:

1. Make optimal use of environmental resources that constitute a key element in tourism development, maintaining essential ecological processes and helping to conserve natural heritage and biodiversity.
2. Respect the socio-cultural authenticity of host communities, conserve their built and living cultural heritage and traditional values, and contribute to inter-cultural understanding and tolerance.
3. Ensure viable, long-term economic operations, providing socio-economic benefits to all stakeholders that are fairly distributed, including stable employment and income-earning opportunities and social services to host communities, and contributing to poverty alleviation.[59]

The subsequent development of winter tourism would become a challenge to maintaining essential ecological processes and the conservation of natural heritage and biodiversity, and would also transform local livelihoods and cultural heritage. This process started after WWI but would take several decades.

TOURISM PIONEERS IN DAMÜLS AND NATIONAL SOCIALIST MODERNIZATION EFFORTS

After the end of WWI, new forms of leisure culture developed in Austria. Sports diffused in society and a growing number of the urban middle- and working class participated in the movement. Skiing, a niche activity before WWI, became more and more popular. Many young men had learned to ski during WWI. When the war was over, they flocked to the wintry Alps to ski. Austria experienced its first skiing boom in the 1920s.[60] Skiing was perceived as a way to leave war traumata behind by gliding in the mountains. Skiers brought novel ways of living to villages such as Damüls and by doing so, they began to transform locally-based life worlds.[61] In 1925, the first skiing courses took place in Damüls, creating a demand for catering and housing in the village guesthouse Adler. Provincial authorities had disliked tourists in mountainous villages in the beginning. Otto Ender, governor of Vorarlberg, held that open minded tourists would threaten the Catholic moral of rural societies.[62] However, in the late 1920s, more and more federal politicians became convinced that tourism might have a considerable positive impact on local economies, and could stop depopulation.[63] When Austria was hit by the Great Depression in 1930, tourism became a strategy to decrease the deficit in the national trade balance.[64]

The »invisible export« created by the foreign currency tourists brought into the country became a household word and basic economic concept in those days.[65] The strategy left visible traces in Alpine villages because of the resulting building boom. In Damüls, guesthouse »Alpenblume« opened its doors in

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58 von Hörmann, *Über Damüls,* 1907, 250.

59 URL: http://sdt.unwto.org/content/about-us-5, quote on website taken from: *Making Tourism More Sustainable - A Guide for Policy Makers*, UNEP and UNWTO, 2005, p.11-12 (29/9/2015).

60 Norden, Gilbert. 1998. *Breitensport und Spitzensport vom 19. Jahrhundert bis zur Gegenwart.* In: Turnen und Sport in der Geschichte Österreichs. Schriften des Instituts für Österreichkunde 60. Wien, 65–66.

61 Tschofen, *Berg,* 1999, 20.

62 Gross, *Wie das 1950er Syndrom,* 2012, 38.

63 Gross, Robert. 2013. *Zwischen Kruckenkreuz und Hakenkreuz. Tourismuslandschaften während der 1000-Reichsmark-Sperre.* In: Montfort 65/2, 54.

64 Ibid.

65 These exports provide income from the service sector (e.g. tourism), not from selling raw materials or processed goods. See: Albers, Willy et al. 1982. *Handwörterbuch der Wirtschaftswissenschaften 9.* Wirtschaft und Politik bis Zölle. Stuttgart, 540.

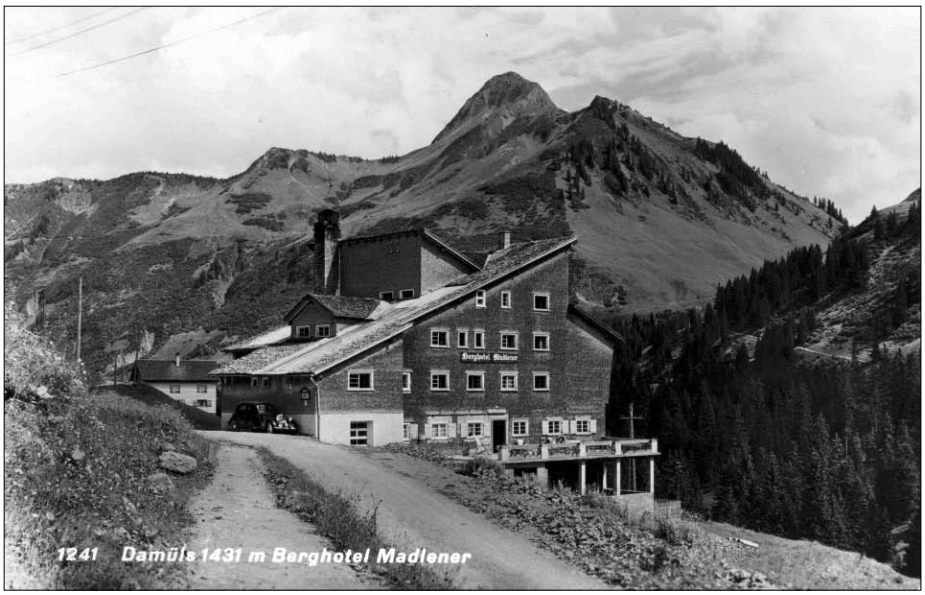

Figure 4: *Picture postcard »Damüls 1431m. Berghotel Madlener.« (sent September 25, 1954), Publisher Foto Risch-Lau. With permission of Vorarlberger Landesbibliothek.*

1928, »Berghotel Madlener« and guesthouse »Sonnenheim« followed in 1932 and »Gasthof Walisgaden« was opened in 1938. Damüls provided 300 beds in 1933, of which roughly one third was located in farmhouses. In the season 1932/33, the village counted about 10.000 overnight stays. 80 percent of those were German guests, who stayed on averages up to six days.[66] Damüls found itself in the midst of tourism-driven modernization in the beginning of the 1930s. Modernity was expressed vividly by the architecture of »Berghotel Madlener« depicted in Figure 4.

The building differs considerably from the architecture of farmhouses. Alois Madlener, the owner of the guesthouse had commissioned the well-known architect Alfons Fritz, who was responsible for a range of modern buildings in the province of Vorarlberg. Alfons Fritz paid reverence to modern alpine architecture in the guesthouse design. »Berghotel Madlener« points to a self-perception of tourism entrepreneurs in the 1930s as innovators. Tourism modernization literally superimposed traditional, agrarian (infra-)structures, demonstrated also by the fact that Alois Madlener - together with the mill owner – built the first power plant of Damüls.[67]

The »romantic tourist gaze is directed to features of landscapes […] which separate them off from everyday […] experiences.«[68] The electrified »Berghotel Madlener« – because of its outstanding architecture – is a telling example for the production of a »in some sense out-of-the-ordinary«[69] tourist attraction, which raised capital availability in Damüls.

The modernization of Damüls came to a sudden halt when Adolf Hitler introduced the »1000-Reichsmark-Sperre«, which was in effect from May 27th, 1933 to July, 11th, 1936. German citizens had to pay a fee of 1000 RM (corresponding to about € 4000 in recent value)[70] when they crossed the border between Austria and Germany for tourism purposes. Hitler wanted to accelerate the annexation of Austria.[71] Damüls plunged into a crisis as illustrated by the following excerpt from a letter written by the mayor of Damüls on January 6th, 1934 to the minister of trade and commerce: »Damüls war immer bereits zur Gänze von Deutschen besucht aber durch die 1000 M. Sperre kommt die Gemeinde Damüls die 4 Gasthöfe die Lohnfurwerksbesitzer [sic!] deren zwei sind, dan [sic!] auch noch viele Private schwer

66 VLA, Sammlung FV 29, FV Statistik 1930/31–1937/38.
67 Gross, *Wie das 1950er Syndrom,* 2012, 41.
68 Urry, *The Tourist Gaze,* 1995, 131-132.
69 Ibid.
70 URL: http://measuringworth.com/exchangeglobal/ (20/5/2013).
71 Otruba, Gustav. 1983. *A. Hitlers »Tausend-Mark-Sperre« und die Folgen für Österreichs Fremdenverkehr (1933-1938).* Linzer Schriften zur Sozial- u. Wirtschaftsgeschichte 9. Linz, 10–11.

zu Schaden und ihre Existenzen schwer betrot [sic!] wo nicht ganz ruiniert werden, den [sic!] durch den steten Zuwachs der Fremden in den letzten Jahren wurde und musste viel verbessert werden bei jedem Geschäfte so dass mann [sic!] dadurch Schulden machen musste in der Hoffnung durch den regen Fremdenverkehr alsbald wieder entlastet zu werden.« [72] Damüls, the mayor writes, depended on German tourists. The inhabitants had restructured tourism infrastructure according to the needs of these guests. Many entrepreneurs went into debt, expecting stable and growing incomes to pay the loans back. The 1000 RM sanction threatened their livelihood; some, the mayor holds, would become insolvent.

All over Austria, thousands of deeply indebted tourism entrepreneurs pleaded the ministry of trade and commerce for aid. In 1933 and 1934, the ministry carried out a »Hotelsanierungsaktion« (hotel refurbishment action) to secure businesses from insolvency. All hotels and guesthouses in Damüls apart from »Berggasthof Walisgaden« received aid. Hans Strasshofer, the owner, participated in illegal, national-socialist propaganda campaigns and was thus excluded.[73] When the »1000-Reichsmark-Sperre« was lifted in 1936, tourists from Germany came back to Damüls, but the numbers of 1932 were not reached again.[74] From 1940 on, Damüls participated in the national socialistic regional development program »Das schöne Dorf« (The beautiful village), a state-orchestrated strategy of economic growth. The program aimed to restructure villages according to national socialist ideals of modernity and to serve as a role model for other villages after the war. »Das schöne Dorf« was selected by means of shape and type of village, key statistical figures, maps, and the condition of infrastructure, but also by the loyalty to national socialist ideology of village leaders. »Ortsgruppenleiter« (leader of the local national socialist group) Leo Breuss, who owned the guesthouse »Adler« was a promising candidate for the campaign. Furthermore, provincial authorities supposed that Damüls had a huge touristic potential, which was not yet fully exploited. To stimulate tourism in Damüls, two ski lifts opening the terrain of »Uga Alpe« and »Oberdamüls« should be built. New infrastructure was considered the utmost expression of modernity and a necessity to improve the village's attraction for tourists to compete successfully with the Arlberg region. Regional authorities, national socialist regional developers and local tourism entrepreneurs agreed to split costs and to build ski lifts as soon as possible. However, when German national economy shifted towards war at the turn of 1941 to 1942, modernization efforts came to a sudden halt.[75]

The most profound change national socialist regional development brought to Damüls was the erection of a power grid from »Großes Walsertal« to the village. Until then, the power station of Damüls, erected by Alois Madlener, had only supplied guesthouses. Prior to 1944, farmers had no access to electricity. In March 1943, the necessary power poles were delivered. Forced laborers from Eastern Europe carried out excavation work for the power grid. At the end of September 1943, the »Aufbaugenossenschaft« (building cooperation) announced that the prisoner's camp and the hotel »Faschina« had successfully been connected to the power grid.[76] The infrastructure made possible by the reckless exploitation of forced laborers built the foundation of the post-war reconstruction of Damüls when National Socialism collapsed in 1945.

TAMING ALPINE HYDROLOGY TO SECURE ROAD BUILDING

After WWII, the road to Damüls was badly damaged. In June 1950, authorities decided that motorized vehicles were to be banned from using the road, with the exception of motorbikes and post busses.[77] No maintenance work had been carried out between 1938 and 1945, so roadside ditches were covered with mud from slope slumps and the surface of the road had been washed away completely. During the winter months, Damüls was accessible solely by sledge or on skis. In 1956, the road was re-opened for vehicles under three tons. The tourism board complained about the situation and its impact on hotels and

[72] Archiv der Republik (AdR), BMfHuV Sch. 1586, Zl. 121.153-14/1934.
[73] AdR – Bestandsgruppe 02 – BKA 147, Zl. 1.563/38.
[74] VLA Sammlung FV 29, FV Statistik 1930/31– 1937/38.
[75] Gross, *Wie das 1950er Syndrom,* 2012, 45.
[76] VLA Landratsamt Bludenz 5, Zl. VI-268/2-43.
[77] Ibid.

guesthouses. According to the department for road construction of the provincial government, ATS 23 Million would have been needed to improve the entire road, a sum way beyond the means of the province. But all actors considered the road to Damüls as vital for a shift of the local economy from a less productive development path with primarily subsistence-based agriculture to a profitable tourism center. So, by defining smaller sub-projects, the provincial government enabled the piecemeal building.[78]

The modernization of the road to Damüls caused a series of conflicts and required great patience of farmers in the village. When the first road to Damüls was built in 1892, the authorities had negotiated contracts with the mountain pasture-association and landowners for free supply of construction timber. When the road was extended in 1953, this contract was still valid. Construction work, however, had changed considerably between 1892 and 1953. Large amounts of timber were needed to improve the road for the demands of motorized traffic. This proved unbearable for affected landowners.[79] Already in 1950, the mountain pasture association started to resist, because road building not only demanded too much timber, but also damaged their land in many ways. Building companies cut down trees randomly and used timber for scaffolds and form boards. Rocks were blasted regardless of side-effects. Waste was thrown into ravines by construction workers, damaging tree barks and juvenile trees.[80] The course of the road itself was set without negotiations with the land owners. The mountain pasture association was forced to cede an area of fertile grassland four meters broad and 300 meters long for road building.[81] Constructing a road to Damüls had priority over agricultural land use because it was considered a prerequisite for the development of tourism. The operation was a threat to local ecosystems and their integrity, a veritable sustainability challenge. But environmental concerns played no role in the process.

Construction and use of the road were a massive intervention into agrarian livelihoods. In the late 1950s, cars had to stop several times to open and close cattle gates on the road to Damüls, a great inconvenience for drivers. In 1960, road police demanded the removal of two cattle gates. But these gates were part of a complex system of collectively erected and maintained fences, keeping together cattle and preventing cattle losses. When the cattle gates were removed, the users of »Argenalp« had to fence their land. The fencing cost (ca ATS 20.000) was one reason the Alp association took the case to court. They argued that the provincial government of Vorarlberg spent large sums on tourist attractions all over the province, but was unwilling to support alpine agriculture, even though farmers provided agricultural landscapes, a central resource for tourism. Like in many other instances, modern mass mobilization caused hidden costs for inhabitants, which led to conflicts without easy solutions.[82]

Heavy building vehicles had ruined pipelines for sewage water several times, resulting in streams of wastewater pouring out over villagers' land and even into their homes.[83] Due to such complications, road building was unpopular in Damüls. The village priest complained in a furious letter to the road building authorities that the construction workers should be more respectful of property rights.[84] He also pointed – as would be seen soon, correctly – to the long-term problem of erosion, citing precipitation analyses that showed that Damüls was one of the rainiest villages in the Alps, putting it at high erosion risk.[85]

Building work was hardly completed when the first landslides, mudflows and drawdowns of soil occurred near the new road. Villagers blamed road building authorities and construction workers for the problems.[86] A further unintended side effect of road building became visible in the district »Uga« in 1962. Terrain surrounding »Berghotel Madlener« was wet and prone to downhill motion. It had been drained in 1940, but the road building had damaged the drainage. When the owner of the »Berghotel

78 Ibid.
79 VLA Abt. VIc, Landesstraßen II. Ordnung, Au-Damüls 1947–1953, Zl. 62.119/3.
80 VLA Abt. VIc, Landesstraßen II. Ordnung, Au-Damüls 1947–1953, Zl. 62.119/3-49.
81 VLA Abt. VIc, Landesstraßen II. Ordnung, Au-Damüls 1947–1953, Zl. 62.119/27
82 VLA Abt. VIc, Landesstraßen II. Ordnung, Au-Damüls 1947–1953, Zl. 62.119/1.
83 VLA Abt. VIc, Landesstraßen II. Ordnung, Au-Damüls 1947–1953, Zl. 62.119/33.
84 VLA Abt. VIc, Landesstraßen II. Ordnung, Au-Damüls 1947–1953, Zl. 62.119/7.
85 Ibid.
86 Ibid.

Madlener« deposed builder's waste west of the Hotel, the area started moving. Not just the hotel, but also farmhouses and the newly built road were threatened. Inhabitants of Damüls erected wooden shoring as a short-term measure, but a long-term solution for the problem was required. Water from the sidelong cuts of the road construction regularly flooded meadows, paths and parking lots.[87] In 1964, the provincial government decided to tame the »destructive water body«[88] of Damüls with concrete pipelines. Figure 5 depicts these building measures.

In the end, the project proved considerably more complex than originally envisaged because shallow ground water was widespread all over the area.[89]

The huge pile of archival records of the road construction administration makes clear that building the road to Damüls was intimately tied to taming high alpine water bodies. Road construction was a massive intervention into the hydrological regime. Countless creeks rushed down the steep gradient crossing the course of the road. Wherever possible, engineers tried to span watercourses by bridges or tunneling of creeks.[90] Very often, however, water did not reach the soil surface but seeped below ground to the valley plain, causing mud flows and slope slumps. Along the Damüls road, engineers aimed to drain the ground, altering subsurface hydrology profoundly. The environmental history of the road shows that it is a bigger intervention than meets the eye. Maintaining a road under such conditions requires the regular investment of money and energy, taking a maintenance toll as long as the road is to be kept in working order. The destabilization of mountain ecosystems is a threat to sustainability caused by tourism.

Figure 5: *Picture Postcard of drainage at the Damüls road close to »Berghotel Madlener«, (sent July 9th, 1969) Publisher Foto Branz, Lustenau. With permission of Vorarlberger Landesbibliothek.*

Road construction to Damüls reveals how »nature« was »targeted and transformed by the twin pressures of science and capital«[91] but, following Prudham, it can also be considered as a »response to new opportunities and constraints from a dialectical conversation between social and environmental change.«[92] Road construction plans for Damüls had existed as early as the beginning of the 20th century. The knowledge- and capital-demanding Alpine topography and hydrology had thwarted realization of the plans. Although national socialist regional development programs envisioned high-flying plans for peripheral villages, they failed in terms of road building in Damüls.[93] The so-called 1950s syndrome,

87 VLA Abt. VIc, Landesstraßen II. Ordnung, Au-Damüls 1947–1953, Zl. 62.119/5-62.

88 Ibid.

89 VLA, LWBA Zl. 5221-12/9.14.

90 VLA Abt. VIc, Landesstraßen II. Ordnung, Au-Damüls 1947–1953, Zl. 62.119/46.

91 Prudham, *Taming trees,* 2002, 638.

92 Ibid.

93 Gehrer, Herbert. 1986. *Der Ausbau der Straßen Vorarlbergs für den motorisierten Verkehr von den 30er Jahren bis 1983.* Amt der Vorarlberger Landesregierung. Bregenz, 87.

the availability of relatively cheap fossil fuels, did not only make individual mobility affordable for the majority of the population but also decreased building costs.[94] Lower energy prices in combination with the distribution of energy-demanding building technology and generous reconstruction aid provided by national and provincial governments enabled countless road projects all over the Alps.[95] Tourism entrepreneurs in Damüls depended on individual tourist coming by car. In order to support them, commonly utilized farming property was permanently superimposed with roads. »Nature« was converted into »automobility-scapes«. The state backed this transformation, as tourism had by then become the higher-valued property regime. Environmental consequences did not figure in their considerations.

CREATING THE BEAUTIFUL LANDSCAPES OF WINTER SPORT: DAMÜLS SINCE 1945

The use of cars for winter tourism and the growth of individual mobility set novel standards in tourism after 1945. The spatial limitations of railways associated with a channeling of the tourist gaze along rail tracks were lifted. The advent of mobility infrastructure for cars together with a novel intensity of marketing strategies fueled tourism. Images of even the remotest place in the Alps became widely available. Tourists seek nature, but »natural environments are in fact environments entangled with culture, politics, technology, and other human activities across time and space.«[96] As agro-ecosystems were transformed for the sake of winter tourism, it began to threaten the pretension tourism rested on: the beautiful landscapes tourists seek. Damüls is a case in point for this development.

In response to changing means of travel and the popularization of winter tourism, the socio-economic structure of the village shifted from agriculture to services. In the beginning of the postwar era, Damüls was an agricultural village. In 1951, 75,8 percent of inhabitants had derived their main income from agriculture, 8,6 percent from the secondary sector (mainly construction work for road building) and 16,6 percent from tourism. The socio-economic composition of the population drastically changed in the next 50 years. In 2001, barely 7,0 percent of its inhabitants drew their main income from agriculture, while none of the farmers was able to sustain a livelihood solely from agriculture. All farmers were part-time tourism entrepreneurs. 83 percent of the inhabitants were connected to the tertiary sector, mainly tourism. Of the remaining 10 percent, most commuted to factories in the valleys.[97] As would be expected, the number of cattle went down from 345 in 1951 to 115 in 2001.[98] Overnight stays rose from 10.000 in 1950/51 to 120.784 in 2001.[99] In 1950/51, this amounted to 47 overnight stays per inhabitant as compared to 366 in 2001. The development of tourism taxed public infrastructure. Water supply and sewers, garbage disposal, power- and food supply had to deliver double capacities during the season, massive investments were necessary and a massive challenge to the local ecosystems resulted.[100]

Most tourists came to Damüls for skiing. Agro-ecosystems were accordingly transformed into winter sport landscapes. While agricultural land use had dominated daily life in Damüls in the 1950s, it later turned into a mere seasonal addition to the dominating tourism sector. Diffusion of winter tourism land use practices had begun when the first T-bar lift was built by Leo Breuss, Remigius Rützler, Alois Bischof, Franz Doming and Bernhard Moosbrugger in 1948. In 1951, the T-bar lift was taken over by Alfred Lingenhöle, a businessman from the provincial capital Bregenz. Lingenhöle had planned to buy

[94] Pfister, Christian. 1994. *Das 1950er Syndrom. Die Epochenschwelle der Mensch-Umwelt-Beziehung zwischen Industriegesellschaft und Konsumgesellschaft.* In: GAIA 3/2, 80.

[95] Bittermann, Wolfgang. 1995. *Von der Landschaftsnutzung zum Landschaftsverbrauch.* In: Sieder, Reinhard et al. 1995. *Österreich 1945-1995. Gesellschaft - Politik - Kultur.* Österr. Texte zur Gesellschaftskritik 60. Wien, 636-638.

[96] Jorgensen, Finn Arne et al. 2013. *Entangled Environments: Historians and Nature in the Nordic Countries.* In: Historisk tidsskrift, 10.

[97] Amt der Vorarlberger Landesregierung. Landesstelle für Statistik (1945-2005). Vorarlberger Wirtschafts- und Sozialstatistik. Jg. 1-61.

[98] Ibid.

[99] Ibid.

[100] URL: http://http://www.statistik.at/blickgem/blick1/g80209.pdf (7/5/2013).

Figure 6: *Picture postcard »Schlepplift 1800«, Publisher Foto Risch-Lau. With permission of Vorarlberger Landesbibliothek.*

building ground for a weekend cottage. Close to the church, he found a plot owned by the association of alpine meadow users, »Alpgemeinschaft Oberdamüls«. The association agreed to sell the property under the condition that Lingenhöle would run the T-bar lift.[101] Soon, a second T-Bar lift was added to the enterprise.[102] Both T-bar lifts were replaced by a state-of-the-art T-bar lift called »Höhe 1800« (denoting its height of 1800 meters) in 1957. This lift was a major tourist attraction in Damüls for years. Images of it were widely distributed by picture postcards and tourism advertising brochures. Figure 6 is a typical example depicting the T-bar lift »Höhe 1800«:

The photograph depicts the ski lift from a vantage point above it, the usual perspective of romantic landscape painting, which made power claims of the nobility over their acreage visible.[103] The bird's eye view, typical for the tourist gaze, suggests a sense of sublimity and domination to the beholder. The infrastructure depicted in the photograph served two functions. It offered inhabitants the possibility to identify with modernity and to distance themselves from their agrarian past, which became increasingly associated with fear of demise.[104] Shortly after the T-bar lift was put into operation, a series of new hotels and guesthouses was established and the population began to grow considerably, for the first time since 1880.[105] At the same time, the representation of Damüls in the media transformed. For decades, the village had been perceived as part of a crisis region. With the winter tourism boom, its image changed. Damüls became a role model for the successful commodification of »nature«, a winter tourism hotspot, surrounded by less productive farming communities.

Capital investments, science based transport technology and energy inputs were integrated by the founders of the ski lift cooperation to transform collectively utilized grassland into a playground for urban skiers. These novel infrastructures created another feedback loop which accelerated the popularization of skiing. For inhabitants and tourists alike, photographs such as Figure 6 served as instruction manuals for modern skiing.[106] Downhill skiing had little in common with the traditional »cross country skiing« [skilaufen] of the interwar years. On lifts, skiers floated uphill, physically disburdened of the ascent, and then rushed downhill [skifahren]. Skiers gained downhill skills much faster than before.[107] This in turn

[101] Gross, *Wie das 1950er Syndrom,* 2012, 46.
[102] Ibid., 47.
[103] WINIWARTER, Verena. 2001. *Buying a dream come true.* In: Rethinking History 5/3, 451–454.
[104] Gross, *Wie das 1950er Syndrom,* 2012, 53.
[105] Ibid.
[106] WINIWARTER, *Buying,* 2001, 421-454.
[107] Gross, *Wie das 1950er Syndrom,* 2012, 123-125.

led to the popularization of skiing in society but also to a redefinition of the meaning of mountains. Formerly perceived as semi-spiritual spaces, they became a mere backdrop of leisure society. The growth and change of skiing practices had repositioned the mountains in the mental topography of humans.[108]

Tourists were and are consumers of visual sensations but they also consume body sensation, especially in the case of winter tourism. As early as the 1920s, bodily perception of skiers was a widespread topic in popular media.[109] Ski lifts were inserted into the up- and downhill circuits of skiers. They compressed the space and time of uphill movement, comparable to the effect of railways in the 19th century.[110] Furthermore, ski lifts remodeled the landscape perception of passengers. Skiers literally floated uphill while gazing on pristine, snowy mountains. With time, tourists became used to the vertical perambulation of the landscape in Damüls.

Why should a tourist come to Damüls in the end of the 1950s if other winter sport destinations (e.g. Lech am Arlberg) provided more sensations with several lifts?[111] Tourists are novelty-seekers, this drove ski lift operators into regularly providing novel ski lifts (thus novel body and landscape sensations) to prevail in the increasing competition between the tourist destinations of the Alps.

The first chair lift on the Alpe Uga was erected in 1960, opening a terrain that provided extraordinary landscape sensations to skiers. The building of a chair lift was very expensive, so the ski lift corporation applied for a reconstruction loan at the Ministry of Trade and Reconstruction, which was at the time administrating funds from the European Recovery Program, commonly known as Marshall Plan. The corporation received ATS 1,7 Million for the project in 1961.[112] The chair lift on Alpe Uga allowed downhill skiers access to slopes that had been popular with back country skiers already in the 1920s for their outstanding winter landscapes. But Alpe Uga was not only known for its beautiful landscape but also for its harsh snow and wind conditions. The majority of leisure skiers were not able to cope with the rough, wind-blown snow on steep side of the mountain. The chair lift was economically unviable and ski lift operators were threatened by insolvency. Intensification was again the solution: A snow groomer solved the problem by transforming the uneven snow cover into a smooth ski slope. Economic returns for the ski lift operators increased after its purchase in 1967.[113] The snow groomer was named »Lisele« (the diminutive of the female name Elisabeth, often used for cows). It was immediately used not only on slopes but also in tourism advertising, as can be seen in Figure 7.

Figure 7: *Snow groomer. Pistenraupe. In: Werbeprospekt »Damüls, die Sonnenterasse in Vorarlberg…« (ca. 1968), pub. by Verkehrsverein Damüls; in possession of Damüls – Faschina Tourismus, Kirchdorf 138, Damüls.*

The snow groomer as advertising agent conveys images of modernity, safety and accessibility. Leisure skiing in Damüls was advertised to a paying, often urban audience with no previous experience of winter in the Alps. The image of the groomer in Figure 7 and others in which it figured prominently, suggested that ski lift operators mastered high alpine nature. It released skiing from topographical and snow cover uncertainties. Snow groomers and their com-

[108] Rigele, Georg. 2000. *Sommeralpen - Winteralpen. Veränderungen im Alpinen durch Bergstraßen, Seilbahnen und Schilifte in Österreich.* In: Umweltgeschichte. Zum historischen Verhältnis von Gesellschaft und Natur. Schriften des Instituts für Österreichkunde 63. Wien, 140-145.

[109] Gross, *Wie das 1950er Syndrom,* 2012, 81-91.

[110] Schivelbusch, Wolfgang. 1944. *Geschichte der Eisenbahnreise. Zur Industrialisierung von Raum und Zeit im 19. Jahrhundert.* München/Wien, 36-28.

[111] Gross, Robert. 2012. *Die Modernisierung der Vorarlberger Alpen durch Seilbahnen, Schlepp- und Sessellifte.* In: Montfort 2, 13-25.

[112] AdR, BMfV/Präs. 667 ERP Kredite. Listen nach Bundesländer 1964-66.

[113] Gross, *Wie das 1950er Syndrom,* 2012, 53.

mercialization as tourist attractions should make the skiing experience predictable and therefore stabilize its profitability.[114]

The image does not show the ecological side effects of snow groomers. Groomers created stable ski slopes resistant to weather fluctuations and the force of thousands of steel edged skiers swinging downhill per day. The compacted snow would melt later and shorten the already short growing season, diminishing agricultural returns.

Ski lift operators usually did not own the slopes to which they provided access. The mountain sides remained in the possession of local landowners. The slopes were still, if less and less intensively, used for agriculture. The novel utilization of grassland as downhill slopes of ski lifts increased conflicts between landholders and ski lift operators in mountainous regions in Damüls and elsewhere in Austria. Originally, land owners were able to prohibit access to their land by law but also by the erection of fences, hedges and other obstacles.[115] But the tourism board and interest groups lobbied for access, arguing that the wealth of the inhabitants, the future development of Alpine communities and the performance of the national economy would be endangered. Regional governments responded to the issue by enacting an unprecedented limitation of property rights, the »Sportgesetz 1968« [act on sports]. According to tourism actors, land owners should be kept from blocking the development and maintenance of ski slope networks. [116] With the new law, the provincial government prioritized the needs of lift operators. Owners were obliged to seasonally remove fences needed for using the slopes as pasture and the use of fertilizers was prohibited. The cost for the removal and re-erection of the fences was originally to be borne by the landowners; this was later changed due to widespread protest. Snow groomers, as principle means to optimize the usability of slopes for skiers were granted permission to operate on private lands.[117] The »Sportgesetz 1968« clearly reflects a shift of priorities but also of power due to the touristic commodification of the Alps. Affected farmers in Damüls see the act until this day as one of the greatest errors of the provincial government. Farmers felt disarmed by a law that constrained them to accept the majority of capital-driven interventions on their land.[118] The Sportgesetz is clearly unsustainable, as it does not respect the socio-cultural authenticity of the local communities, endangers their cultural heritage and traditional values and does not provide fairly distributed socio-economic benefits to all stakeholders. The consequences soon became visible.

Changing snow management due to the intensification of tourism reached a critical point in the 1970s, when farmers noticed damages on their grassland. Spring snowmelt occurred later where the snow had been compacted, which hampered the germination of early flowering plants. This resulted in changes of species composition. When groomer operators were not careful, their heavy vehicles also damaged the turf. Farmers realized that ski slope management reduced their hay harvest. They counteracted harvest losses and the belated snowmelt with novel forms of grassland management. »Thomasmehl«, a budget, black powder, a byproduct of ironmaking, rich in the plant nutrient phosphate — but also, unfortunately, in toxic heavy metals — was the substance of choice to get rid of the snow and to induce higher growth rates on damaged grassland. Farmers used »Thomasmehl« until 1995, when its use was restricted by law. Heavy-metal free dark rock meal replaced it.[119]

The integration of mechanized snow management practices was just the beginning of the increasing technological transformation of landscapes in Damüls. In 1980, five ski lifts with a transport capacity of 5000 riders per hour serviced the area. In 1987, two further lifts were added. Between 1984 and 1996, the ski lift operator mainly enlarged transport capacities of the existing ski lifts, but then the first chair lift carrying four skiers per chair was built. In the year 2000, a massive change occurred, when Damüls and the neighboring village Mellau joined into one network of slopes and lifts. For this, the ski lift operator

[114] Ibid., 55.
[115] Vorarlberger *Sportgesetz*, LGBl.Nr. 9/*1968*.
[116] VLA PrsG 1968, 19, Sportgesetz I. Teil, Zl. 306/70/1968.
[117] VLA PrsG 1968, 19, Sportgesetz I. Teil, Zl. 306/21/1966.
[118] Authors interview with a farmer. Anonymized by request of the interviewed person, Damüls, 4/4/2009.
[119] Ibid., 55-57.

built three new chair lifts, a ski tunnel and a series of avalanche barriers. Again, this came at the expense of Alpine nature. Many trees were felled. Cliffs were blasted to construct ski slopes. The resulting area, one large entertainment park accessible to skiers, was the third biggest ski arena within the province with a transport capacity of 20.000 riders per hour in 2010.[120]

Again, side effects are to be noted. The area treated by snow groomers expanded between 1970 and 2010 from 19,8 to 74,3 hectares. The ratio between increased transport capacity of ski lifts and development of ski slopes decoupled during the decades from 1970 and 2010. While transport capacity rose 9,2 fold, ski slope area grew »only« 2,8 fold, leading to more congestion on downhill rides, a phenomenon noted all over the alps. [121]

Slope area had become a scarce resource. It became imperative to keep it in good skiing condition for the entire season. The tourist enterprises of Damüls reacted with the installation and systematic expansion of a snow system in Damüls in 1991. Since the mid-1980s ski lift operators all over the Alps had been confronted with growing global competition and unusually mild winters. The decline of snow-covered periods increased the vulnerability of the industry. In most winter sport destinations, both the communities and many individual businesses were indebted. When tourist numbers in Damüls declined in the winter season 1989/90 by about 66 percent (compared to 1988/89) the ski lift operator incurred an economic loss of about ATS 14 Million (approximately € 1 Million) in just one year. The installation of a snow system in 1991 should combat this detrimental situation.[122] Water for artificial snow for 11 percent of the slope area came from the alpine creek Argenbach, which was integrated into a technostructure, a network of pumps, hydrants, piping and snow cannons. Although it had been turned into an organic machine, it had its limits.[123] Within two decades, the area under artificial snow increased to 80 percent of the total slope area (2010). The necessary amount of water by far outstripped the capacity of the small creek Argenbach. Thus, a freshwater storage pond became necessary. It was dug on the Alpe Uga, creating a long-lasting environmental legacy of snow making in Damüls. A second legacy is more diffuse but very profound. Artificial snow is expensive. Therefore, bumpy parts of the slopes were straightened for two reasons; to keep it from accumulating in recesses, and to avoid excessive exposure to sun, which might result in earlier melting. Soil was moved from the bumps to troughs, and then the bared spots were re-vegetated with seeds preferably resembling the local flora.[124] In the late 1990s, the ski lift cooperation realized that this technique was not just ineffective with regard to the intended effect, but on the contrary, increased erosion. In response, they improved techniques, cut turf bricks when removing bumps, stored them during the excavation work and as a last step, replaced them.[125] The result of this intervention on Alpine nature was a straightened slope, perfectly fitted to the needs of efficient snow management. Local plant biodiversity was conserved not for its intrinsic value but because it is the most effective means of preventing erosion. Stability of the remodeled terrain is a concern of ski lift operators, and they turn to nature as means to prevent the erosion their actions make probable.

CONCLUSION

Historians have long tended to neglect the entanglement of landscape and social change, of the interplay between nature and society. Historiography largely ignored that human beings are part of the ecological web of life and depend on other species. In Damüls, inhabitants built networks consisting of potato, cattle, grassland, forests and wooden farmhouses, cow barns and haystacks to mediate environmental fluctuations. When the valleys were industrialized, Damüls nearly vanished as a permanent settlement area. Tourism was the solution to compensate income losses in agriculture. In the beginning, the construc-

[120] Ibid., 58.
[121] Ibid., 63.
[122] Ibid.
[123] White, Richard. 1995. *The Organic Machine. The Remaking of the Columbia River.* New York.
[124] Gross, *Wie das 1950er Syndrom,* 2012, 59-64.
[125] Ibid.

tion of tourism infrastructure was restricted by a lack of local capital and energy. Backed by state power, capital poured into the community in later decades. While the hotel refurbishment action and the national socialist regional development program had limited effects on the transformation of the community, unprecedented acceleration took place after 1945. After six decades of economic growth, Damüls was ranked as one of the five richest communities (in terms of financial power) in Austria at the beginning of the 21st century.[126] But growth left deep traces in both physical and social realms. Traditional land use and property patterns were transformed by ski lift operators and the regional government. »Nature« perception became dominated by commodification processes of land and its people – the tourist gaze, guiding not only tourist perception but also their practices. The topography itself was increasingly spanned by a network of ski lifts, ski slopes, roads, and hotels, fueled by energy produced elsewhere. Their purpose was to increase the economic performance of Damüls as a tourism economy.

What are the consequences of winter tourism for the future sustainable development of the community? As we have tried to point out, subsistence-oriented Damüls met the criteria of sustainable agricultural livelihoods for a long time. Its integration into the fossil-fuel based larger economy of the province led to a population decrease that in turn, led to labor scarcity and the demise of the subsistence pattern. Winter tourism became the new livelihood basis. The ensuing tourist boom does not meet the criteria for sustainable tourism, as it entailed massive, long lasting interventions into alpine ecosystems and threatened the cultural heritage of alpine agriculture.

As environmental historians, we see the possibilities of future sustainable development depending on actors' understanding of the past. We know that cultures of recollection frame our horizon of experience. We know that the cognitive act of perception of the present depends on past experiences.

If we understand sustainable development as a regulatory idea, a concept used to project from the present into a desirable future, visions about desirable futures are needed. Too often, however, stakeholders make decisions to maximise the short term profit on the basis of contemporary knowledge while ignoring or discounting long term consequences.[127] Historical narratives are an important contribution to the knowledge base for future decisions, bearing the potential to widen the framing for desirable futures beyond the usual 'technical adaptation to climate change' so typical for current discussions about winter tourism policy.

Framing the environmental history of Damüls as a history of commodification of Alpine »nature« reveals a basic feature of such economies. David Harvey argues that »some sort of »outside« is necessary for the stabilization of capitalism […, it] can either make use of some pre-existing outside […] or it can actively manufacture it.«[128] Focusing on tourism development in Damüls illustrates that »the outside« of tourism originally was »nature« transformed by agriculture. While tourism can be considered as a »niche activity« in the first half of the 20th century, counterbalanced by a powerful farming sector, tourism actors integrated more and more aspects of »the outside« into its utilization processes. Even the hay harvests and dairy farming are nowadays considered as management activities to maintain »beautiful landscapes«. Furthermore, plant biodiversity, hydrology, land property, topography gradients and soils became commodified. Winter seasons no longer follow the timing of »nature«.[129] Rather, they are »opened« by a push on the button of the snow-system. Local stakeholders worked incessantly against local limitations by technology and capital but also against growing competition. The ski lifts and snow-systems in Damüls turned the wheel of local development away from its agricultural roots, challenging efforts of sustainable development by creating technological systems with their inherent need of energy and their transformative interventions into local ecosystems and social systems alike. Damüls as an agricultural village allowed a meagre livelihood for its inhabitants, which became increasingly challenged during moderniza-

[126] URL: http://www.gemeindebund.at/rcms/upload/news/RankingdreichstenGdesterreichs.pdf?PHPSESSID=a3ce71d382 (2/1/14).

[127] Haberl, Helmut et al. 2013. *Long-Term Socio-Ecological Research (LTSER). An Emerging Field of Research.* In: Singh, Jit Simron. 2013. *Long Term Socio-Ecological Research. Studies in Society. Nature Interactions Across Spatial and Temporal Scales,* Dordrecht, 30-31.; Winiwarter, Verena and Knoll, Martin. 2007. *Umweltgeschichte. Eine Einführung.* Köln, 312.

[128] Harvey, *Imperialism,* 2003, 141.

[129] Prudham, *Taming trees,* 2002, 641-642.

tion and industrialization of the valleys. But one can safely assume that a net yield of solar energy was created, as otherwise, Damüls' agriculture would not have been feasible on the longer term. The tourism destination Damüls, however, depends heavily on the provision of energy and capital brought in by visitors from afar. Therefore, a sustainable future based on winter tourism seems hardly possible for Alpine communities such as Damüls. Its history of commodification of Alpine »nature« is a cautionary tale of side-effects, feedback loops, technological and social lock-ins, showing the challenge of creating sustainable livelihoods in fragile Alpine settings. Tourists are novelty seekers when it comes to slopes. This has led to a more and more intense use of fragile land in the past. It could also be the road to a sustainable future, if new, gentler ways of experiencing winter landscapes became popular. Demographic change in Europe increases the challenge, as the young and middle-aged are getting relatively fewer. A sustainable society needs to decrease its use of fossil fuels. Which kind of resource-conscious bodily pleasure gentle both to the tourist and to the local and global ecosystem could be advertised and popularized to make Alpine winter tourism more sustainable? Looking at history helps to see that things might be different in the future, as they were different in the past.

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SAŽETAK

Svake zime, na stotine tisuća skijaša posjeti alpska naselja, kako bi doživjelo i osjetilo alpski krajolik. Na primjeru mjesta Damüls, dobro poznatog skijališta u zapadnoj austrijskoj pokrajini Vorarlberg, možemo pokazati kako je razvoj zimskog turizma doveo do ogromnog ekonomskog rasta, ali i ogromnog utjecaja na alpski krajolik. Cilj nam je ispričati povijest okoliša Damülsa kroz zadnjih dvjesto godina, analizirajući strategije komodifikacije »prirode« i imovinskih prava. Članak istražuje kako su se stanovnici nosili sa promjenom ekoloških i ekonomskih uvjeta u predindustrijsko doba. Stanovnici su živjeli uz ograničene resurse, tipične za agrarno društvo. Kada su industrijalizirane doline, Damüls je gotovo nestao kao stalno naselje. Tada su turisti zakoračili na scenu, pokrenuvši kotač lokalnog razvoja u drugom smjeru u nekoliko koraka. U devetnaestom stoljeću su putopisci i fotografi uveli su Damüls u mentalnu topografiju tragača za urbanom zabavom. Razvilo se romantični turistički pogled na Damüls. Od 1930-ih naovamo, savezne vlasti su otkrile ekonomsku moć turizma za poboljšanje nacionalne trgovinske bilance i potaknule transformaciju i razvoj turizma. Iako je međuratnom razdoblju utjecaj turizma bio skroman zbog ograničenog kapitala i dostupnosti energije, ta ograničenja su ukinuta kad je stigao sindrom 1950-tih. Ovaj treći korak karakterizirao je masivni građevinski rast, utječući i na naslijeđenu imovinu i nekretnine samog mjesta. Namnožile su se žičare, hoteli, ceste, a kasnije i sustavi za snijeg i skijališta, omogućavajući udoban i lagan pristup visokim alpskim krajolicima. Održavanje ove infrastrukture zahtijeva energiju i kapitalna ulaganja, ali i uzima danak održivosti. Agrarni Damüls proizvodi vrlo skromne viškove hrane, ovisno o raspoloživoj proizvodnji. Turistički Damüls zato guta energiju u pružanju usluga turistima, kako bi donio mnogo veći gospodarski dobitak. Održiva budućnost alpskih naselja zahtijeva nove oblike upravljanja alpskom prirodom i okolišem.

MARGINAL ISLANDS AND SUSTAIN ABILITY: 2,000 YEARS OF HUMAN SETTLEMENT IN EASTERN MICRONESIA

MARGINALNI OTOCI I ODRŽIVOST: DVIJE TISUĆE GODINA NASELJENOSTI OTOKA ISTOČNE MIKRONEZIJE

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Summary

Low coral islands in the Pacific are often perceived as marginal habitats for human settlement. This view is supported by the small and fragmented islet landmass, poor soils, lack of perennial surface fresh water, and extreme vulnerability to flooding by storm waves, and more recently, rising sea-level attributed to global warming. The atolls and table reefs of Kiribati and the Marshall Islands have produced some of the earliest dates for human settlement of eastern Micronesia. Sustainability for the last 2,000 years was just as likely the result of relatively low population densities, low impact extractive technologies, and efficient use of limited resources, as the application of intentional and unintentional conservation practices.

Key words: Kiribati, Marshall Islands, historical ecology, conservation
Ključne riječi: Kiribati, Marshallovo otočje, povijesna ekologija, očuvanje prirode

1. INTRODUCTION

With over 40,000 years of human settlement, the Pacific islands display great ecological and cultural diversity. Yet, the forces of globalization are an ever present threat. Although environmental degradation and the loss of traditional languages and cultures by the advent of modernity are not limited to islands, the latter appear more vulnerable to disturbance compared to continental areas. Until relatively recently, it was generally assumed that anthropogenic impacts on island ecosystems were the result of Western influence via the introduction of alien crops, ornamental plants, and animals, causing widespread damage to the environment.[1] No one can deny that threats to island biodiversity continue at an accelerated rate as a consequence of human population growth, urban expansion, monoculture, pollution, and overfishing. A half century of research has, however, revealed that indigenous people were also capable of altering their terrestrial environments to a significant degree prior to the arrival of outsiders.[2] These impacts can sometimes be traced to the early stages of human settlement, leading in some cases to resource depression, extirpation, and extinction. By contrast, the influence of indigenous societies on marine resources is less well documented,[3] and remains a fruitful topic for research in light of suggestions that rapid disper-

[1] A.W. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900-1900* 2nd ed. (Cambridge: Cambridge University Press, 2004).

[2] P.V. Kirch and T.L. Hunt, ed., *Historical Ecology in the Pacific Islands: Prehistoric Environmental and Landscape Change* (New Haven: Yale University Press, 1997).

[3] A. Anderson, "Short and sometimes Sharp; Human Impacts on Marine Resources in the Archaeology and History of South

sal, notably in the case of the Lapita expansion across the southwest Pacific beginning about 3,500 years ago, could have been driven in part by the impact of early humans on nearshore and intertidal resources of high value that could be efficiently harvested, such as flightless birds, colony-breeding seabirds, turtles, large reef fish, and invertebrates.[4]

2. LOW CORAL ISLANDS

It is argued that without a fair amount of human-induced environmental impact, Remote Oceania (the islands lying to the north and east of the main Solomon chain, Figure 1) would not have been successfully colonized by people lacking a well-established agricultural base.[5] While the importance of food production to early colonizing groups needs to be demonstrated[6], agriculture subsequently expanded to the extent that islands became largely transformed into anthropogenic landscapes. Some human-induced impacts had a destructive effect on island biota, but it is difficult to imagine life on some islands, especially low coral islands - atolls and table reefs or low coral islands lacking a lagoon (Figure 2), without introduced root and tree crops. Patrick Kirch characterized such islands as 'consummate man-made environments'.[7]

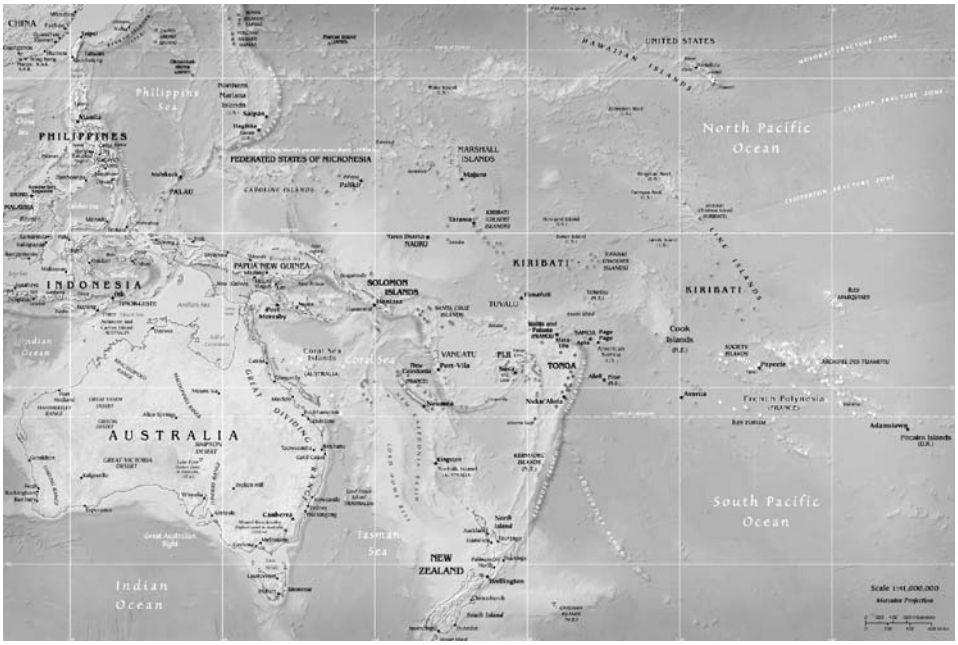

Figure 1

Polynesia," in *Human Impacts on Ancient Marine Ecosystems: A Global Perspective*, ed. T.C. Rick and J.M. Erlandson (Berkeley: University of California Press, 2008); J.M. Erlandson and T.C. Rick, "Archaeology Meets Marine Ecology: The Antiquity of Maritime Cultures and Human Impact on Marine Fisheries," *Annual review of Marine Science* 2 (2010); A.E. Morrison and T.L. Hunt, "Human Impacts on the Nearshore Environment: An Archaeological Case Study from Kauai'i, Hawaiian Islands," *Pacific Science* 61 (2007).

4 M.A. Mannino and K.D. Thomas, "Depletion of a Resource? The Impact of Prehistoric Human Foraging on Intertidal Mollusk Communities and its Significance for Human Settlement, Mobility and Dispersal," *World Archaeology* 33 (2002); K. Szabó and J.R. Amesbury, "Molluscs in a World of Islands: The use of Shellfish as a Food Resource in the Tropical Island Asia-Pacific Region," *Quaternary International* 239 (2011).

5 P.V. Kirch, *The Lapita Peoples: Ancestors of the Oceanic World* (Oxford: Blackwell, 1997).

6 D. Kennett, A. Anderson, and B. Winterhalder, "The Ideal Free Distribution, Food Production, and the Colonization of Oceania," in *Behavioral Ecology and the Transition to Agriculture*, ed. D. Kennett and B. Winterhalder (Berkeley: University of California Press, 2006).

7 P.V. Kirch, *On the Road of the Winds: An Archaeological History of the Pacific Islands before European Contact* (Berkeley: University of California Press, 2000,) 181.

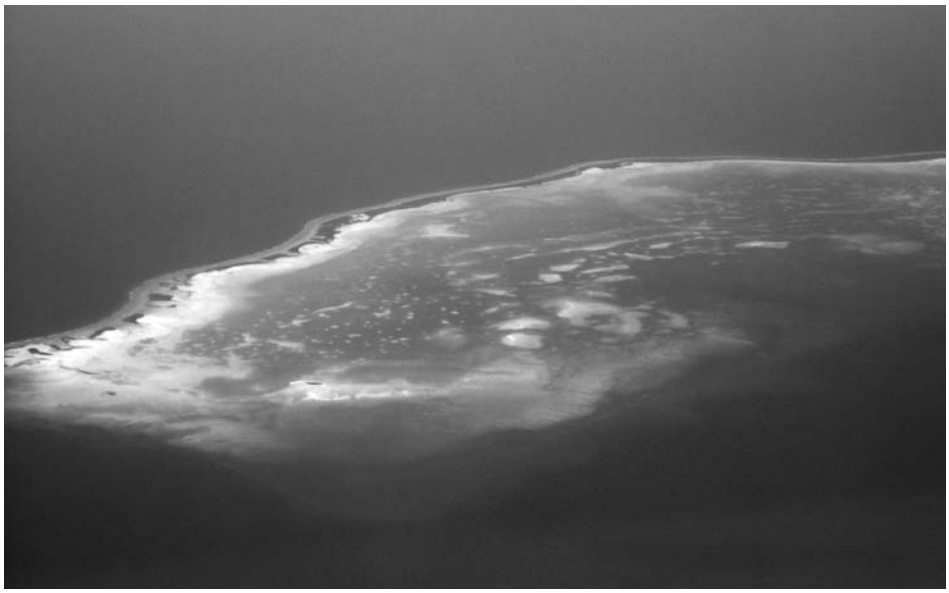

Figure 2

Low coral islands best exemplify the close links between marine and terrestrial ecosystems. As islands formed by biogenic agents (unconsolidated carbonate sediments deposited by waves on reef platforms), atolls and table reefs can be regarded as especially constraining habitats for human existence. The challenges faced by people, both past and present, include low soil fertility, absence of perennial surface fresh water, and extreme vulnerability to flooding by storm surge because of low elevation of the highly fragmented landmass, only a few meters above mean sea-level.[8] There are some 300 atolls and low coral islands in the Pacific Islands region and many more individual islets. Several archipelagoes are dominated by these limestone islands, such as the Tuamotu, Tuvalu, the Marshall Islands, and Kiribati, and their vulnerability to environmental disturbance is well known.[9] Kiribati (Gilbert Islands Group or western Kiribati) and the Marshall Islands have produced some of the earliest dates for the human colonization of eastern Micronesia, about 2,000 years ago coinciding with the post-mid-Holocene drawdown in sea-level, which resulted in the atolls and table reefs to become emergent and habitable.[10]

3. FOOD PRODUCTION

Once coral islands became suitable for human habitation, colonists continued to face several challenges, notably in setting up a viable subsistence base given low soil fertility and in some cases insufficient rainfall. The range of food crops that could sustain people on low coral islands was limited compared to what could be grown on the more fertile volcanic islands. Nevertheless, coral island societies

[8] J. Liew, "Sustainable Development and Environmental Management of Atolls," in *Sustainable Development and Environmental Management of Small Islands*, ed. W. Beller, P. d'Ayala, and P. Hein (Paris and Park Ridge, NJ: UNESCO and Parthenon Press, 1990).

[9] A. Alling et al., "Catastrophic Coral Mortality in the Remote Central Pacific Ocean: Kirabati [sic] Phoenix Islands," *Atoll Research Bulletin* 551 (2007); J. Barnett and N. Adger, "Climate Dangers and Atoll Countries," *Climate Change* 61 (2003).

[10] S.J. Barry, P.J. Cowell, and C.D. Woodroffe, "A Morphodynamic Model of Reef-island Development on Atolls," *Sedimentary Geology* 197 (2007); M.T. Carson, "Austronesian Migrations and Developments in Micronesia," *Journal of Austronesian Studies* 4, no. 1 (2013); A. Di Piazza, "Te Bakoa. Two Old Earth Ovens from Nikunau Island (Republic of Kiribati)," *Archaeology in Oceania* 34 (1999); W.R. Dickinson, "Impact of Mi-Holocene Hydro-Isostatic Highstand in Regional Sea Level on Habitability of Islands of Pacific Oceania," *Journal of Coastal Research* 19 (2003); W.R. Dickinson, "Beach Ridges as Favored Locales for Human Settlement on Pacific Islands," *Geoarchaeology* 29 (2014); M. I. Weisler, H. Yamano, and Q. Hua, "A Multidisciplinary Approach for Dating Human Colonization of Pacific Atolls," *Journal of Island and Coastal Archaeology* 7 (2012); C.D. Woodroffe and R.J. Morrison, "Reef-island Accretion and Soil Development on Makin, Kiribati, Central Pacific," *Catena* 44 (2001); C.D. Woodroffe, B. Samosorn, Q. Hua, and D.E. Dart, "Incremental Accretion of a Sandy Reef Island over the Past 3000 Years Indicated by Component-specific Radiocarbon Dating," *Geophysical Research Letters* 34 (2007).

Figure 3

devised various strategies that took full advantage of edible wild resources, including abundant marine life, in addition to foods that were successfully introduced.[11]

Pits excavated down to the brackish water lens for the cultivation of giant swamp taro (*Cyrstosperma chamissonis*) are among the most outstanding features of the landscape, particularly on the wetter islands (Figure 3). In Kiribati, over 20 cultivars have been identified, with some varieties grown mainly for prestige and ceremonies. Swamp taro cultivation entails a sophisticated system of mulching and fertilization using leaves from a variety of trees. Pits were commonly excavated in the middle of islets where the lens is thicker. Some of the pits were lined with coral boulders to stabilize the walls. Those who still practice this form of food production have their own secret techniques of composting.

Taro pit cultivation has witnessed a general decline for variety of reasons, including damage by historically-introduced pigs, crop disease, tropical storms, growing dependence on food imports, and increasing salinization of the water table associated with global warming and sea-level rise.[12] Given the dynamic nature of atoll geomorphology, anthropogenic traces on the landscape can easily be obliterated unless located well inland, such as swamp taro pits and associated mounds.[13] Excavation and dating of ancient surface soils under taro pit spoil dirt in adjacent mounds yielded evidence of early land clearing.[14] Accordingly, the oldest dates for human occupation usually will be found in association with landscape alteration. One of the first tasks that colonists needed to perform was to clear vegetation in preparation for taro pit digging, because corms (swollen underground plant stems) can take nine months to several years to mature.[15]

Coral island societies relied heavily on tree crops, such as breadfruit, pandanus, and coconut, to meet dietary needs and provide material for a host of products.[16] Agroforestry (Figure 4) is a distinguishing

[11] G. Clark, "Micronesia," in *Early Human Expansion and Innovation in the Pacific: Thematic Study*, co-ordinator I. Lilley (Paris: International Council on Monuments and Sites – ICOMOS, 2010).

[12] F.R. Thomas, "Kiribati: 'Some Aspects of Human Ecology', Forty Years Later," *Atoll Research Bulletin* 501 (2003).

[13] P. Webb and P.S. Kench, "The Dynamic Response of Reef Islands to Sea-level Rise: Evidence from Multi-decadal Analysis of Island Change in the Central Pacific," *Global and Planetary Change* 72 (2010); H. Yamano, H. Kayanne, F. Matsuda, and Y. Tsuji, "Lagoonal Facies, Ages, and Sedimentation in Three Atolls in the Pacific," *Marine Geology* 185 (2002).

[14] M. I. Weisler, "The Antiquity of Aroid Pit Agriculture and Significance of Buried A Horizons on Pacific Atolls," *Geoarchaeology* 14 (1999).

[15] F.R. Thomas and M. Horrocks, "'Sustainability Archaeology' and Landscape Transformation in Eastern Micronesia: Kiribati Case Study," (In prep).

[16] R.R. Thaman, "Kiribati Agroforestry: Trees, People, and the Atoll Environment," *Atoll Research Bulletin* 333 (1990).

Figure 4

characteristic of the earliest agriculture in the Pacific Islands and is still an important component of contemporary atoll landscapes, even in urbanized settings in houseyard and urban gardens. In addition, food preservation technology reached its zenith on coral islands, as people developed ways to process certain foods that they could last through periods of scarcity and for use as sea rations among communities that regularly traveled between islands . Fermented breadfruit, dried pandanus paste, and dried arrowroot starch could be stored for years.[17]

As most of Kiribati and the northern Marshall Islands are located in the dry belt of the equatorial oceanic zone, periods of drought are common. The usual way of accessing water was through the digging of wells, but water was also collected from coconut palm fronds and trunks, as well as empty giant clam shells. Coconut water and toddy (coconut sap) could provide additional nutrients.

4. MARINE RESOURCES

If opportunities for agricultural intensification in the past were limited, the lagoons generally teemed with fish and other marine organisms, providing food as well as raw material (fish bone, shells, coral) for the manufacture of tools and ornaments.[18] Fishponds and fish traps made from loosely built walls of coral boulders were extensively used prior to European contact (Figure 5).[19] What is less clear, however, is the extent of human impact on the marine environment. Elsewhere in Oceania, there is evidence that overfishing by indigenous communities resulted in a decrease in the average size of available resources, particularly of shellfish, that can be distinguished from the effects of natural disturbance.[20]

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17 M. Merlin et al., *Keinikkan Im Maḷan Aelõń Kein: Plants and Environments of the Marshall Islands* (Honolulu: East-West Center, 1997).

18 G. Koch, *The Material Culture of Kiribati* (Suva: Institute of Pacific Studies, University of the South Pacific, 1986); B.G. Moir, *Mariculture and Material Culture on Takuu Atoll* (PhD diss., University of Hawai'i, Ann Arbor: University Microfilms International, 1989).

19 F. Dieudonne, *The Pacific Islands and the Sea: 350 Years of Reporting on Royal Fishponds, Coral Reefs and Ancient Fish Weirs in Oceania* (Encinitas, CA: Neptune House, 2002).

20 M.S. Allen, "Resolving Long-Term Change in Polynesian Marine Fisheries," *Asian Perspectives* 41 (2002); Allen, M.S., "Human Impact on Pacific Nearshore Marine Ecosystems," in *Pacific Archaeology: Assessments and Prospects*, ed. C. Sand (Nouméa: Département d'Archéologie, Service des Musées et du Patrimoine de Nouvelle Calédonie, 2003); D.H.R. Spennemann, "Availability of Shellfish Resources on Prehistoric Tongatapu, Tonga: effects of Human Predation and Changing Environment." *Archaeology of Oceania* 22 (1987).

Figure 5

While marine losses have not been widely reported from coral islands and the chronology of some documented losses remains uncertain,[21] the very high ratio of reef to land would have ensured abundant protein resources, with little noticeable impact by human communities that remained generally small. However, resident human populations might have had a noticeable effect on less mobile organisms, such as certain shellfish. It has been suggested that people on Utrōk Atoll in the northern Marshall Islands may have extirpated the Bullmouth helmet shell (*Cypraecassis rufa*) sometime in the past. However, the presence or absence of marine species in a particular habitat is largely determined by chaotic or unpredictable recruiting of juvenile organisms that shape the structure of reef assemblages over time.[22] This is not to deny that some species, by virtue of biological, ecological, and behavioral attributes, display levels of resilience to human exploitation.[23] Less resilient organisms, like the giant clam, *Tridacna gigas* in the Marianas, New Caledonia, and Fiji disappeared presumably because of being overexploited.[24] Along with other members of the *Tridacna* family, this species is considered vulnerable to gathering pressure, even when using traditional gathering methods.

5. COPING WITH ENVIRONMENTAL STRESS

Environmental stress can be reduced by the use of social capital. Land tenure systems and kinship networks enabled people living on coral islands to maximize choice of residence and group affiliation to access resources. In reference to the Marshall Islands, Hart[25] highlighted the underlying collective effort required to ensure survival, as illustrated by strong mutual social obligations. This framework could be regarded as a prerequisite for effective resource management.

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21 J. Drew, C. Philipp, and M.W. Westneat, "Shark Tooth Weapons from the 19th Century Reflect Shifting Baselines in Central Pacific Predator Assembles," *PLOS One* 8 (2013); D.W. Steadman, "Extinction of Birds in Eastern Polynesia: A Review of the Record and Comparisons with other Pacific Island Groups," *Journal of Archaeological Science* 16 (1989); F.R. Thomas, *Archaeological Survey of Wōtto Atoll* (Majuro, Marshall Islands: HPO Report 2004/01, Republic of the Marshall Islands Historic Preservation Office, 2004).

22 G. Paulay, "Benthic Ecology and Biota of Tarawa Lagoon: Influence of Equatorial Upwelling, Circulation, and Human Harvest," *Atoll Research Bulletin* 487 (2001).

23 C.P. Catterall and I. Poiner, "The Potential Impact of Human Gathering on Shellfish Populations, with Reference to some NE Australian Intertidal Flats," *Oikos* 50 (1987); I. Poiner and C.P. Catterall, "The Effects of Traditional Gathering on Populations of the Marine Gastropod *Strombus luhuanus* linne [sic] 1758, in Southern Papua New Guinea," *Oecologia* 76 (1988).

24 J.L. Munro, "Fisheries for Giant Clams (Tridanidae: Bivalvia) and Prospects for Stock Enhancement," in *Marine Invertebrate Fisheries: Their Assessment and Management*, ed. J.F. Caddy (New York: John Wiley & Sons, 1989).

25 K. Hart, *Sung for Anidreb: A Brief History of the Marshall Islands* (Majuro, Marshall Islands: Equatorial Publishing, 1998).

Land tenure systems developed to safeguard terrestrial production among kin groups, while being flexible enough to enable neighboring communities to access resources in time of need. Various cooperative strategies ensured that people could claim rights to resources, made possible, for example, by adoption and intermarriage, trade, and sometimes cyclical migrations to alleviate problems of over- and under-population, thus contributing to sustainable practices.[26] Despite their abundance on most atolls, marine resources were at times subjected to avoidance practices, which would have enabled stocks to recover.[27] For example, the concept of *mo* (taboo) in the Marshall Islands still applies within some inhabited and uninhabited atolls where large bird colonies live and turtle nesting is known. By chiefly decree, northern atolls lacking sufficient rainfall to support permanent human settlement were designated as 'game reserves' to be exploited at certain times only and in an orderly and ritualized way.[28] These atolls have also retained much of their original flora, however sparse.[29]

On small marginal islands, the need to devise strategies for managing population growth may have arisen quickly, so as not to outstrip resources.[30] Warfare, cannibalism, infanticide, and abortion may contribute to population regulation, but there were also non-destructive means such as ritual celibacy, prolonged lactation, and adoption as an alternative to ensuring continuity of the family line. However, it may be that in some instances under-population was a more serious threat to community survival than population pressure.[31] Initially at least, relatively large families and clans would be necessary to ensure adequate levels of resource production.[32] Populations responded to the vagaries of environmental perturbation in a most successful way:

The atoll populations used flexible social processes for the control of fertility and rates of reproduction; they actively managed recovery from the demographic challenges of contingency events and ensured their continuity as atoll populations occupying enduring settlements.[33]

While European- introduced diseases between 1850 and 1900 contributed to population decline in Kiribati, the Marshall Islands, and other several other localities because of the inhabitants' relative epidemiological isolation, depopulation also followed in the wake of Western-induced labor migrations during the same time period to various other Pacific Islands and beyond to work on plantations and mines. Another important cause of depopulation was inter-group warfare encouraged by political, economic, and religious rivalries, with the establishment of external trade and missionary influence.[34]

Interisland contacts would confer advantages in the event of demographic instability and shortages in food and raw materials as a result of environmental perturbation, such as that caused by drought or cyclones.[35] Because of their marginality for human existence, coral islands occupy a prominent posi-

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[26] W.H. Alkire, *Coral Islanders* (Arlington Heights, IL: Ahm, 1978); I. Ushijima, "A Reinterpretation of the *Sawai* Overseas Exchange System of the Caroline Islands," in *Cultural Adaptation to Atolls in Micronesia and West Polynesia: A Report of the Cultural Anthropological Research in Caroline, Marshall and Ellice Islands*, ed. E. Ishikawa (Tokyo: Committee for Micronesian Research 1985, Tokyo Metropolitan University, 1987).

[27] T. Akimichi, "Conservation of the Sea: Satawal, Micronesia," in *Traditional Fishing in the Pacific: Ethnographical and Archaeological Papers from the 15th Pacific Science Congress*, ed. A. Anderson (Honolulu: Pacific Anthropological Records No. 37, B.P. Bishop Museum, 1986); G.A. Klee, "Oceania," in *World Systems of Traditional Resource Management*, ed. G.A. Klee (New York: John Wiley & Sons, 1985).

[28] M. Merlin et al., *Keinikkan Im Meļan Aelōń Kein: Plants and Environments of the Marshall* Islands (Honolulu: East-West Center, 1997).

[29] F.R. Fosberg, "A Review of the Natural History of the Marshall Islands," *Atoll Research* Bulletin 330 (1990).

[30] R. Bedford and B. Macdonald, "The Population of Kiribati: A Review of some Myths about Migration and Depopulation" (Unpublished paper, Department of Geography, University of Canterbury, Christchurch, 1982).

[31] N. McArthur, I.W. Saunders, and R.L. Tweedie, "Small Population Isolates: A Micro-Simulation Study," *Journal of the Polynesian Society* 85 (1976)

[32] J.D. Nason, "The Strength of the land: Community Perception of Population on Etal Atoll," in *Pacific Atoll Populations*, ed. V. Carroll (Honolulu: University Press of Hawai'i, 1975).

[33] V.J. Green and R.C. Green, "An Accent on Atolls in Approaches to Population Histories of Remote Oceania," in *The Growth and Collapse of Pacific Island Societies*, ed. P.V. Kirch and J-L. Rallu (Honolulu: University of Hawai'i Press, 2007), 253.

[34] F.X. Hezel, *The First Taint of Civilization: A History of the Marshall Islands in Pre-colonial Days 1521-1885* (Honolulu: University of Hawai'i Press, 1983); H.C. Maude and H.E. Maude, "Tioba and the Tabiteuean Wars," *Journal of the Polynesian Society* 90 (1981).

[35] T.L. Hunt and M.W. Graves, "Some Methodological Issues of Exchange in Oceanic prehistory," *Asian Perspectives* 29 (1990).

tion in discussions centered on exchanges. Atolls may be connected to 'high' volcanic islands,[36] but in the absence of the latter, elaborate internal networks were established.[37] These networks functioned to distribute resources between coral islands that differed in terms of productivity, both terrestrial and marine.[38] These differences were linked to variation in rainfall, and also to intra- and inter-islet size, as well as the degree of lagoon closure, shape, and depth.

As with other coral island groups, populations in the Marshall Islands were linked by inter-community support networks, which were adaptive in light of latitudinal variation in rainfall, resulting in differential production of foodstuffs between the dry north and the wetter south and the risk of cyclone damage, prompting Marshallese chiefs to secure land holdings scattered over several islets of the same atoll, as well as land rights to resources on other atolls.[39] Inter-island links in the Gilbert Islands formed smaller regional network clusters.[40]

6. HISTORICAL ECOLOGY

In recent years, historical ecology has emerged as one of the most useful and comprehensive approaches to understanding how environments and landscapes were affected by climate change, early human settlement, historical interactions, and modern development and industrialization.[41] This approach, which combines the natural and social sciences using paleoecology, archaeology, land use history, and long-term ecological research, has potential for examining natural and cultural phenomena that generated changes to island ecosystems.[42]

Compared to 'high' volcanic islands, atolls and table reefs have received scant attention from archaeologists focusing on historical ecology. More specifically, little is known about paleoclimatology, the introduction of exotic fauna, the extent of human-induced environmental impacts, and social transformations on low coral islands prior to Western contact.[43] Given the unique environmental challenges posed by coral islands, it is all the more surprising that pre-European ecological research has been largely neglected. By contrast, the last two decades have witnessed a host of environmental studies, from sea-level rise to contemporary human impact on terrestrial and marine ecosystems.[44] As noted above, a number of studies have looked at the long-term effects of human exploitation and environmental change on fish, invertebrate, and sea mammal populations, resulting in declines in species diversity and reduction in

[36] W.H. Alkire, *Coral Islanders* (Arlington Heights, IL: Ahm, 1978).

[37] A. Grimble, *Migration, Myth and magic from the Gilbert Islands* (London: Routledge and K. Paul, 1972); I. Williamson and M.D. Sabath, "Small Population Instability and Island settlement Patterns," *Human Ecology* 12 (1984).

[38] I. Williamson and M.D. Sabath, "Island Population, Land Area, and Climate: A Case Study of the Marshall Islands," *Human Ecology* 10 (1982).

[39] D.H.R. Spennemann, "Freshwater Lens, Settlement Patterns, Resource Use and Connectivity in the Marshall Islands," *Transforming Cultures eJournal* 1, no. 2 (2006).

[40] W.H. Alkire, *Coral Islanders* (Arlington Heights, IL: Ahm, 1978), 109.

[41] W. Balée, "The Research Program of Historical Ecology," *Annual Review of Anthropology* 35 (2006); S.M. Fitzpatrick and W.F. Keegan, "Human Impacts and Adaptation in the Caribbean Islands: An Historical Ecology Approach," *Earth and Environmental Science Transactions of the Royal Society of Edinburg* 98 (2007); R. Ono and D.J. Addison, "Historical Ecology and 600 Years of Fish Use on Atafu Atoll, Tokelau," in *Prehistoric Marine Resource Use in the Indo-Pacific Regions*, ed. R. Ono and D.J. Addison (Canberra: ANU E Press, 2013); T.C. Rick and J.M. Erlandson (eds.), *Human Impacts on Ancient Marine Environments: A Global Perspective* (Berkeley: University of California Press, 2008); E.W.B. Russel, *People and the Land through Time: Linking Ecology and History* (New Haven: Yale University Press, 1997).

[42] S.M. Fitzpatrick and M. Intoh, "Introduction: Archaeology and Historical ecology in the Pacific Basin," *Pacific Science* 63 (2009); P.V. Kirch and T.L. Hunt, ed. *Historical Ecology in the Pacific Islands: Prehistoric Environmental and Landscape Change* (New Haven: Yale University Press, 1997).

[43] M.S. Allen, "New Ideas about Late Holocene Climate Variability in the Central Pacific," *Current Anthropology* 47 (2006); A. Anderson, "The Rat and the Octopus: Initial Colonization and the Prehistoric Introduction of Domestic Animals to Remote Oceania," *Biological Invasions* 11 (2006); G.K. Pregill and M.I. Weisler, "Lizards from Prehistoric Sites on Ebon Atoll, Marshall Islands," *Micronesica* 39 (2007); J.P.D. Sachs et al., "Southward Movement of the Pacific Intertropical Zone 1400-1850," *Nature Geoscience* 2 (2009).

[44] F.R. Thomas, "Kiribati: 'Some Aspects of Human Ecology', Forty Years Later," *Atoll Research Bulletin* 501 (2003).

average age and size.[45] It is possible that low coral island societies were more acutely aware of resource limitations than communities on larger 'high' islands, and thus realized early on the need to conserve resources.[46] This assumption needs to be critically examined. Optimal foraging models derived from human behavioral ecology[47] have been very useful in distinguishing conservation behavior *per se* (conservation by design) from its effects.[48]

7. CONCLUSIONS

Because of their small size, limited and at times fluctuating resources, and relative isolation, low coral islands are of interest for evaluating aspects of past human adaptation to challenging environments. Much remains to be learned regarding their cultural transformation to sustainability before European contact. What stands out is that several communities were able to live sustainably through the interaction of factors such as relatively small populations, low impact technology, efficient use of resources via the application of specialized agricultural techniques and fishing methods and an understanding of environmental cues and fluctuations, and conservation practices (both intentional or by design such as the presumed deliberate extirpation of resource-competing pigs and unintentional as illustrated by optimal foraging strategies).[49]

In a general sense, it can be argued that islands, and especially low coral islands, are microcosms of larger, but equally fragile environments.[50] From some of the volcanic islands in the Pacific, archaeologists have uncovered evidence for extensive landscape change resulting from vegetation clearing, soil erosion, and species extinction. Debate continues regarding the role of humans versus climatic factors as the leading cause for these changes, but it is reasonable to assume that human impact on the environment exacerbated in some cases the effects of natural disasters, sometimes resulting in major social disruption. More data are needed to evaluate the degree and main causative agent of environmental change in low coral island settings.

The interlinked topics of 'sustainability' archaeology, historical ecology, and conservation[51] highlight the many challenges faced by contemporary Pacific island communities as they attempt to cope with changing environments, economies, and social values, which more than ever pose a threat to sustainable livelihoods. While the past, as documented through historical ecology, can provide some of the knowledge and tools for sustainable livelihoods, we also need to be critical of the effectiveness of traditional coping strategies under new conditions of growing population, altered land- and seascapes, escalating

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45 M.S. Allen, "Human Impacts on Pacific Nearshore Ecosystems," in *Pacific Archaeology: Assessments and Prospects*, ed. C. Sand (Nouméa: Département d'Archéologie, Service des Musées et du Patrimoine de Nouvelle Calédonie, 2003).

46 C. Wilson, Kiribati: *State of the Environment Report* (Apia, Samoa: Pacific Environment Programme, 1994;) L.P. Zann, "Traditional Management and Conservation of Fisheries in Kiribati and Tuvalu Atolls," in *The Traditional Knowledge and Management of Coastal Systems in Asia and the Pacific* , K. Ruddle and R. Johannes (Jakarta: UNESCO/Regional Office for Science and Technology for Southeast Asia, 1985).

47 H. Kaplan and K. Hill, "The Evolutionary Ecology of Food Acquisition', in *Evolutionary Ecology and Human Behavior*, ed. E.A. Smith and B, Winterhalder (New York: Aldine de Gruyter, 1992).

48 M.S. Alvard, "Testing the 'Ecologically Noble Savage' Hypothesis: interspecific Prey Choice by Piro Hunters of Amazonian Peru," *Human Ecology* 21 (1993).

49 C.M. Giovas, "No Pig Atoll: Island Biogeography and the Extirpation of a Polynesian Domesticate," *Asian* Perspectives 45 (2006); F.R. Thomas, "Shellfish Gathering and Conservation on Low Coral Islands: Kiribati Perspectives," *Journal of Island and Coastal Archaeology* 9 (2014).

50 P.V. Kirch, "Oceanic Islands: Microcosms of 'Global Change'," in *The Archaeology of Global Change: the Impact of Humans on their Environment*, ed. C.L. Redman, S.R. James, P.R. Fish, and J.D. Rogers (Washington, D.C.: Smithsonian Books, 2004).

51 S. van der Leeuw and C.L. Redman, "Placing Archaeology at the Center of Socio-Natural Studies," *American Antiquity* 67 (2002); R.L. Lyman and K.P. Cannon, ed. *Zooarchaeology and Conservation Biology* (Salt Lake City: University of Utah Press, 2004); D.L. Hardesty, "Perspectives on Global Change Archaeology," *American Anthropologist* 109 (2007); P.V. Kirch, "Archaeology and Global Change: The Holocene Record," *Annual Review of Environment and Resources* 30 (2005); F.R. Thomas, "The Value of Historical ecology in Planning for Sustainable Livelihoods: Kiribati Case Study," *Journal of Pacific Studies* 32 (2012).

Figure 6

climate-related hazards, and changes in community and individual needs.[52] Surely, adjustments will have to be made to assist in developing long-term ecologically secure approaches to survival. For example, ethnographic data, primarily collected during the first half of the 20th century, confirmed the existence of traditional fishing regulations in the form of taboos with attendant secular and supernatural sanctions, and more recently some rural villages and local councils have limited access to certain fishing grounds.[53] Reviving conservation practices could be quite challenging nowadays in a transformed natural and social environment.[54] Hope remains, however, with approaches that can strengthen the resilience of communities and their ecosystems for both sustainable development and climate change adaptation.[55] The persistence of some conservation practices, albeit on a small scale, is illustrated on outer islands in Kiribati in the form of aquaculture of giant clam and cockle species, representing the live storage of animal meat, in enclosures demarcated by coral cobbles (Figures 6 & 7).

We should moreover look at *culture* as a vital link between past, present, and future. Several low coral communities were successful in achieving sustainability for centuries, and their accomplishments deserve to be recognized and celebrated. Knowledge and practices are dynamic, just as cultures are. Culture on low coral islands and elsewhere in the Pacific islands region is still firmly rooted in community obligations. Kin- and community-related activities can reduce risk and uncertainty. Reciprocity as embodied in the Kiribati concept of *bubuti*, a request that cannot be refused, best exemplifies the close ties between people living in a challenging physical environment. As the anthropologist Tony Whincup remarked 'the integration of people and place' for *I-Kiribati* (the people of Kiribati) has indeed become an imperative of survival.[56] An integrated understanding of land- and seascapes for sustainable livelihoods is strongly

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[52] F.R. Thomas, "Successes and Failures on Atolls: A Review of Prehistoric Adaptation and Contemporary Lessons," in *Culture and environment: A Fragile Coexistence*, ed. R.W. Jamieson, S. Abonyi, and N.A. Mirau (Calgary: Archaeological Association, University of Calgary, 1993); J. Overton, "A Future in the Past? Seeking Sustainable Agriculture," in *Strategies for Sustainable Development: Experiences from the Pacific*, ed. J. Overton and R. Scheyvens (London: Zed books, 1999); F.R. Beardsley, "Restoration of Traditional Knowledge to Enhance Self-sufficiency," *Micronesian Journal of the Humanities and Social Sciences* 5 (2006); P. Nuttall, A. Newell, B. Prasad, J. Veitayaki, and E. Holland, "A Review of Sustainable Sea-transport for Oceania: Providing Content for Renewable Energy Shipping for the Pacific," *Marine Policy* 43 (2014).

[53] R.E. Johannes and B. Yeeting, "I-Kiribati Knowledge and Management of Tarawa's Lagoon Resources," *Atoll Research Bulletin* 489 (2001).

[54] F.R. Thomas, "Remodeling Marine Tenure on the Atolls: A Case Study from Western Kiribati, Micronesia," *Human Ecology* 29 (2001).

[55] D. Storey and S. Hunter, "Kiribati: An Environmental 'Perfect Storm', "*Australian Geographer* 41 (2010).

[56] T. Whincup, "*Te Wa:* The Traditional Canoe of Kiribati," http://www.spasifikmag.com/freetravelarticletewaphotoessay/ (accessed on 2 November 2010).

Figure 7

linked to a *sense of place*. Historical ecology has often documented the transformation of *place*, whose custodians today, the local communities, will need to take on an increasingly active role to manage their biocultural world successfully.

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SAŽETAK

Niski koraljni otoci u Pacifiku često se doživljavaju kao marginalna staništa za naseljavanje ljudi. Ovakav stav dolazi zbog malih i fragmentiranih komadića kopna, otočića sa siromašnim tlom, nedostatkom trajne površinske vode za piće i ekstremne izloženosti poplavama od olujnih valova, a u novije vrijeme i dizanja razine oceana zbog globalnog zatopljenja. Atoli i niski, ravni grebeni otočnih državica Kiribati i Maršalovo otočje imaju povijest nekih od najranijih naseljavanja ljudi istočne Mikronezije. Održivost u posljednjih dvije tisuće godina bila je vjerojatno posljedica relativno slabe gustoće stanovništva, ekstraktivnih tehnologija malog utjecaja i učinkovitog korištenja ograničenih resursa, kao i primjena ciljanih ali i nenamjernih postupaka zaštite prirode.

HISTORY AND ENVIRONMENTAL CRISIS

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Summary

The earth has existed for 4.54 billion years; biologically modern humans have been around for only 200,000 years. 99.9% of the entire time earth has existed, it existed without modern humans. In the mere 200 years of industrialized capitalism our species has developed into a threat to the life-sustaining systems of our planet. Writing law and forming governing institutions adequate to confront this crisis is a daunting task that demands international legal regimes based in an emergent theory of human species-governance that acknowledges the rights of the living earth. This essay examines how existing environmental governance is plagued by weaknesses and co-opted by neo-liberalism. A number of environmentally dedicated individuals have charted pathways forward, but we do not yet have a coherent edifice of policy and practices that will solve the environmental crisis. The promising emergent link between environmental law and human rights requires leverage from a richer conceptualization of the environment to deliver effective environmental governance. The difficult task ahead of us is to develop law that recognizes the rights of evolved life on earth and that vests humans with the responsibility to respect and protect the evolved world.

Key Words: climate change, environment, crisis, human rights, globalization, UNFCC, law, governance, pacha mama, right to nature, adaptation, eco-cosmology

Ključne riječi: klimatske promjene, okoliš, kriza, ljudska prava, globalizacija, UN Konvencija o klimatskim promjenama (UNFCC), zakon, upravljanje, Majka Zemlja (pachamama), pravo na prirodu, prilagodba, eko-kozmologija

We have grown accustomed to the hue and cry about global warming and, as a global society, mostly find it rather too difficult to do much about it. However, this does not mean that there is not an environmental crisis afoot. Like so many other contemporary troubles—the war in Afghanistan, chronic and global violence against women, continued leaking of radiation from the Fukushima nuclear reactors—specialists labor to make headway while most of us continue on with our lives.

The essay took form first as an extended review of several books that had been chosen due to the academic prominence of their authors and their timeliness in addressing environmental law and governance. Lawyers are trained to think within the highly structured matrices of the law, and their writing usually reflects these constraints. My perspective as a historian and as a lawyer, however, illuminated the edges of the legal texts, so that taking account of what was beyond those edges— the forces and assumptions that shaped the legal discussions— took on an importance of its own. Hence the essay developed into a wider assessment of the contemporary environmental crisis and law, and an appraisal of the failure of governance to address both climate change and this broader environmental crisis.[1] Governance and glo-

[1] The books under review included, Donald K. Anton and Dinah L. Shelton, *Environmental Protection and Human Rights* (New York: Cambridge University Press, 2012); Frank Biermann and Philipp Pattberg, eds., *Global Environmental Governance Reconsidered* (Cambridge, MA: MIT Press, 2012); David R. Boyd, *The Environmental Rights Revolution: A Global Study of*

bal governance here both refer to the laws that are written, enacted and (perhaps only partially) enforced to constrain behaviors and structure human endeavors. Bear in mind that the focus throughout this essay is on environmental law and law-based governance, and how this law is meeting— or failing to meet— the challenges of the present environmental crisis. The sophistication of environmental philosophy and social theory falls outside the grasp of law. Indeed, we shall see how law has remained largely wedded to an under theorized and deeply instrumental understanding of the environment.

This essay considers various legal solutions to the contemporary environmental crisis. The most ambitious proposal, as for example advanced by Frank Biermann and Philipp Pattberg in *Global Environmental Governance Reconsidered,* is to create a World Environmental Organization.[2] In the absence of such a global governing body, some legal scholars advocate assimilating environmental rights to fundamental human rights. Such is the solution presented, for example, in Donald Anton and Dinah Shelton's teaching-tome, *Environmental Protection and Human Rights* and in David Boyd's *Environmental Rights Revolution*.

The philosophical question of humanity's relation to the environment subtends the association between environmental protection and human rights, and we shall see how associating environmental rights to human rights draws on a conventional, largely unexamined, concept of the environment.[3] What is meant by the term »environment« is infrequently considered in legal texts, and the paucity of thought given to this itself is indicative of the subordinated status of the environment. It seems that in law, the »environment« usually means that which is not the primary focus. Neither the subject (the active agent), nor the object (the valuable product), it is what merely surrounds or is left-over in the wake of human activity. The environment is a type of under-recognized, under-theorized, remainder category and its relative low status in law can in some part be attributed to this. Law, in this respect, has failed to integrate more sophisticated understandings of humanity in relation to the living world. This might finally change in response to the specter of climate change as it haunts our global society, forcing upon us a new awareness of humanity's place in deep time.[4] Reorienting our sense of humanity within the scale of geological and cosmological time entails profound cultural, ethical, and governance implications. These are beginning to be acknowledged, and have found some tentative expression in law and governance.[5] However, as this essay demonstrates, environmental law and governance are largely wed to market thinking and neo-liberal development agendas. The environmental crisis, while surely belonging to the cycle of repetitive crises of late capitalism, also partakes of history on a cosmological scale.[6] More than the history

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Constitutions, Human Rights, and the Environment (Vancouver: University of British Columbia Press, 2012); Michael B. Gerrard and Katrina Fischer Kuh, eds., *The Law of Adaptation to Climate Change: U.S. and International Aspects*, (Washington, DC: American Bar Association, 2012); Al Gore, *The Future*, (New York: W.W. Norton, 2013).

2 Frank Biermann and Philipp Pattberg, eds., Global Environmental Governance Reconsidered (Cambridge, MA: MIT Press, 2012).

3 That this is so in texts devoted to law and empirical governance reflects that the sophisticated discussions in academe have failed to translate into practice. For just one example, contrast, the recognition of humanity's interconnection and entanglement with nature discussed in Timothy Morton, Ecological Thought (Cambridge, MA: Harvard University Press, 2010). The (limited) exception, as we shall see, is in a small sector of South America, where pacha mama has emerged into law.

4 Orientation toward deep time has, itself, a history. See, William L. Thomas, Lewis Mumford and Carl O. Sauer, Man's Role in Changing the Face of the Earth (Chicago: Chicago University Press, 1956). See also, Alice Bullard, Exile to Paradise (Palo Alto: Stanford University Press, 2000), 21-29.

5 Which is not say that there are not significant efforts to retheorize governance in response to the contemporary environmental crisis, see, notably, John Barry, The Politics of Actually Existing Unsustainability: Human Flourishing in a Climate-Changed, Carbon-Constrained World, (New York: Oxford University Press, 2012); David Bollier and Burns Weston, Green Governance: Ecological Survival, Human Rights and the Law of the Commons, (New York: Cambridge University Press, 2013); and Erika Cudworth and Stephen Hobden, Posthuman International Relations: Complexity, Ecologism and Global Politics (London: Zed Books, 2012).

6 On permanent crisis see, for example, Peter Redfield, »Doctors, Borders, and Life in Crisis, Cultural Anthropology, at 335-339; Stephen Morton, States of Emergency: Colonialism, Literature and the Law, (Liverpool: Liverpool University Press), and Bonnie Honig, Emergency Politics: Paradox, Law, Democracy, (Princeton: Princeton University Press, 2009). Honig takes Giorgio Agamben's theory of emergency and bare life into a newly productive direction, arguing that emergencies can be sources of new rights and new laws, and function as a type of everyday democratic negotiation. For Giorgio Agamben's rethinking of Carl Schmitt's theory of sovereignty in Political Theology (1922) and Walter Benjamin's eighth thesis on history see, Homo Sacer:

of capitalism, the history of evolved life is at stake, and an awakening of governance to this deep-time historical dimension is required.

Unless those who write the laws grapple with the deeper issues sketched in the preceding paragraph, law and governance are destined to remain handmaidens to market and development forces. Some commentators, such as Mark Maslin, have already consigned the governance of climate change to failure because efforts to date have failed to curb carbon emissions.[7] But even Maslin acknowledges the need to adapt, which, as we see in Michael Gerrard and Katrina Fischer Kuh's book, is a prominent strategy of climate change governance.[8] Adaptation is not an intellectually ambitious set of law and policies. As presented in the volume edited by Michael Gerrard and Katrina Fischer Kuh, adaptation to climate change demands relatively little in the way of intellectual or cultural innovation even as it entails enormous economic costs.[9] Moreover, no matter how great the failure of environmental governance, we will always-- to the point of our species extinction-- need to continue to strive to provide good governance. However, the daily hard-scrabble effort to earn a living, whether on the individual, national, or global level, often precludes environmental care-taking. In the aggregate, productivity and consumerism trump environmentalism. This truism—that productivity and consumerism trump environmentalism—illuminates the contemporary legal relation between humanity and the environment. Humanity dominates, resources serve, what is left over is the environment.

Moving beyond this instrumental relation to the environment is made more possible when we grasp the contemporary environmental crisis as an unparalleled moment in history. This is not just a crisis for specific countries, or a crisis of globalization. It is a crisis in cosmological history. Only by contemplating the vast expanse of time in which our anthropogenic environmental devastation is a tiny wisp of half of a moment, can we begin to comprehend the historical cusp of our present moment. This conviction that we must understand the environmental crisis within the perspective of deep, cosmological time recognizes that so far as we know, our very existence is an exceptional event. Taking perspective on Deep Time generates awe and fear. Awe is provoked by the unlikely treasure that is the evolved world as we know it. Fear arises from knowledge of our current unparalleled and acute assault on the evolved world. Deep time teaches us the fleetingness of our civilization and the momentousness of our environmental rapacity. It is a means of taking perspective and awakening to the present crisis.

1. DEEP TIME, THE NEAR FUTURE AND SPECIES GOVERNANCE

A deep time perspective on humanity's relationship to the environment allows us to cultivate an understanding of the magnitude of our natural inheritance and to recognize the importance of developing species governance. Our natural inheritance entails the unlikelihood and utter aloneness of our blue planet within known space, and the extent, therefore, of our duty to ensure we do not ruin this singular cosmological event nor that we deprive future generations of the plenitude of evolved life. In sum, thinking about the present in terms of deep time clarifies our perception of crisis and our sense of responsibil-

Sovereign Power and Bare Life, (1995), trans. by Daniel Heller Roazen (Palo Alto: Stanford University Press 1998). Assimilating climate change politics into national security protocol has powerful advocates, so that the climate crisis is cast in its essence as a national security crisis. See, e.g., Caitlin E. Werrell and Francesco Femia with Preface by Anne-Marie Slaughter, eds., The Arab Spring and Climate Change (Washington DC: Center for American Progress, February 2013), available at http://www.americanprogress.org/wp-content/uploads/2013/02/ClimateChangeArabSpring.pdf (accessed 3/20/13). Slaughter argues for a reformulation of foreign policy indicators in which climate change is recognized as producing a complicated set of stressors that can destabilize populations and undermine governmental order. The new foreign policy should cultivate 'soft' security factors such as human security, livelihood protection, and sustainable development and de-emphasize cold war 'hard' security factors (4). This augurs an increased emphasis on bio-politics in the international arena.

7 Mark Maslin, Global Warming: A Very Short Introduction (New York: Oxford University Press, 2008).

8 Michael B. Gerrard and Katrina Fischer Kuh, eds., The Law of Adaptation to Climate Change,: U.S. and International Aspects, (Washington DC: American Bar Association, 2012).

9 Michael B. Gerrard and Katrina Fischer Kuh, eds., *The Law of Adaptation to Climate Change: U.S. and International Aspects*, (WashingtonDC: American Bar Association, 2012).

ity. It does this because when we think of the present in terms of deep time we gain an understanding of the singular value of our natural inheritance.

Al Gore's *The Future* does an admirable job of bringing the current crisis into focus within a deep time spectrum.[10] Already in the Introduction Gore frames his book within deep time, describing an earth 4.5 billion years old, the emergence of life 3.8 billion years ago, the development of multicellular life 2.8 billion years ago, the appearance of primates 65 million years ago, and the probable extinction of the sun 7.5 billion years in the future. In anticipation of his corrective focus on deep time Gore comments that, the »amount of time we devote to these vast stretches of time in the past and future are often fleeting at best«.[11] However, humans are now conscious agents of evolution and a powerful force in geophysical events, the responsibilities incurred with these powers must be acknowledged and shouldered.[12]

The task of imagining human agency and human governance within deep time sometimes veers directly into dooms-day proclamations. For example, prominent biologists and ecologists have recently argued that population and economic pressures are pushing the earth to a planetary scale tipping point.[13] Gore is cautious of such end-days arguments, because he feels they are overused and thereby, like the boy who cried wolf, desensitize people to real dangers.[14] A tradition in Western thought of (social) scientific doomsday predictions runs from Thomas Malthus at the end of the eighteenth century at least through the 1972 publication of *Limits to Growth* by Donella Meadows.[15] In a deeply reasonable manner, Gore remains highly attuned to hedges, fresh possibilities, unexpected discoveries and technological innovations that, when they arise, will decisively alter what looks to be a scenario leading inevitably toward a disastrous tipping point.

Gore also proposes that if we are to understand humanity within the billions of years of cosmological time, or even if only within the comparatively narrow time of life on planet earth, this enjoins as well, for adequate historical perspective, that we consider the accelerating rate of historical change and what type of fore-shadowing of the future is perceptible. Deference to futurists such as Ray Kurzweil, Mitch Kapor and Peter Diamandis leads us to anticipate a world of implanted nano-computers that enhance a wide variety of human biological capacities and deeply seductive virtual realities such that today's humanity as it exists in (largely inattentive or instrumental) relation to the environment is dwarfed and nearly irrelevant.[16] We, the globalizing post-modern, will be shortly consigned to a historical relevance akin to that of the Neolithic era. We are currently in a period of »hyper-change,« which, Gore notes, »we have difficulty even perceiving and thinking clearly about«.[17] And yet, to live our current historical epoch responsibly and sustainably, we must try. This foray into deep past and near future aids the evocation of our precarious, pivotal present moment.

Commitment to redeeming or protecting the natural world will not, axiomatically, arise from the technological marvels that are surely on the horizon. This is a core thesis of Gore's *The Future*. Futurists and technophiles generally underestimate the irreducible need to govern wisely. Singularity University, the Silicon Valley futurist educational outpost, features genomics, robotics, Internet studies, energy and the environment, and nanotechnology, but does not feature governance. Conversely, Naomi Klein writ-

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[10] In emphasizing humanity in the context of deep time, Gore joins others such as Edward O. Wilson, In search of Nature, (Washington DC: Island Press, 1996), who wrote, »We need this longer view . . . not only to understand our species but more firmly to secure its future« x).

[11] Gore, The Future, p. XXX.

[12] Gore, The Future, p.209.

[13] See Anthony Barnosky et al., »Approaching a State Shift in Earth's Biosphere,« Nature June 7, 2012.

[14] Al Gore, The Future, p.144.

[15] Gore, The Future, p. 144.

[16] The most prominent futurist thinking is represented by Ray Kurzweil, The Singularity is Near: When Humans Transcend Biology, (New York: Viking Press, 2005) and Peter H. Diamandis with Steven Kotler, Abundance: The Future is Better than You Think (New York: The Free Press, 2012), see especially, pp.53-54. Gore discusses the singularity on 240-42. Larry Page, founder of Google, has asserted that in the near future »[Google] will be included in people's brains,« (see, Steven Levy, In the Plex: How Google Thinks, Works, and Shapes Our Lives (New York: Simon & Shuster, 2011, cited in Diamandis & Kotler, p.55).

[17] Gore, The Future, p.38.

ing about the prospect of a geo-engineering solution to climate change beat an old (if not worn out) drum when she claimed that it is the newness of the tech fix that is threatening because it would pass some imagined threshold separating humans from nature.[18] Hybrids have already long been with us.[19] Frankenstein – the bio-technological monster-- has haunted our civilization since 1818. What is to be feared and guarded against is the hubris of the technophiles who credulously believe that innovations, without good governance, will cure us of our environmental cravenness. The hyper-intelligent, nano-augmented humanity, for example, might merely pursue a hyper-technocratic way of living, a way of living in which virtual reality becomes that which matters most, and in which the living earth of billions of years of evolution is mostly irrelevant for the vast majority. The mere blink of an eye which is the industrial age could accomplish vast destruction of much of the eons of evolution.

Gore finds some grounds for optimism in the widespread access to the Internet, because of its democratization of learning and of public access to political speech. He lauds the internet-facilitated growth of the »world mind« as a counter-force to television, which he argues has been a tool of corporate oligarchy.[20] However, despite the promises of the future, Gore worries whether nanobot-augmented, Internet-internalized, bioengineered humans, will care.[21] He advocates for time-tested reason-based politics and for a plethora of policies designed to rein-in anti-democratic technologies, but he concedes that such reason-based politics will fail without leadership »that is based on the deepest human values«.[22]

These »deepest human values« that can save us from »developing« the earth to exhaustion are left unexplored by Gore. This is a major omission. Reason alone is inadequate to the task. The rejection of science by climate change deniers should not blind us to the truth that, generally speaking, reason and science-based thinking have served environmental depletion and destruction quite well.[23] Cost benefit analysis, risk analysis, all manner of scientific innovations, the academic field of capitalist economics – all of this is reason based and also often serves the forces that are deeply implicated in the current crisis. Values—themselves arising from realms of experience not always deeply subject to reason-- underwrite reason, giving it a goal for which it can elaborate pathways. Our democratic system of governance is committed to allowing a plurality of values, and yet this liberalism has fallen under the spell of a type of least-common-denominator, economic man. The deck is now stacked, even within environmental law as we shall see, thoroughly in favor of those who value the production of money above other goods. In this system, the natural world exists to serve the production of money.

In light of this certainty, Gore calls for regrounding our law and politics on the deepest human values. One illustration of such an attempt is the agenda of the Yale Forum, which is housed within the Yale School of Forestry. The Yale Forum sees the fundamental relationship between humanity and the evolved world as an errant religiosity, the product of an over-reliance on a precept of divinely ordained human dominion over the world and under-recognition of the cosmos as an unfolding of the divine. The current Yale Forum Directors, Mary Evelyn Tucker and John Grim, take their inspiration from Thomas Berry's lifelong quest to re-envision humanity's relation to the earth as essentially a sacred relationship.[24] Inspired in part by Pierre Teilhard de Chardin, Berry wrote cosmological history that invested humanity with a fundamental role in evolving a sustainable future. He sought a reinvention of humanity at the species level »by means of story and shared dream experience.«[25] Regarding law and the reinvention of the

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[18] Naomi Klein, »Geoengineering: Testing the Waters,« New York Times, Sunday Review, p.4, Oct. 27, 2012.

[19] Bruno Latour, We've Never Been Modern, trans. by Catherine Porter (Cambridge, Harvard University Press, 1993).

[20] Gore, The Future, p.57.

[21] Gore, The Future, pp.361-62.

[22] Gore, The Future, for example pp. 104 and 369-74.

[23] For a notable recent attempt to deploy reason as a primary goad to environmental commitment see Peter Singer, »Changing Values for a Just and Sustainable Future,« in The Governance of Climate Change, eds. David Held, Angus Hervey and Marika Theros, (Malden, MA: Polity Press, 2011), 144-161.

[24] The activities of the Forum include many faith traditions, as is evident from their calendar of events (available at http://fore.research.yale.edu/). The directors' relationship to Berry is close. See for example, Thomas Berry, The Christian Future and the Fate of Earth, ed. by Mary Evelyn Tucker and John Grim, (Maryknoll, NY: Orbis Books, 2009).

[25] Berry, The Christian Future, 117. Berry's ecozoic cosmology is presented in, Brian Swimme and Thomas Berry, The Universe

human species, Berry wrote of the need for »legal rights of geological and biological as well as human components of the Earth community. A legal system exclusively for humans is not realistic.«[26]

The call for species governance within a cosmological perspective is a compelling specific iteration of the »deepest human values« invoked by Gore. For effective governance the prospect of eco-cosmological myths for the masses is an earnest possibility, while for historians a whiff of irony accompanies the project.[27] Dipesh Chakrabarty, writing from the perspective of social history, has also proposed the creation of species governance.[28] Consciousness of the collective power of humanity to alter global climate is a type of species consciousness that can be mobilized to re-conceptualize humanity's relationship with evolved life and the globe that sustains it. Species governance calls for a global recognition of humanity's responsibilities toward the evolved world. Without tying human law to species governance and to to deep time as revealed by science, the project of effective environmental governance cannot be achieved. To say that this is a battle over the course of global history is not an exaggeration, although it is a misapprehension to consider those interested in defending the diversity of evolved life well positioned in relation to those interested in defending the elites of the most privileged form of evolved life, homo sapiens.

2. GLOBAL GOVERNANCE

The contemporary environmental crisis exceeds in scale any other contemporary issue, and the dimensions of this crisis should compel us to heighten our engagement and to re-think the inter-dependence and inter-twined well-being of humanity and the evolved world. Anthropogenic climate change serves as the call-to-arms, and yet the environmental crisis is as a whole is much larger than the already enormous challenge of climate change. The broad array of environmental harms includes discharge of toxic chemicals, pollution by plastics, habitat destruction, loss of biodiversity, destruction of the ozone layer, destruction of rain forests, inadequately stored radioactive waste, depletion of fisheries, mercury poisoning and acidification of the oceans, depletion and pollution of aquifers, and more.[29] The cumulative impact of all these depletions, excretions, and excesses is an ecosystem in severe, multi-faceted crisis. We are in the midst of a sixth great extinction of species. The current rate of extinctions compares to the extinction of the dinosaurs 65 million years ago except that the contemporary causes are anthropogenic.[30]

Good governance is an essential component of the methods by which environmental devastation will or will not be curbed. Yet, as is somewhat reluctantly acknowledged in Biermann and Pattberg's *Global Environmental Governance Reconsidered*, environmental governance is not robust. While the European Union has in the last decades pursued an active environmental agenda, Canada under its current government has become decisively anti-environmental. In the U.S. there are continued attacks on environmental

Story: From the Primordial Flaring Forth to the Ecozoic Era – A Celebration of the Unfolding of the Cosmos (New York: HarperCollins, 1992).

26 Berry, The Christian Future, 118-119.

27 Martin Jay, »Intention and Irony: The Missed Encounter Between Quentin Skinner and Hayden White,« History & Theory 52:1, 32-48 (5 Feb. 2013),

28 Dipesh Chakrabarty, »Postcolonial Studies and the Challenge of Climate Change,« New Literary History 43:1 (Winter 2012), 1-18, 13-14.

29 For indepth depictions see, J.R. McNeill, Something New Under the Sun: An Environmental History of the Twentieth-Century World (New York: W.W. Norton & Co., 2001). The title of his book is a rejoinder to Ecclesiatics 1:9-11, »What has been is what will be, and what is done is what will be done; and there is nothing new under the sun. Is there a thing of which it is said, 'See, this is new?' It has been already, in the ages before us. There is no remembrance of former things, nor will there be any remembrance of later things yet to happen« (quoted in McNeill, xxi). McNeill points out that, contrary to the wisdom of Ecclesiastics, the extent of anthropogenic environmental destruction is unprecedented in human history, »the place of humankind within the natural world is not what it was« (xxi). »This is the first time in human history that we have altered ecosystems with such intensity, on such scale and with such speed« (3). Anton and Shelton, generate a vivid portrayal of the wide-spread crisis via citing the Millennium Ecosystem Assessment (see 3-15). The original report is the World Resource Institute, Millennium Ecosystem Assessment, Ecosystems and Human Well-Being (Washington, D.C.; Island Press, 2005), available on-line at http://www.unep.org/maweb/en/synthesis.aspx.

30 McNeill, 262-263.

regulation, whether for clean air or clean water. The U.S. Congress refuses to act on climate change and in 2013 appointed a climate change denier, Chris Stewart of Utah, to head a committee that oversees the EPA and climate research. Emergent economies in India, China and Brazil pursue development with steep environmental costs. These examples could be multiplied, but the point is already clear: environmental governance is not a favored child. The contributors to *Global Environmental Governance* do not dwell on the quality or extent of environmental governance; rather they seek out, describe, and analyze the emerging forms of global environmental governance. This new global governance of the environment entails new actors (international bureaucracies, global corporations, non-governmental organizations, and science networks), new transnational governmental mechanisms (environmental regimes, public-private partnerships, and governance experiments), and new interlinkages and fragmentations (horizontal links between institutions, international-domestic links, and alignments in regional governance). In this study, a portrait gradually emerges of environmentalism co-opted by neo-liberalism and consigned to market forces (see especially Chapters 5 & 6 and the conclusion).

The hold of neo-liberalism over the international environmental agenda is show-cased in the changed meaning of sustainability in legal circles coupled with the rise of so-called public-private partnership.[31] The sustainability movement that emerged in 1970s environmentalism was a way of drawing attention to »the ecological limits of industrial development and population growth.«[32] Implicit in this early use is that the environment is what should be sustained by moderating the methods and goals of development. Sustainability meant sustaining a healthy environment. In 1987, in the Brundtland Commission report, sustainable development was described as »development which meets the needs of the present without compromising the ability of future generations to meet their own needs.«[33] Bäckstrand and her co-authors remark on the Brundtland definition, »not only was the term *environment* excluded from the definition, but what was to sustain has also changed: 'Humanity has the ability to make *development* sustainable'«.[34] By 2002, the Johannesburg World Summit on Sustainable Development inserted private enterprise as a chief mechanism for achieving environmental goals via the public-private partnerships initiative (this change of emphasis is not discussed in Anton and Shelton, who anchor their presentation of sustainable development in the already-neo-liberal Brundtland Report).[35] Bäckstrand *et al*. describe these partnerships as driven by the priorities of northern actors or large developing countries rather than by the greatest environmental needs.[36] The legitimacy and effectiveness of these partnerships, they argue, are »modest at best.«[37] The partnerships lack accountability mechanisms and do not operate with transparent or participative decision making. Bäckstrand *et al*. recommend requiring reporting, monitoring, implementation assistance and documentation. These techniques are essential mechanisms of established international environmental governance. That a major institution omitted them in favor of private, non-transparent enterprise speaks volumes. Without such mechanisms and without benchmarks for goal attainment, no accurate measurement of the success of the partnerships can be obtained.

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31 Karin Bäckstrand, Sabine Campe, Sander Chan, Ayşem Mert, and Marco Schähoff, »Transnational Public-Private Partnerships.« Chapter Six in Biermann and Pattberg, eds., Global Environmental Governance Reconsidered, (Cambridge, MA: MIT Press, 2012).

32 Bäckstrand *et al.*, Transnational Public-Private Partnerships.« p.132.

33 Bäckstrand *et al.*, Transnational Public-Private Partnerships.« p.132.

34 Bäckstrand *et al.* p.132, emph. in the origianl). For rethinkings of sustainability from critical and non-Western perspectives see the special issue of Development 54 (2011) as well as the Development collection on sustainability available at http://www.palgrave-journals.com/development/collections/sustainability.html (accessed 4/25/13), in particular, Catherine Walsh, »Development as 'buen vivir': Institutional Arrangements and (de)colonial Entanglements,« Development 53, no.1 (2010), 15-21 (discussed below); and Terry Barker, Şerban Scrieciu and David Taylor, »Climate Change, Social Justice and Development,« Development (2008) 51, 317–324, which advances an ethical, pro-poor and pro-development climate change regime. See also the debates about the constitutional developments in Ecuador and Bolivia referenced below in this essay.

35 Anton and Shelton, p.87.

36 Bäckstrand *et al.*, Transnational Public-Private Partnerships.« p.142.

37 Bäckstrand *et al.*, Transnational Public-Private Partnerships.« p.142.

Biermann and Pattberg envision the creation of a World Environmental Organization (WEO) achieved by elevating the United Nations Environmental Program (UNEP) to the status of International Organization.[38] This is not an original idea, but rather one with currency among those active in environmental governance.[39] Sam Adelman, for example, has proposed a WEO to enforce a global recognition of the rights of the environment as a foundational norm, a precondition for human life and for human rights.[40] The likelihood or necessary preconditions for member states of the U.N. to support the establishment of a WEO are left unexplored by Biermann and Pattberg, but such political difficulties are overwhelming. It would be wonderful if they could explain how to muster sufficient support to establish a WEO and how to ensure it is vested with sufficient authority. The World Trade Organization has waxed powerful, driving globalization and economic development. The much-vaunted increase in global trade has entailed huge environmental costs. The goal of a powerful WEO, however, remains elusive, even as the need for effective environmental governance become more acute.

3. ENVIRONMENTAL RIGHTS AS HUMAN RIGHTS

The World Environmental Organization proposed by Biermann and Pattberg, if it existed and held sufficient power, could provide a counterweight to the WTO and, in general, to the dominance of economic development over environmental concerns. Assimilating environmental rights into human rights provides an alternative recourse for countering neo-liberalism. The human rights solution has the benefit of relying on currently existing law and institutions to build further environmental guarantees. However, assimilating environmental rights into human rights also severely limits the scope of environmental rights. Thus, despite the seeming promise of expressing environmental rights as human rights, this approach fails to address the scope and scale of the environmental crisis. Rather, humans as the conscious actors on behalf of all evolved life must create law that recognizes the value of the incomparably improbable and irreplaceable evolved world. From this perspective, we understand human rights are properly a sub-category within the rights of the evolved world.

The clearest predecessor to Anton and Shelton's *Environment and Human Rights* and Boyd's *The Environmental Rights Revolution* is Stephen Humphreys' edited volume, *Human Rights and Climate Change*.[41] While focused only on climate change, and not on environmental law more generally, Humphreys' collection marked a historical moment in which human rights and environmental rights were decisively linked on the world stage. Humphrey's volume responded to actions at the United Nations, including the 2008 Human Rights Council resolution on human rights and climate change, and the subsequent series of studies on their linkages.[42] The political prominence of climate change, and especially its role in international relations and international law, has served to elevate consciousness of the more general link between environmental rights and human rights. By 2012 the Human Rights Council of the United Nations appointed the Wake Forest law professor, John Knox, as Special Rapporteur on human rights and the environment and given him a mandate to develop the legal ties between these fields. That Anton and Shelton have also published a case book on environment and human rights reflects the increasing validity of the linkage of the two fields. Boyd's book musters convincing evidence of the significance of the link in constitutions around the globe. That these books portray historical legal developments is certain. Whether this development is of great consequence is less clear, as the dominance of economic concerns and economic logic show little sign of abating.

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38 Biermann and Pattberg, p.270.

39 See the discussion of a World Environmental Organization in Sam Adelman, »Rethinking Human Rights: The Impact of Climate Change on the Dominant Discourse,« in Human Rights and Climate Change, ed. by Stephen Humphreys, (New York: Cambridge Univeristy Press, 2010), 159-179, p.175.

40 Adelman, »Rethinking Human Rights,« in Human Rights and Climate Change, p.174

41 Stephen Humphreys, ed., Human Rights and Climate Change, with Foreword by Mary Robinson (New York: Cambridge University Press, 2010).

42 Humphreys, Human Rights and Climate Change, 3.

The Market or Human Rights

To the extent they are legally recognized, environmental values are usually monetized, a procedure that, as Mark Sagoff has pointed out, inserts market logic as a controlling device into the heart of democratic governance.[43] The monetizing of the natural world in order to render it susceptible to economic management is objectionable because it systematically undervalues both the inherent value of evolved life and the abundant plenitude of commonly held resources casually wasted.[44] Added to these objections is the perverse impact of economic discounting in which the »value« of a far distant danger, such as leaked radiation from long-term nuclear waste storage, is discounted to current rates, making it appear insignificant. In addition to minimizing the monetary cost of the threat, this economic logic supplants political dialogue over whether we as a society want to create such a legacy for future generations. Finally, the dominance of market logic within environmental law is mirrored and multiplied by the dominance of the market over environmental concerns in the policy arena. While some argue that the development of a business sector with stakes in clean technologies and renewable energy does see win-win scenarios for development and the environment, these market sectors remain a small segment of the overall economy. They are also fundamentally driven by the profit motive and themselves incur on-going environmental and social costs.[45]

Inscribing environmental rights within human rights is meant to defeat the drive toward neo-liberal cooptation of environmental goals and the pervasive monetization of environmental values. Richard Hiskes writes in *The Human Right to a Green Future*, the »muscular political vocabulary« of human rights is central to today's political ideas of rights and justice.[46] Hiskes argues that human rights law (including environmental law) can and should serve as the central law around which globalization is achieved.[47] The specific laws and cases in Boyd and Anton and Shelton's volumes demonstrate the progress of such theory into constitutional, statutory, and case law. However, it is an exaggeration to believe that human rights provide the pragmatic political language of the contemporary era, the language in which power struggles are waged. There is not a strong legal regime in which human rights can be effectively asserted.[48] Indeed, the widespread willingness to violate human rights in the name of development and the usual impunity for such violations is one of the sources of environmental crisis.[49]

Such violations could be minimized either by strengthening human rights governance or, as Al Gore suggests, by further integrating environmental costs into standard economic thinking. Gore specifically

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[43] On the monetization of environmental goods see, Frank Ackerman and Lisa Heinzerling, Priceless: On Knowing the Price of Everything and the Value of Nothing (New York: Norton, 2004). On the displacement of democratic political process by market logic see, Mark Sagoff, The Economy of the Earth: Philosophy, Law, and the Environment 2nd edition (Cambridge UP, 2008), chapters two and three.

[44] Debates about the so-called tragedy of the commons continue to rage. The most persuasive and prominent progressive argument is that environmental costs must be integrated into the costs of production. This is expressed as the internalization of so-called 'externalities.' This argument, however, mandates that industrial concerns and consumers pay for using resources that currently are free or very low cost, so that there is considerable highly capitalized push-back against this agenda. The seminal article is Garrett Hardin, »The Tragedy of the Commons,« Science 162, no. 3859 (December 1968) 1243-1248. Among the vast literature, the recent book, David Bollier and Burns Weston, Green Governance: Ecological Survival, Human Rights and the Law of the Commons, (New York: Cambridge University Press, 2013), provides orientation in the debates and deeply informed insights.

[45] Hazardous waste created by solar panel manufacturing, birds slaughtered by wind turbines, distortion of global grain prices by the marketing of ethanol, these are just some of the undesirable by-products of the green economy.

[46] Richard P. Hiskes, The Human Right to a Green Future: Environmental Rights and Intergenerational Justice (New York: Cambridge University Press, 2009), 2. In contrast, Sam Adelman remarks that human rights are honored more in the breach than in enforcement and that they are notoriously non-justiciable. See, Sam Adelman, »Rethinking Human Rights: The Impact of Climate Change on the Dominant Discourse,« in Human Rights and Climate Change, ed. Stephen Humphreys, (New York: Cambridge University Press, 2010) 159-179, 161.

[47] Hiskes, 100.

[48] I intend here to mean human rights claims brought before tribunals as human rights claims and not as some more specifically statutorily recognized right.

[49] Jon Barnett, »Human Rights and Vulnerability to Climate Change,« in Human Rights and Climate Change, ed. Stephen Humphreys (New York: Cambridge University Press, 2010), 257-271.

recommends the reform of the measurement of gross domestic product to account for resource depletion, the externalities of pollution, and the relative equality of income distribution.[50] Optimizing environmental protections could proceed with both strategies, so that the independence from economics is pursued in tandem with the increased recognition of costs of environmental degradation.

Can Human Rights Adequately Accommodate Environmental Rights?

Environmental rights as human rights means that the rights of the environment exist only to the extent they are co-extensive with some form of service to humanity. Shelton has argued that the areas in which human rights and environmental concerns do intersect suffices as an area for concerted action.[51] However, the severe constraints on environmental concerns are evident. The deep ecology movement, arguably already deeply weakened by the 1992 Rio Summit, which prioritized a right to development, is side-lined when human rights are prioritized.[52] Thus, for example, Anton and Shelton's book does not even mention the emergent legal theory of ecocide.[53] In important ways, inscribing environmental rights within human rights puts limits on the aspiration to value and protect the evolved world.

Environmentalists have frequently advocated the legal recognition of intrinsic rights of the natural world. Aldo Leopold, for example, famously argued for a »land ethic« that recognized inherent rights of other species and of ecological communities to exist. The intrinsic value of the natural world is recognized as well in the preamble to the Convention on Biological Diversity. This widely ratified multi-lateral environmental treaty recognizes »the intrinsic value of biological diversity and of the ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values of biological diversity and its components«.[54] In a similar spirit, Justice William O. Douglas advocated for a wilderness bill of rights, and wrote in his 1972 dissenting opinion in *Sierra Club v. Morton*, that environmental objects should have standing to sue »for their own preservation.«[55]

This drive to recognize inherent rights of the natural world reached a new height in Ecuador in 2008 through a constitutional amendment that declared that nature (called Pacha Mama) is a legal person.[56] The 2010 constitution of Ecuador holds, in article 71, that »Nature, or Pacha Mama, where life is reproduced and created, has the right to integral respect for her existence, her maintenance, and for the regeneration of her vital cycles, structure, functions, and evolutionary processes.«[57] The Ecuadoran recognition of legal personhood for nature (article 66) is joined with entitlement to restoration of nature as a right separate from right of recompense for humans with injured property rights, and a mandate for the use of the precautionary principle. In further developments, the 2009 amendment to the Bolivian constitution, which granted important procedural rights for environmental protection, was supplemented in April 2011 by laws that recognized far-reaching rights to »mother nature« and defined natural resources as a blessing.[58]

The Ecuadoran constitutional rights of Pacha Mama were first interpreted by a court on March 30, 2011.[59] The court ruled that, »[W]e can not forget that injuries to Nature are 'generational damages' which are such that, in their magnitude have repercussions not only in the present generation but

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50 Gore, The Future, p.372.

51 Anton and Shelton, p. 130-132.

52 Bill Devall and George Sessions, Deep Ecology: Living As if Nature Mattered (Salt Lake City: Gibbs M. Smith, Inc, 1985).

53 Ecocide, or the destruction of nature, was theorized as a crime in 1996 by Mark Gray. The Supreme court of England and Wales participated in mock trial to develop and showcase the proposed crime. CEOs responsible for developing the Athabasca tar sands were (mock) tried and found guilty in 2011. See the NGO website for reports, erradicatingecocide.com/overview/mock-trial/.

54 As quoted in Anton and Shelton, p.123.

55 Anton and Shelton, p.124.

56 Anton and Shelton, p.124.Other environmental provisions in Ecuador's constitution include a prohibition on genetically modified organisms, a reversal of legal burden of proof in environmental cases so that the accused must prove their actions have not caused the alleged harm, a mandate that uncertainty in law be resolved in favor of Pachamama, and a requirement that urban areas promote non-motorized transportation (Boyd, 70).

57 Quoted by Anton and Shelton, p.124.

58 Boyd, p.126.

59 Decision available on-line at http://blogs.law.widener.edu/envirolawblog/2011/07/12/ecuadorian-court-recognizes-constitutional-right-to-nature/), accessed 3/20/13.

whose effects will also impact future generations.« The court quoted Alberto Acosta, President of the Constituent Assembly: »Man can not survive at the margins of nature… The human being is a part of nature, and can not treat nature as if it were a ceremony to which he is a spectator. …we… must prohibit human beings from bringing about the extinction of other species or destroying the functioning of natural ecosystems.«[60]

What is meant by Pacha Mama in the Ecuadorian constitution is not opened for discussion by Anton and Shelton or Boyd (Anton and Shelton, 124 and Boyd, 70 and 140).[61] The deep contrast with American law, which has recently increased the status of corporate personhood, deserves emphasis.[62] Indeed, Anton and Shelton devote a mere page and a half in their thousand-page book to discussing what is meant by environment (2-3). Noting the French origin in »*environner*,« (meaning »to encircle«) they write that, »environment can include the aggregate of natural, social and cultural conditions that influence the life of an individual or community« (2). The scope of the environment can be »a limited area or the entire planet« (2). According to the U.S. Environmental Protection Agency, the environment is »the sum of all external conditions affecting the life, development and survival of an organism« (2). Because of the vagueness of the definition and because of the broad variety of actions that can give rise to adverse environmental consequences, Anton and Shelton remark that it is »difficult to establish the limits of environmental law as an independent legal field; indeed they [these features of 'environment'] imply the integration of environmental protection into all areas of law and policy« (3). Anton and Shelton argue, therefore, that environmental law should be a central, unifying field. In fact, so long as »environment« is devoid of inherent meaning, its vagueness contributes to its weakness.

The possibility that something different from mere »that-which-surrounds« is expressed by Pacha Mama is not entertained by Anton, Shelton or Boyd. The measure of this difference is indicated (if not fully explored) by the acknowledgement that Pacha Mama is the Andean earth goddess and therefore that the term motions toward meaning incommensurate with the bland »that which surrounds.«[63] The preamble to the Ecuadoran constitution evokes a new form of society: »We decided to construct a new form of citizen coexistence, in diversity and harmony with nature, to reach 'el buen vivir, el *sumak kawsay*.'«[64] These innovations are characterized by Acosta as a »'conceptual rupture' with the dominant development logic of the previous six decades.«[65] While it is unrealistic to expect Ecuador and Bolivia to derail neoliberal globalization, nonetheless we can agree with Arturo Escobar, the anthropologist of development

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[60] Translated by Erin Daly, H. Albert Young Fellow in Constitutional Law, in his blog post, »Ecuadorian Court Recognizes Constitutional Right to Nature, at http://blogs.law.widener.edu/envirolawblog/2011/07/12/ecuadorian-court-recognizes-constitutional-right-to-nature/)

[61] Arturo Escobar examines the extent to which these constitutional and legal developments chart an alternative development path to neoliberalism; see his, »Latin America at a Cross-Roads,« Cultural Studies 24, no.1 (January 2010), 1-65. See also the response articles, Juan Ricardo Aparicio, »Reply to Arturo Escobar's Latin America at a Cross-Roads,« Cultural Studies 25, no.3 (2011) 439-445; Charles R. Hale, »Comment on Arturo Escobar,« Cultural Studies 25, no.3 (2011) 459-463; Alejandro Grimson, »Reply to Arturo Escobar,« Cultural Studies 25, no.3 (2011) 446-449; Eduardo Restrepo, »(Un)Thinking Modernity and the Burdens of Difference,« Cultural Studies 25, no.1 (2011) 432-438; David Slater, »Latin America and the Challenge to Imperial Reason,« Cultural Studies 25, no.3 (2011) 450-458; and Cristina Rojas, »Latin America, Turning Left or Crossing Multiple Roads,« Cultural Studies 25, no.3 (427-433).

[62] Recall Gore's criticism of this Powell-court induced elevation of the corporation in American law. Discussed above.

[63] Nature's etymological root is the Latin natura, meaning to birth. This root meaning, however, leaves no trace in contemporary law. The seminal history of this covering-over is Carolyn Merchant, The Death of Nature: Women, Ecology and the Scientific Revolution (1980), with new preface (Harper & Row: 1990). On Ecuadoran and Bolivian constitutional innovations see, Catherine Walsh, »Development as Buen Vivir: Institutional arrangements and (de)colonial entanglements,« Development 53, no.1 (2010), 15–21. Walsh perceives a worrisome rise of the state along with the biocentric constitutional provisions. See also, M. Arsel, N.A. Angel, »'Stating' Nature's Role in Ecuadorian Development: Civil Society and the Yasuní-ITT Initiative, Journal of Developing Societies 28, no.2 (2012) 203-227.

[64] As quoted in English in Catherine Walsh, »Development as 'buen vivir': Institutional Arrangements and (de)colonial Entanglements,« Development 53, no.1 (2010), 15-21, p.18

[65] Alberto Acosta, »El Buen Vivir, una oportunidad por Construir,« Ecuador Debate, no. 75 (2009) 33-48, p. 39. See also, Eduardo Gudynas, El mandato ecológico. Derechos de la naturaleza y políticas ambientales en la nueva Constitución, (Quito: Abya-Yala, 2009). Walsh, p.20, however, suggests this program is a humanized neo-liberalism, deeply similar to Integral Sustainable Development.

theory, that these legal innovations point the way to an alternative to Euro-modernity.[66] Inserting Pacha Mama into constitutional law echoes, as well, the aspirations toward eco-cosmology advanced by the Yale Forum.

The cosmological and species implications of deep time parallel the extra-human and extra-economic implications of Pacha Mama. Whether expressed in theological or scientific terms, the awesome scale of time and of creative forces far beyond the control or relevance of humanity is evoked. This context of deep, geologic, and cosmological time needs to be expressed in legal systems. The Latin American examples provide inspiration for law that acknowledges humanity as the avatar of evolved life in the cosmos and as bearing unique responsibility for the fate of all evolved life.

The concept of intergenerational justice is another step —weak though it is—toward a legal expression of humanity as the avatar of evolved life. The legal concept of intergenerational justice was first theorized only in the 1970s.[67] The obligation to preserve evolved life arose as a response to the newly developed destructive capacity of the post-World War II industrialized world. Edith Brown Weiss called for this historically emergent responsibility to be met with a »Declaration of the Planetary Rights and Obligations to Future Generations.«[68] Such inter-generational continuity, however, must overcome the much celebrated individualism of modernity.[69]

The *Minors Oposa* case, decided in the Philippines in 1994, is the pre-eminent enforcement of intergenerational rights to date. In this suit Philippine minors formed a class to protect virgin tropical rainforests from state-granted lumber concessions (Anton and Shelton, pp. 92-95).[70] Plaintiffs successfully sought to enforce rights under the 1987 constitutional amendment that recognized a right of the people of the Philippines to a balanced ecology and recognized the concepts of inter-generational responsibility and intergenerational justice. Meanwhile, legal scholars in the United States have debated theories of intergenerational rights (also called, the rights of future generations) for at least forty years, but these theories have not crystallized into applicable law on the federal level. The (now abandoned) plan for nuclear waste storage at Yucca Mountain had certified storage of waste for up to one million years.[71] This astounding regulatory reach into the future (homo sapiens have only inhabited the Americas for approximately 14,000 years) exhibits a federal concern for responsibility to future generations which is nowhere else codified. Some states such as Hawaii, however, have an expansive public trust doctrine that carries intergenerational consequences.[72] Boyd notes that at least forty states around the world include intergenerational rights in their constitutions.[73]

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66 Escobar, »Latin America at a Cross-Roads,« Cultural Studies 24, no.1 (January 2010), 1-65.

67 Edith Brown Weiss pioneered this field with her much debated, In Fairness to Future Generations: International Law, Common Patrimony, and Intergenerational Equity (New York: United Nations University, 1989). More recent monographs include Laura Westra, Environmental Justice and the Rights of Unobrn and Future Generations: Law, Environmental Harm, and the Right to Health (Sterling, VA: Earthscan Press, 2008), and Richard P. Hiskes, The Human Right to a Green Future: Environmental Rights and Intergenerational Justice (New York: Cambridge University Press, 2009). See also, Burns H. Weston, »The Theoretical Foundations of Intergenerational Ecological Justice: An Overview,« Human Rights Quarterly 34 (2012), 251-266 and Burns H. Weston and Tracy Bach, »Recalibrating the Law of Humans with the Laws of Nature: Climate Change, Human Rights and Intergenerational Justice« (Vermont Law School & University of Iowa: Climate Legacy Initiative, 2009), available at http://www.vermontlaw.edu/Academics/Environmental_Law_Center/Institutes_and_Initiatives/Publications-x4059.htm (accessed 4/16/13).

68 Brown Weiss, In Fairness to Future Generations, 345 & 349.

69 For example, see Marie-Cécile and Edmond Ortigues, Oedipe Africain 3rd edition (Paris: l'Harmattan, 1984), e.g., 75, 79, 80-83, where they describe the immersion of Wolofs, Serer and Lebous in successive waves of generations and the process of individuation required to become a modern individual; and as discussed in Alice Bullard, »Oedipe Africain, A Retrospective,« Transcultural Psychiatry 42, no. 2 (June 2005), 171-203.

70 Oliver A. Houck, Taking Back Eden: Eight Environmental Cases that Changed the World (Washington, DC: Island Press, 2010), 43-60, gives a vivd account of the Minors Oposa case.

71 See, http://www.epa.gov/rpdweb00/yucca/ (accessed March 28, 2013), follow links to »fact sheet« and see »standards.« Nuclear waste is not discussed in Anton and Shelton.

72 Anton and Shelton, p.36. The state as owner and guardian of land was also grounds for the landmark climate change case, Massachusetts v. the EPA. See discussion in Dinah Shelton, »Equitable Utilization of the Atmosphere: A Rights-Based Approach to Climate Change?« in Human Rights and Climate Change, ed. Stephen Humphreys (New York: Cambridge University Press, 2010), 91-125, p.111. This case is not in the Anton and Shelton collection.

73 Boyd, p. 70.

How, then, should we view this historically emerging link of environmental rights to human rights? This link offers some compensation for the absence of a World Environmental Organization. It takes advantage of existing human rights laws and institutions and, to some at least, seems to augment the power of the environmental agenda. Advocates of the human rights-environmental rights linkage rely on a conviction that human rights can trump the logic of neo-liberalism. However, it is a mistake to think that human rights law is more powerful than the law of property and of trade. Without effective international enforcement via a World Environmental Organization environmental governance will remain weak.

The inadequacy of human rights to this particular crisis, however, is manifest when the difference of evolved life from human life, and of Pacha Mama from mere 'that which surrounds« are contemplated. The vast scale of the global environmental crisis reveals that human rights should be inscribed within a cosmological, deep time appreciation of the evolved world. Pacha Mama's rights as expressed in Bolivian and Ecuadoran law are the first examples of such eco-cosmological law. Intergenerational rights – a relatively weak motion toward temporal responsibilities -- are only now emerging. For the most part, the undomesticated evolved world remains outside of linked human and environmental rights just as deep time remains outside of the logic of human law. Yet, humanity is uniquely responsible for the threat to the survival of all evolved life. Human rights, as valuable as they are, are inadequate to expressing humanity's responsibility for the fate of evolved life.

4. ADAPTATION TO CLIMATE CHANGE: DEVELOPMENT REDUX

One of the biggest lessons from Gerrard and Fischer Kuh's *Law of Adaptation to Climate Change* is learned up-front. There is no hint in this text of the authors' faith that humans will successfully govern to prevent climate change. The failure of the U.S. Congress in 2009 to enact the Waxman-Markey carbon cap-and-trade bill carried forward to a failure at the international U.N. Framework Convention on Climate Change negotiations in Copenhagen. Comprehensive laws aimed at progressive reductions of green house gas emissions at this point are stalled if not moribund.[74] Even with successful aggregate reduction of green house gas emissions, several decades must elapse before climate benefits will appear, and even then, the climate will continue to change for several more decades.[75] Adaptation is the order of the day.

Gerrard and Fischer Kuh have produced a book seemingly intended to guide policy makers and legal counsel in understanding current law, to provide reasonably comprehensive descriptions of likely impacts of climate change, and to describe how current governments, administrative bodies and market mechanisms are acting to meet these challenges. This cornucopia of legal and technocratic details will usefully serve as a type of encyclopedia of adaptation challenges and planning, or as a reference book for those looking for broad-scale orientation in various specifics of climate change adaptation. It is also an illustration of how merely depicting law-as-it-is occludes the politics that produce it. The focus on details combined with the disclaimer that adaptation is as yet fragmentary in nature combine to create a text devoid of an overt thesis. Nonetheless, through the myriad details, an over-riding truth emerges: significant adaptation programs are deeply dysfunctional, so much so, that overall one can argue that adaptation efforts have been maladaptive. Adaptation is, in essence, an effort to preserve the status quo, including development as usual.

As Gerrard and Fischer Kuh write, »mitigation laws are like a patchwork of scraps that are barely sewn together.«[76] However, adaptation laws cannot even be characterized as patchwork, rather »there is little cloth, and the existing scraps are hardly linked.«[77] Contained within the overt acquiescence to ad-

[74] The Durban Platform for Enhanced Action created in 2011, aims to establish a new binding emissions treaty by 2015, with a target date of implementation in 2020. If the goals are reached, this treaty will cover 100 per cent of emissions. See, http://www.un.org/wcm/content/site/climatechange/pages/gateway/the-negotiations/durban (accessed May 3, 2013).

[75] (Gerrard and Fisher Kuh, eds., Law of Adaptation, p. xxi.

[76] Law of Adaptation, p.11.

[77] Law of Adaptation, p.11.

aptation is a subtext that there is no coherence to adaptation, and because there is no coherence, there is no overall meaning or message carried with it. This is of course nonsense. The stakes are very high, both when adaptation is emphasized at the expense of mitigation, and when adaptation strategies are dysfunctional. Without adequate mitigation efforts, adaptation is itself bound to fail. Al Gore notes in *The Future*, if we focus on adaptation while foregoing mitigation, »the consequences will be so devastating that adaptation will ultimately prove to be impossible in most regions of the world.«[78] Gore gives an example of the forecasted »almost unimaginably deep and prolonged drought« that will afflict »a wide swath of highly populated and agriculturally productive regions, including all of Southern and south-central Europe, the Balkans, Turkey, the southern cone of Africa, much of Patagonia, the populated southeastern portion of Australia, the American Southwest and a large portion of the upper Midwest, most of Mexico and Central America, Venezuela and much of the northern Amazon Basin, and significant portions of Central Asia and China.«[79] The vast fire-storms that have plagued Australia and the American West in recent years provide another sobering example.[80]

Adaptation as a strategy to confront climate change is bound to fail insofar as its chief aim is to preserve the status quo; that is, to preserve the state of affairs that generates vast amounts of green house gases that are themselves producing climate change. As described by Robert Fischman and Jillian Rountree in their chapter on Adaptive Management, adaptation as a governance technique first and foremost resists the impacts of climate change in order to preserve the status quo.[81] Second, adaptation aims to ensure that particular locales can absorb environmental disturbances, that they can change and still remain functional, with the same basic structure, identity, and feedbacks.[82]

The fundamental collusion of adaptation with the economics that are producing climate change does not imply that all individual instances of adaptation are poorly conceived or without merit. Indeed, in *Human Rights and Climate Change*, Humphreys argues that adaptation projects can address immediate human rights violations and are underfunded in comparison with mitigation.[83] However, in the aggregate and by design adaptation will reproduce the economic conditions themselves productive of the contemporary environmental crisis.

Even this irresolute and ineffective adaptation methodology is greatly stymied in U.S. politics. Robert Glicksman's chapter, »Governance of Public Lands, Public Agencies and Natural Resources,« details a small victory over the climate-change-denying Congress achieved through the establishment by the executive branch of the Interagency Climate Change Adaptation Task Force (ICCATF) in 2009.[84] However, this adaptation planning must be pursued without any congressional funding or implementing legislation. Vicki Arroyo and Terri Cruce's chapter, »State and Local Adaptation,« presents the relative vitality of state actions.[85] However, the many state and local projects detailed by Arroyo and Cruce are insufficiently developed, and far too small in number and size to compensate for lackluster federal leadership. Despite the efforts of a great number of dedicated professionals and volunteers, the programs are anemic, underfunded, and of unproven value.[86] If adaptation strategies are to be welcomed, as Gerrard and Fischer Kuh imply, this portrait of existing U.S. adaptation law is dismal indeed. The overtly maladaptive dimensions to adaptation are even more so.

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78 Gore, The Future, p. 304.

79 Gore, The Future, p. 304.

80 Australian Climate Commission, The Angry Summer, February 2013 available at http://climatecommission.gov.au/report/the-angry-summer/ (accessed 3/29/13). Mark Hudson, *Fire Management in the American West: Forest Politics and the Rise of Megafires* (University Press of Colorado, 2011).

81 Law of Adaptation, p. 24.

82 Law of Adaptation, p. 25.

83 Stephen Humphreys, »Introduction: Human Rights and Climate Change« in Human Rights and Climate Change, ed. by Stephen Humphreys, (New York: Cambridge University Press, 2010), 1-34, 51.

84 Law of Adaptation, pp.447-48.

85 Law of Adaptation, p.570.

86 Law of Adaptation, p. 593.

Hydraulic fracturing and biofuels are adaptive strategies that place enormous stress on water supplies, and yet water supplies are already under threat from overconsumption and climate change. Dry states will become drier, groundwater aquifers will be tapped out or polluted by hydraulic fracturing, population will increase, hence increasing demand, and agriculture will require increasing amounts of irrigation.[87]

Energy production and water scarcity dove-tail in the fields of hydraulic fracturing, and ethanol and biofuel production.[88] Burning these fuels, of course, contributes to green house gas emissions. Meanwhile, extraction and production of these fuels directly threaten water supplies. Shale gas extraction requires from two to eight million gallons of water, laced with about 0.5 percent chemical proppants (104-05). The treatment or storage of this water is controversial. In 2005 an amendment to the Safe Drinking Water Act exempted hydraulic fracturing from coverage. In both the 111th and 112th Congresses legislation was introduced to repeal this exemption, but this effort has not been successful. Meanwhile Congress dithered by commissioning a study from the EPA to determine whether hydraulic fracturing poses an environmental threat rather than re-imposing Clean Water Act governance over the industry.[89] Even if the proppant-laced water were covered by environmental legislation, it is not clear that such water can be made safe. It might be possible to reuse the water to drill other wells, which might be practical if it did not require transporting the water long distances (105-06).

Ethanol and other biofuels also pose risks to water supplies. Producing biofuels alters the agricultural mission of farmers, leading them to devote crop water to fuel rather than to food. During the heating and cooling in the biorefinery four gallons of high-quality water are required for the production of one gallon of fuel (106). Moreover, high levels of ethanol additives to fuel mixtures increases the solubility of toxic gasoline compounds, and facilitates the migration of these chemicals into the drinking water supply (108). Such negative feed-back loops are double losses for the environment and indicate maladaptive practices rather than successful adaptation.

The contemporary activities in the Arctic provide further examples of maladaptive responses to climate change. While much discussion of the Arctic focuses on the melting of the polar cap as an indicator of climate change's advance and as a herald of rising sea levels, the counter-story is that the Arctic is now open for business.[90] Linda Malone's chapter on »Human Security and Military Preparedness,« captures this new commercial importance, and states with military might are ready to deploy to back their territorial and mineral rights claims. Shipping lanes through the polar cap, oil and gas extraction, and tourism will all increase as the ice continues to melt. There are an estimated 90 billion gallons of oil and 1,670 trillion cubic feet of gas in the Arctic region according to the U.S. Geological Survey (cited by Malone, 857). Russia, Canada, the United States, Norway, Denmark and Finland are vying for territory and rights to develop these resources. The newness of commerce in the Arctic is underlined by the relative powerlessness of its government, the Arctic Council, which lacks authority to pass legally binding laws and lacks any ability to enforce laws or regulations.[91] Indeed, the prior insignificance of the Arctic is demonstrated by the fact that 2011 was the first time a U.S. Secretary of State attended a meeting of the Arctic Council. Now states that are mere ad hoc observers to the Council, including China, the EU, Italy, Japan and South Korea, are campaigning for full membership (860). Currently Russia is positioned to defend its extensive (1.2 million square kilometers) Arctic territorial claim with a fleet of eighteen icebreakers and a $7 billion expansion of the port in Murmansk (856). Canada is defending its Arctic claims with a new fleet of F-35 jets and is also constructing a new Arctic base (858).

With the territorial and commercial competition for the Arctic heating up, the drive to preserve the polar ice is inevitably weakened. While Malone does not write of the comparative power of environ-

[87] See, generally, Robert Adler in chapter three, »Managing Water Supplies,« and by Benjamin Houston and Noah Hall in chapter four, »Managing Demand for Water,« in Law of Adaptation. See specifically, p.56-57.

[88] Houston and Hall in Law of Adaptation, pp.104-108.

[89] For the current update from the EPA see. http://www.epa.gov/hfstudy/ (accessed March 28, 2013).

[90] Keith Gesson, »Polar Express: A Journey Through the Melting Arctic with Sixty-odd Thousand Tons of Iron Ore,« The New Yorker (December 24, 2012), 98-117.

[91] Law of Adaptation, p. 860.

mentalists and the oil and gas industries, clearly adaptation to climate change—allowing the commercial exploitation of the Arctic-- is the governments' preference over mitigation. This (mal)adaptation will include substantial polluting commercial exploitation in the previously ice-bound Arctic and feed more hydrocarbons into the greenhouse gas pipeline.

Adaptation in international law is expressed via the United Nations Framework Convention on Climate Change (UNFCCC) and its subsidiary agreements. The UNFCCC, now twenty years old, initially focused primarily on the mitigation of climate change. The shift in emphasis to adaptation represents the defeat (one would hope only partial and temporary) of climate change mitigation. Both mitigation and adaptation are legally framed within the market-based, neo-liberal »right to development« as expressed in UNFCCC Article 3(4), »parties have a right to, and should, promote sustainable development« (605). Dominating the environmental agenda since the 1980s, the neo-liberal emphasis on development, even as mitigation and adaptation are pursued, expresses a deep tension, if not an impossibility of conflicting goals within the very treaty designed to halt climate change.[92]

International adaptation is also caught in the bind of U.N. politics, which are state-to-state, and not citizen-based. The UNFCCC treaty as well as its subsidiary agreements (most famously the Kyoto Protocol, but numerous others as well) do not directly reach individual citizens around the world. Rather, the programs and funding established are funneled through states. State-based injustices, such as the oppression of minority peoples or gender-based biases, are influenced by the U.N. climate change programs only with great difficulty. Good governance mechanisms, most notably those established via the UNFCCC REDD mechanisms, aim to ensure the inclusion of *le menu peuple* in mitigation and adaptation strategies, and yet the implementation of these mechanisms is difficult at best.[93] The process for obtaining mitigation funding, as well, requires consultation with local people, but it does not require that the goals supported at the local levels be prioritized or even included in the funded projects.[94]

David Freestone, writing in Chapter 17 of The Law of Adaptation, describes the UNFCCC with disregard for these nuances. What he does provide is a portrait of the legal evolution of the UNFCCC from a treaty focused on climate change mitigation to one focused on adaptation. Other entities, includ-

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[92] These policies ascribe to developmentalist logic, and fall-in with what Escobar describes as neo-developmentalism in contrast to post-developmentalism, »By neo-developmentalism I mean forms of development understanding and practice that do not question the fundamental premises of the development discourse of the last five decades, even if introducing a series of important changes (Escobar 1995, 2009). By post-development, I mean the opening of a social space where these premises can be challenged, as some social movements are doing.« Escobar, 2010, p.20.

[93] REDD+ (Reducing Emissions from Deforestation and Degradation) provides explicit guidelines for good governance in http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf, 26. These include governmental transparency, respect for knowledge and rights of indigenous and local peoples, full and effective participation of relevant stakeholders including indigenous peoples and local communities, and respect for conservation and biodiversity. Strategies of governance of daily life that dynamically forms environmentally active citizens is explored in Arjun Arawal, »Environmentality: Community, Intimate Government and the Making of Environmental Subjects in Kumaon, India,« Cultural Anthropology 46, no.2 (April 2005), 161-190.

[94] The mandate for local participation in decisions with environmental impact is clearly established in the Rio Declaration, Principle 10, »Environmental issues are best handled with participation of all concerned citizens, at the relevant level.« »[Public p]articipation in decision-making is of key importance in efforts to tackle climate change. … The right to participation in decision-making is implied in article 25 of the International Covenant on Civil and Political Rights which guarantees the right to 'take part in the conduct of public affairs'«. Report of the Office of the United Nations High Commissioner for Human Rights on the relationship between climate change and human rights (Jan.15, 2009), U.N. Doc. A/HRC/10/61, at para. 79, available at http://www.ohchr.org/Documents/Press/AnalyticalStudy.pdf. Elizabeth Ferris, »Protection and Planned Relocations in the Context of Climate Change,« Legal and Protection Policy Research Series, UN High Commission on Refugees, Internal Displacement Division, (Geneva: UNHCR, 2012), calls on lessons learned from displacement for development projects to inform climate displacement processes. Local participation in resettlement planning is emphasized. Community based risk assessment is highly developed. For example, see the Brookings-LSE collaborative project on displacement that has sponsored many scholarly studies focused on »bottom-up« evaluation of climate change risks and bottom-up analysis of costs and benefits of relocation. See, http://www.brookings.edu/about/projects/idp. See as well the projects of WeADAPT, at WeAdapt.org, and the Nature Conservancy 3D modeling initiative, at http://www.nature.org/ourinitiatives/regions/asiaandthepacific/solomonislands/explore/choiseul-3d-modeling.xml. However, there is no mandate to fund projects conceived at the local level.

ing the World Bank, the European Union, and the United Nations Environmental Program (UNEP) have followed suit in changing their emphasis from mitigation to adaptation. The World Bank Economics of Adaptation to Climate Change Study estimates that the costs of adaptation per year between 2010 and 2015 will be from $70 to $100 billion (615). This same study notes, without irony, that the best adaptation strategy is development, because development allows economic diversification and therefore increases resilience. Freestone remains silent on the increased greenhouse gas emissions produced by this accelerated drive to development, and on the increased opportunities for the World Bank in financing accelerated development.[95] At the very least we must recognize that accelerated development in the name of adaptation removes us ever further from the goal of climate change mitigation.

Michelle Leighton's »Population Displacement, Relocation, and Migration,« Chapter 20 of The Law of Adaptation, sounds the familiar battle cry of imminent disaster for which states are not prepared (719). This disaster will fall disproportionately on the less developed world. Climate displacement will likely affect one in nineteen residents of developing countries, while only impacting one in 1,500 residents of OECD countries (693). Estimates of total numbers likely to be displaced range widely from 2.3 million per year to 62 million per year (693). Refugee law will not accommodate these individuals, as under refugee law climate migrants appear to be mere economic migrants (705).[96] Meanwhile, states that lose all or most of their territory due to sea level rise must negotiate for permanent residence elsewhere, as the Carteret Islanders did with Bougainville in Papua New Guinea. This negotiation, not discussed in Leighton's chapter, is notable as a people-to-people solution rather than an agreement between states. Indeed, the migration of the Carteret Islanders has been accomplished through public campaigning for funds and it was made possible in large part by the donation of church land.[97] Such local initiatives to settle displacement crises do not make it into Leighton's state-centered analysis. Locally driven and negotiated resettlement, however, deserves greater recognition and should be allocated international funding because state-led resettlement is typically plagued by corruption.[98]

Abundant evidence in Gerrard and Fischer Kuh's massive tome points to the maladaptive realities of adaptation programs. Adaptation is piecemeal, provisional, and frequently commercialized; it has become a money-making creature of the market-place. Primary examples of this mal-adaptation include the World Bank policy to promote increased rates of development as a means of fostering adaptation, the commercialization and militarization of the Arctic, and the negative impact of hydraulic fracturing and biofuels on water supplies. Taking perspective on the adaptation strategies in this book, however, reveals a troubled agenda that is absorbing huge amounts of environmental experts' time and energy. Adaptation builds upon the failed policies of climate change mitigation and there is no basis to expect it to be more successful. Adaptation moreover aims to preserve the status quo economic order, thereby guaranteeing continued or even accelerated environmental degradation.

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[95] On the unlikelihood of increasing development and reducing green house gas emissions see Humphreys, Human Rights and Climate Change, 23, note 50. Not mentioned in this chapter, or indeed in this book, is that environmental organizations have campaigned for the World Bank to perform carbon accounting on its loans, as the environmental organizations point out that the mitigation and adaptation projects financed by the Bank are outweighed by the financing of new coal fired power plants and other high emissions development projects.

[96] A leading voice in this advocacy is Walter Kälin, an expert on the rights of internally displaced peoples. See his »Guiding Principles on Internal Displacement, Annotations,« Studies in Transnational Legal Policy, no. 38, (Washington DC: American Society of International Law, 2008).

[97] Alyssa Johl, »Local Adaptation and Climate Displacement: Cateret Islanders,« manuscript. Jennifer Redfearn's film, The Sun Come Up (2011) documents this migration. At least some Carteret Islanders have voiced strong criticisms of this film. In the U.S. it was nominated for an Academy Award.

[98] Displacement for development projects, most notably for dams, typically does not adequately replace lost land and livelihoods. See World Commission on Dams, Dams and Development: A New Framework for Decision-Making (Sterling, VA; Earthscan Press, 2000), 102-130

CONCLUSION

The earth has existed for 4.54 billion years; biologically modern humans have been around for only 200,000 years. 99.9% of the entire time earth has existed, it existed without modern humans. In the mere 200 years of industrialized capitalism our species has developed into a threat to the life-sustaining systems of our planet. Writing law and forming governance adequate to confront this crisis is a daunting task that demands detailed laws around the world based in a barely emergent theory of species-governance. This review has delved into particulars that demonstrate how existing environmental governance is plagued by weaknesses and co-opted by neo-liberalism. The substantial and diverse expertise of numerous environmentally dedicated individuals has produced certain in-roads and victories, but not a coherent edifice.

Incremental gains, small islands of preserved ecosystems, and the hope that a confluence of technological innovation, good governance and heightened intelligence will allow the thriving of our evolved world may generate some optimism. But global success will require much more substantive legal, ethical, and economic reform at the global level. The blueprint derived from more optimistic legal scholarship suggests a World Environmental Organization could play a significant role in moving reforms forward. Another strategy is to align environmental rights with human rights. This consolidated agenda will need to displace neoliberal free-trade law from its position of primacy in international governance. The counter-story, however, is that environmental experts' energy is increasingly invested in piece-meal adaptation strategies, commercial enterprises increasingly see profit in climate change (as in the Arctic), and a national security agenda biases or even balkanizes climate change management. Al Gore's lament that strong leadership is absent reflects the current eclipse of the environmental agenda on the national and international stage, even as activists, experts, and professionals battle to make progress to reduce carbon emissions. This is a field in which scholarship and theory have advanced faster than the political capacity for reform. Law that recognizes the power and the responsibility of the human species as a geological and evolutionary force is needed. The difficult task ahead of us is to develop law that recognizes the cosmological specificity of evolved life on earth and that vests humans with the responsibility to respect and protect the evolved world.[99]

SAŽETAK

Zemlja postoji već 4,54 milijardi godina; biološki moderni ljudi su okolo za samo 200.000 godina. 99,9% od ukupnog vremenskog Zemlji postoji, ona postoji bez modernih ljudi. U više od 200 godina industrijalizirane kapitalizma naša vrsta razvila u prijetnju sustava za održanje života na našem planetu. Pisanje zakona i formiranje vladajućih institucija adekvatno suprotstaviti ovu krizu je težak zadatak koji zahtijeva međunarodne pravne režime sjedištem u nastajanju teorije ljudske vrste-upravljanja koji priznaje prava dnevnoj zemlji. Ovaj esej istražuje kako postojeća vlast okoliš je udario po slabosti i kooptiran od neoliberalizma. Brojni ekološki posvećen pojedinaca su ucrtana putove prema naprijed, ali mi još uvijek nemamo suvislu građevinu politike i prakse koje će riješiti krizu na okoliš. Obećavajućih nastajanju veza između prava okoliša i ljudskih prava zahtijeva poluge iz bogatije konceptualizacije okoliš za pružanje učinkovite upravljanja okolišem. Težak zadatak pred nama je razviti zakon koji priznaje prava evoluirao život na Zemlji i da prsluci ljudi s odgovornošću da poštuju i štite evoluirala svijet.

[99] That private decisions and daily practices are fundamental to environmental renewal is argued in Peter Newell, »Human Rights and Corporate Accountability,« in Human Rights and Climate Change, ed. Stephen Humphreys (New York: Cambridge University Press, 2010), 126-158, 128

»*WUAI, KESIAZHEH, NYENGUI*:« HISTORY AND LIVELIHOOD CHALLENGES IN A CAMEROON'S MONTANE FOREST RESERVE

WUAI, KESIAZHEH, NYENGUI: POVIJEST I ŽIVOTNI IZAZOVI U ZAŠTIĆENOM ŠUMSKOM REZERVATU KAMERUNA

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Summary

This paper examines the challenges Laimbwe people face in utilizing resources in the Kom/Wum Forest Reserve in Cameroon for their livelihood. The reserve was created in 1951 and since then movement into and exploitation of resources therein was regulated by forest guards and those who went ahead to do so were punished. The increase in the population of the villages in and around the reserve has forced many to venture into the forest to sustain life. This illegal encroachment for food and shelter has led to rapid deforestation and created more conflicts between the users of the forest and officials of the Ministry of Forestry and Wildlife in Cameroon. The government seeks sustainable use of the forest and its resources for the benefit of the nation, the local population, and other stakeholders in the forest sector.

Key words: Forest, Livelihood, Cameroon, Grassland, Sustainable
Ključne riječi: šuma, život, Kamerun, travnata stepa, održivi razvoj

INTRODUCTION

The international concern and awareness about the environment today is due to changing climatic conditions and global warming. Such has been accentuated by the unsustainable exploitation of natural resources and other human activities that harm planet earth. Considering the damage this has caused already, there is growing concern from different parts of the world about urgently preserving what is left of the environment. In many African countries south of the Sahara, areas that were once covered by natural evergreen forest with flowing rivers are bare and the rivers have dried up with untold consequences on the population, the architects of deforestation. Due to the alarming rate at which forest is 'chopped down' by foreign logging companies (Brown *et al* 2003:2) and the dilemma of governments of developing countries to raise revenue from forest exploitation while striving to protect it, there have been attempts to sustainably manage the forest by also engaging the community, the challenges notwithstanding.

Various efforts have been made by national governments, international organizations as well as the African Union and the United Nations Organization to bring the issue of sustainable management of the forest and other resources to the table. These attempts have met with acceptance and enthusiasm but also with resistance and criticisms. Those who have accepted forest regulation and protection argue that the rate at which environmental degradation takes place, if nothing is done to stop it, dooms the human race and future generations to disaster (Sieböck 2002: 2; Oyono 2005a: 1; Oyono *et al* 2005: 357). They have

invested money to support programs aimed at protecting the environment and its rich biodiversity for the good of the human race and also to promote tourism. Others have criticized calls for environmental protection on the basis that the communities located close to resources tend to be deprived of its use while other commercial groups elsewhere and a 'forestry elite' benefit (Ibid; Samndong and Vatn 2012:213). Many other reasons have been given in support or opposition to calls for environmental protection but it suffices to say that environmental issues are seriously taken into consideration by industry, civil societies and others who want to see a more rational use of the resources by avoiding wastage. Cameroon is one of the countries in West/Central Africa that has been actively involved in the sustainable management of forests and other natural resources.

RELEVANCE OF STUDY

Forests all over the world have become important sites for the conservation of biological diversity. People living around forest areas value the forest for several reasons. The forest is a reservoir for the supply of water, fuelwood, medicines, honey and other products with a cultural and spiritual importance (Gardner n.d.: 153). In fact, the forest means a lot to local communities in terms of its socio-cultural and economic importance.

Montane forests are rare and small when compared with the vast lowland forests of the Congo basin for example but recognized as globally important centers of endemism, containing significant numbers of birds, animals, and plants that are found nowhere else. The importance of these categories of forests like those of the Bamenda highlands in Cameroon[1] cannot be over-emphasized. Conservation experts believe they need to protect the montane forests like the Kom/Wum Forest Reserve that is the subject of this study. In this and other forest reserves of the grasslands of Cameroon are rare species of mammals, reptiles and amphibians that are still to be fully studied (Gardner n.d.: 154-155). These reserves provide opportunities to study and protect the many species of birds, animals and plants that are endemic, rare, or vulnerable. These are ecologically, socio-culturally and economically significant protected areas. Forests also act as watersheds for many water courses. Water is life in terms of fishing, regulation of climate, and other functions and if the forests that serve as watersheds are not preserved then these rivers eventually dry up and people suffer.

Forests in Cameroon like elsewhere also play an important social role in the livelihood of forest dependent people. Apart from the traditional use of non-wood forest products like fruits, bush meat and medicinal plants, community forestry has opened additional opportunities for forest dependent communities. Through this they have become involved in forest management and forest products processing (Amariel 2005: 6). Community forestry does not only build capacity, it offers additional value to forest products and make people to sustainably manage their own forest for the present and the future. With inadequate knowledge in forest management, the people in some rural communities destroy forests and in doing so mortgage the future of their offspring. The sustainable management of forests fosters the livelihoods of the people in several ways. It also provides protein in the form of bush meat and various edible plants and a job to the hunters who rely on the forest for sustenance (Amariel 2005: 7). Forest protection has also valorized conservation education, tourism and rural development in different ways (Bisong *et al* 2009: 166).

The timber and non-timber forest products have been of industrial significance. The wood obtained from logging has been used by the sawmilling, pulp, and paper manufacturers, and furniture and fixtures industries (Ogendo 1966: 509). Through this, employment has been provided to many people at the level of transportation of timber from the forest to the industries as well as those employed to work in various

[1] The forest reserves of the North West Region of Cameroon which have however come under illegal exploitation include the Mbembe Forest Reserve created in 1934, Fungom Forest Reserve created in 1951, Kom / Wum Forest Reserve created in 1951, Bafut Ngemba Forest Reserve created in 1953 and the Bali Ngemba Forest Reserve established in 1961. All these forest reserves but for one were created in the colonial period. Only the Bali Ngemba Forest Reserve was created in 1961, the year of the reunification of British Southern Cameroons with the Republic of Cameroon.

related industries. Even sawdust from the sawmill industry is used as additional fuel to the one that is harvested directly from the forest. Other non-timber products obtained from the forest have been used in pharmaceutical and other industries providing employment to many people and saving lives through the medicines produced.

CAMEROON'S FORESTRY POLICY AND HISTORY

Cameroon as a country is located within West and Central Africa with a population of over 20 million people. The country lies between latitudes 2° and 13° N and between longitudes 8° and 16° E. It has been described as all of Africa in one triangle or »Africa in miniature« because of its wide range of climates and ecosystems stretching from the Sahelian through the Afro-montane region of the Savannah to the coastal forested region of the South. This bilingual country has four principal types of forests including the Atlantic, pluvial, high altitude and the Guinea-Congolese forests. Other scholars like Amariel (2005: 5) classify the Cameroon forests into three: plain evergreen, plain semi-deciduous, and mountain forests. There are however protected areas covering about 8.4% of the land area. Of these protected areas, there are approximately 125 forest reserves, which represent about 4% of the total area.

The reserves vary in sizes from a few hectares to 300,000 hectares and cover an area of around 18,600 square kilometers. These reserves, production and protection forests are the property of the state of Cameroon but most of them are in very poor condition. Farming activities in many of them have destroyed these reserves. The guards are few in number and ill-equipped to protect these forests from degradation. Above all, forest reserves in Cameroon receive low budgetary and infrastructure priority, which helps explain why they are in a poor state (Benhin and Barbier 1999: 6-10).

When Germany colonized Cameroon on July 14 1884, the country's ethnic groups living in the forest zone had established territories. They managed natural resources according to family law and the village chiefs were the main managers of these resources. Those who went hunting in the forest returned and presented their catch to the chief who distributed it to the villagers. Hunters who went out of the village hunting zone obtained permission from the chief and those who went ahead without permission were punished accordingly. The communal management of the forest and its resources gave way to German legal ownership. The cohabitation of the new version of the state introduced by the Germans and customary systems created problems that continued after independence and the reunification of Cameroon in 1960/61. Villagers were prevented from killing animals without obtaining hunting permits (Oyono 2005: 115; Mengang n.d.: 239-241) and those caught without permits were sanctioned. When Cameroon was divided into British and French Cameroon after the First World War, France took control of French Cameroon as a Mandated Territory of the League of Nations in 1922 and in 1930 began to create hunting reserves. The French colonial administration also educated the local population about the need to plant exotic plants. Game guards were put in place to protect forests and wildlife (Mengang n.d.: 241). With regards to British Southern Cameroons, which came under the control of the British during the same period, a forest conservator was appointed to assist the government in the management of the forest (Njoh 2007: 113).

The laws that governed exploitation of the forest and its products during the colonial period were tailored to benefit the colonial state. The conservator in British Africa was more or less a watchdog of the colonial state over the forest and its precious resources. The introduction of exotic plants using local labor was to serve the economic interests of the state. These exotic plants possessed enormous commercial value within the global capitalist system (Njoh 2007: 113; Community Forest 1). Such a forestry policy, which was intended to benefit the state to the detriment of local communities continued in the post-independence era in Cameroon Amungwa 2011: 53). In the 1974 Land Ordinances all forest areas without statutory titles are »communal« and therefore subject to local traditional resource rights regimes. Such forests fall under the recognized sovereignty of community chiefs. These chiefs have certain political and legal rights over these lands as attested by their ritual powers over them. The state however maintained limitless power over land and related resources (Minang and Mccall 2006: 87; Njoh 2007: 113). In 1976

following the Fourth Five Year Development Plan (1976-1981) all forest within the national territory was to be the property of the state. Such a policy gave an opportunity for the state and by extension political bureaucrats, military and entrepreneurial elite and logging companies to benefit from forest development (Njoh 2007: 113).

Eighteen years after the 1976 law relating to ownership of forests in Cameroon a forestry law was enacted. The 1994 Forestry Law No. 94/1 of 20th January led to the introduction of »community forests« managed by the neighboring community based on a management plan agreed to with the state. It considers that all benefits accruing from the management of the forest go to the community in which the forest is located (Gardner n.d: 154; Alemagi 2011: 65). According to this policy the Mount Cameroon Project for example has initiated a participatory biodiversity conservation approach to wildlife management to ensure sustainability and appropriateness to the local needs of the people in terms of use, capacity and resources. This local wildlife management scheme has led to the issue of hunting licenses, the development and allocation of sustainable quotas, sanctions, monitoring and control of wildlife activities. Similarly, in the Bamenda highlands community forestry has developed as a partnership between the conservation community, which is interested in the conservation of biological diversity, and the local population which is interested in the benefits derived from the forest (Olsen *et al* 2001: 13; Gardner n.d.: 153). The introduction of the community based management options was the outcome of a poor management of government reserves. In spite of this, there are many forests which are not under community management because the communities are not interested in them and in some cases, forests already designated as government reserves need to be managed by the government (Gardner n.d.: 158). There are therefore numerous problems associated with forest conservation and management as a whole in Cameroon and other African countries.

PROBLEMS ASSOCIATED WITH FOREST CONSERVATION AND MANAGEMENT

The conservation of the forest nowadays notwithstanding, there are still problems associated with conservation. This is usually because no society embraces nature, landscape or forest in a harmonious manner (Klanovicz *et al* 2008: 94) but often with conflict. Human activities like farming and the establishment of large-scale plantations often lead to forest encroachment and degradation. The bush meat trade also leads to the depletion of wildlife. It is estimated that 78,000 metric tons of bush meat is harvested annually in Cameroon. In spite of the law on protected or endangered species, poachers continue with bush meat trade, the risks notwithstanding (Olsen *et al* 2001: 13; Amariel 2005: 7 and 17). Other recurrent problems are conflicts between elephants and farmers. Farmers' livelihoods are affected by crop damage from subsistence cultivation around the forest reserves or other community protected forests. In Central and West Africa over 408 lives were lost in 2012 alone due to human-elephant encounters with enormous property damage. In this same year, over 1017 elephants were estimated killed in the forest zones of the North West, South West and Littoral Regions of Cameroon alone due to the international ivory trade. (Nkwatoh and Fosah 2012: 266-268; Tchamba and Foguekem 2012: 79).

Rapid deforestation for small-scale agriculture has been a problem. Shifting cultivation is responsible for about 79-95% of all deforestation in Cameroon and other parts of Africa like Tanzania. The practice of slash and burn in cultivation has led to a high dependence on the forest. Another problem is the logging of timber for export and this depletes the forest at an alarming rate in Africa (Alemagi 2011: 65; Kihiyo 1995: 164; Boateng 2013; 21; Cáceres *et al* 2013: 91; http://usaidlandtenure.net/cameroon). The production of timber has also opened up the forest for agricultural activities by farmers further depleting the forest of its rich biodiversity (Benhin and Barbier 1999: 5-12). In the highlands of Bamenda in Cameroon for example, there is a progressive destruction of the forest through farming and grazing for sustainable livelihood. What is left is small patches of forest (Gardner n.d.: 153) that cannot support the needs of the population at the present and in the future. Besides, the lack of appropriate forest management and use has kept rural communities poor because they have often misused the forest without consideration for the future. The introduction of community forestry was a result of the poor management of the forest reserves

created by the government before and after independence such as the Kom/Wum Forest Reserve created in 1951 (Saving the Natural Heritage 2009). Yet, there is self-seeking behavior among members of village management committees like in the southern part of Cameroon. This has resulted in the absence of an effective environmental representation and rural democracy because many of the committees are unaccountable to the people. Disputes between villages neighboring forest reserves over some forest resources which have led to their depletion have also been difficult to overcome (Amariel 2005: 6; Gardner n.d.: 158; Phil and Efoua 2006: 147-148).

The governments of post-independence African countries have created problems for the local populations, who are the greatest beneficiaries of the forest. There is in Cameroon for example, a *conflit de langage* between the state and local communities on land and forests ownership as well as on the regulation of access to natural resources. This situation has been compounded by the creation of concessions on customary lands, the creation of protected areas, the sharing of revenues from commercial logging, the establishment of agro-industries and oil compensation (Phil 2005: 115). There is also a continuous degradation of the forest in the African continent due to the persistence of conflicts between agriculturists and forest guards who are charged with the responsibility of preserving the forest from destruction. It is also because the resources of the forests are exploited without consideration for regeneration or sustainability (Nemb 2011: 1). Since governments are keen on playing down on unemployment figures and also in raising money for development, they have found it difficult to achieve these without conflicts.

Other problems include the extraction of fuelwood for commercial fish smoking in the mangrove ecosystems such as in the Douala-Edea Wildlife Reserve (DEWR) and most of the West/Central African coastal systems. The destruction of the mangrove forest has a multiplier effect because fish, shrimps and Non Timber Forest Products (NTFPs) have become scarce around these ecosystems (Feka *et al* 2009: 450-451). In addition, major provisions of Cameroon's forestry and environmental policy serve the interests of powerful domestic and international stakeholders rather than the country's national goals. This policy also serves the interests of the elite and other powerful members of the country's forest and environmental stakeholder pool. Through it, strangers in areas of community forests have been excluded and this has created tension between indigenous and non-indigenous populations (Njoh 2007: 109-118). Even in districts such as Mwenezi in Zimbabwe where various communication systems and networks have been used to influence the behavior of target groups, there are still lapses due to favoritism, bribery, gender, age and status (Mudege 2003). Forest exploitation is generally advancing at an unsustainable pace and forestry rights have become increasingly complex and subject to active disputes (http://usaidlandtenure.net/cameroon). The Kom/Wum Forest Reserve of the grasslands of Cameroon has known its own fair share of problems although it remains important for the sustainable livelihood of the people.

KOM/WUM FOREST RESERVE: REGULATION, CONFLICT AND LIVELIHOOD CHALLENGES

In the North West Region of Cameroon is the Kom/Wum Forest Reserve, which covered a total surface area of about 13,440 acres in 1932.[2] It was officially surveyed and demarcated into the Kom/Wum Forest Reserve by the British colonial administration in 1950/51 (Kah, 2001).[3] This forest reserve was regulated by the Forestry Ordinance of Nigeria established in 1916. In section 24 of the Ordinance it was considered lawful for a Native Authority with the sanction of a Lieutenant Governor to fell protected trees without payment of fees or royalties when the timber thereof was required for public purposes. The general provisions of the Forestry Ordinance prevented any person from taking any protected timber or protected minor forest produce, uproot, destroy or injure any oil palm or any protected tree or protected minor forest produce or any tree or plant from which any protected minor forest produce was obtainable.

[2] File No. 4583A, Ad 17, Assessment Report on the Wum Native Authority Area of Bamenda Division 1932, National Archives Buea henceforth cited as NAB.

[3] File No. 106, Ci (1950)1, Annual Reports (Report of 1952 enclosed). Also 1951, 1953 and 1954, Wum Division, NAB.

Also, people could not tap any oil palm for palm wine. People could only do this through a licence or permit issued under these regulations. People who wanted to fell trees paid fees before doing so.[4]

The Kom/Wum Forest Reserve is rich in different species of animals, trees and fruits and extends from around River Mughom in the North East of Bu northwards to Mbengkas and Baisso village settlements. The North West section of the forest is sacred and locally called *ngekang* or *ngulekang*, meaning the Nduokang lineage 'bush.' The forest cover is thick, the trees tall and many of them hundreds of years old. On the western section of the reserve is a gallery forest through which flow the rivers Meteh, Menchum (Metschem), Tschuh Akooghe and Mughom. Along these river valleys are intensive rice, maize and cocoyam cultivation for domestic consumption and commercialization to Wum and Bamenda. A greater portion of the reserve descends into the River Meteh valley towards the east and the Tschuh Akooghe, a tributary of Meteh, which takes its rise from the Kom hills. In the past elephants and gorillas were hunted for food in this section of the forest (Andreas Kom Personal Communication 2008; Jacob Bah Personal Communication 2009). The forest cover from east to west of Laimbwe country occupies a stretch of undulating terrain within an altitude of between 680-1040 meters above sea level. The forest is estimated at about 210 hectares in size containing 22 types of animals, 57 types of trees, shrubs and ground plants and over 160 different types of birds (Mbengkas Community; Lah 2005: 1). The altitude of the forest rises further after Baisso into the Kom hills. This is an extension of the range of hills constituting the Bamenda highlands of Cameroon.

The Laimbwe people who are the occupants of the Kom/Wum Forest Reserve are a very hardworking people. Their major economic activities are agriculture, fishing, lumbering, hunting and small businesses that involve buying and selling agricultural products. They cultivate food and cash crops like maize, cocoyams, rice, groundnuts and coffee. The men and recently women also keep livestock such as goats and pigs for sale and also for funeral celebrations (Kah 2011, 2012 and 2013). Cattle herding is a preoccupation of the Fulani people locally known as Akus. To gain respect in the community, a Laimbwe person is expected to give birth to a child and be able to care for this child through the provision of his or her basic needs such as food and bush meat. This philosophy of life and sustainability is summed up in what the people proudly refer to as *Wuai, Kesiazheh* and *Nyengui*. When literally translated this means child, food and bush meat. It is represented by three straight white lines and better valorized by masquerade societies like the *Libah* and others when they are performing. Three within the Laimbwe system of belief is therefore as important as the trinity to the Christians who talk about God the Father, Son and Holy Spirit. The Kom/Wum Forest Reserve with all its resources has remained important in the realization of the dream of the Laimbwe people who rely on it for their daily bread or livelihood. The restriction of people from using its resources for sustaining life became a source of conflict between the people on one hand and the Germans and British on the other.

At the beginning, the German and British presence in Laimbwe land between 1900 and 1961 accelerated the exploitation of its natural and human resources. The tracing of the Bamenda -Wum road by the German colonial administration to facilitate administration and promote commerce opened up what was to be later gazetted by the British as the Kom/Wum Forest Reserve . The construction of the road through the forest led to the destruction of shrines belonging to lineages within and around the reserve. Even the rights of the people to these shrines when the reserve was established were systematically forfeited. Forest guards restrained Laimbwe people from the exploitation of certain resources like the iroko and mahogany trees in the Reserve. Those who defied forestry rules were sanctioned by officials of the forestry department. From this period onwards the Laimbwe people who are located around the forest reserve have been at conflict with the forestry officials (Chief Chu 2 February 1978; Welcome Address to D.O. Wum 22 November 1985; Address to S.D.O. 2 April 1986; Muam 2001; Confidential Findings

[4] File No. Qh/a, 1916/2. Forestry Ordinance-Regulations made under the Forestry Ordinance Nigeria 1916, NAB; File No. 242/17, Qh/a, 1917/3, Timber-Report on System of Felling-Calls for, NAB.

27 October 2004; Letter of Fon Mpai n.d.; Memorandum Divisional Delegate undated; Letter Divisional Delegate 2 February 2005; Simon Muam Asang Personal Communication 2008). [5]

When rice was introduced into Laimbwe land as a cash crop in the early 1950s from Nigeria by the British,[6] the Laimbwe people needed more land for its cultivation and commercialization. This was only possible through encroachment into portions of the forest reserve. The people of Bu village were the first to do so against opposition from officials of the forestry department. After repeated conflicts with forest guards over the destruction of forest in many areas for rice plots, agreement was reached between the two parties between the late 1970s and early 1980s. A portion of land was then handed over to the village for rice farms. This was however not enough and before long the Bu people occupied more land in what is today a temporary settlement, Nduneei. From Nduneei, the people have destroyed more forest through slash and burn during the dry season (Akemwa Personal Communication August 27 2008). A few of them have seen reason to plant cocoa and bananas in the forest without necessarily destroying it. Across the other side of the Meteh River valley, the inhabitants of Mbengkas since the start of the 21st century have destroyed the forest for rice farms. The commercial value of rice is high because of its high demand in the towns of Wum , Fundong and Bamenda to complement the quantity imported from South East Asia into Cameroon and that produced on the Ndop plain. The inhabitants use the proceeds to construct modern houses and also to educate their children.

The forest reserve has not been taken proper care of by the forestry department although there are threats of sanctions to people who clandestinely exploit its resources (Confidential Findings 27 October 2004; Welcome Address to D.O. Wum, 22 November 1985; Address to S.D.O. 2 April 1986; Letter Fon Mpai undated; Memo Divisional Delegate undated; Memo Divisional Delegate 2 February 2005).[7] The Laimbwe people argue (and rightly so) that the Reserve is their property and serves as home for ancestral shrines of their lineages and other socio-economic purposes. This sharply contrasts with the position of the government represented by officials of the Divisional Delegation of Environment and Forestry Wum and Fundong who are opposed to claims of ownership of land within the Kom/Wum Forest Reserve (Letter Divisional Delegate 2 February 2005). Illegal logging in the forest reserve has attracted a flurry of petitions to Wum and Fundong administrations but this has not deterred those involved in illegal exploitation from ending it (Welcome Address to D.O. 22 November 1985; Address to S.D.O. 2 April 1986).[8]

The Laimbwe people and some government officials believe in exploitation without replacement and some forest guards collect money from illegal exploiters who devastate the remaining forest with impunity. The sawing and transportation of timber for money became big business in Laimbwe land after the independence and reunification of Cameroon in 1960/61 because of the introduction of the machine chain saw in replacement of the handsaw. Its introduction led to rapid deforestation of the savannah Kom/Wum Forest Reserve without immediate attempts made at its regeneration to this century. These problems over the use of the Kom/Wum Forest Reserve explain why there is need to put in place a better management policy.

TOWARDS A SUSTAINABLE MANAGEMENT OF THE FOREST

Considering the importance of the Kom/Wum Forest Reserve to the livelihood of the Laimbwe people and to the government in terms of regulating the rich biodiversity, it is important to find a middle ground to end the conflicts over the use of the forest since the colonial period. Continuous conflicts between Laimbwe people and forestry officials, the rapid depletion of the reserve due to human activities and inter-community conflicts over the exploitation of the resources will not lead to a more efficient

[5] NW/Qb/a. 1982/6/Bk, Annual Report on the Situation of Economic and Social Development Menchum, 1st July 1981- 30th June 1982, Regional Archives Bamenda;

[6] File No. Ci (1957)3, Annual Reports Wum Division, 1955, 1956 and 1957.

[7] NW/Qb/a. 1982/6/Bk, Annual Report on the Situation of Economic and Social Development Menchum , 1st July 1981- 30 June 1982 Regional Archives Bamenda henceforth cited a RAB.

[8] Ibid.

and sustainable management of the forest and its resources for the present and future generations of Cameroonians. Rather, it would only complicate issues further.

An important step towards sustainable management and preservation of this montane forest reserve is for the Ministry of Forestry and Wildlife to incorporate indigenous initiatives in agro-forestry. This will give the people confidence and a sense of belonging as far as proper and sustainable management of the forest is concerned. Indigenous initiatives have been incorporated into the management of protected areas in other places like the Cross River National Park in Nigeria and within areas covered by forest among the Shona of Zimbabwe. Prohibitions and restrictions through taboos on unsustainable use of certain plant species, forests, mountains, rivers, pools and non-human animals, among other ecological species in the ecosystem, is not a new epistemology among the Shona people but reflect a long tradition from time of old.

There are similar calls for indigenous methods of forest preservation to be made part of the sustainable management of the forest in southern Brazil (Bisong *et al* 2009: 165; Klanovicz *et al* 2008: 94; Chemburu and Masaka 2010: 121; Tanyanyiwa and Chikwanha. 2011). The failure of the local population to collaborate with forestry officials or those exploiting the forest is usually because of the non-involvement of the people in designing programs for sustainable management of their forest resources. Even when efforts are made to devolve decision-making and resource control to local populations the conflict of interests and marginalization of traditional authorities has marred its successful execution (Egbe 2001:1; Oyono 2005a; Dupuy and Bakia 2013). If conscious efforts are made to incorporate their perception of sustainable forest management they are more likely to contribute to the process of managing and protecting the forest reserve which also benefits them.

Since a lot of the pressure on the forest is a result of the farming methods adopted by peasant farmers, it is important that the Cameroon government through the Ministry of Agriculture introduce more sustainable farming methods that will reduce the pressure on the forest in this and other areas. Such measures should be harmonious with the culture of farming among the Laimbwe people. Other methods could be introduced and made popular among the people through education and provision of necessary tools. This can reduce the practice of shifting cultivation and slash and burn which has destroyed the flora and fauna and rich and scarce biodiversity of the reserve. This is crucial not only for the Kom/Wum Forest Reserve but also the other forest reserves of the grasslands of Cameroon created mostly during the colonial period. Other West African communities are adapting to new farming methods which do not necessarily involve huge capital and technology. This is to avoid conflict between forestry officials and the local communities over the exploitation of forest reserves and also to sustain lives (Boateng 2013: 21).

Massive education campaigns in schools, churches, social groups, family meetings, traditional institutions within the Laimbwe villages of Baisso, Bu and Mbengkas should be embarked upon to show the importance of having a forest and sustainably managing it to fight poverty and handle the needs of a growing population. Continuous education in the Laimbwe language will likely lessen tensions between the people, forest officials and illegal exploiters of timber and other plants highly demanded in big towns and cities like Bamenda and Douala (Brown et al 2003:2). The over-riding aim of such planned education campaigns should be geared towards instilling in the people a sense of sustainable management of the forest reserve. One of the campaign strategies should be to invite elders to talk to the younger generation about the ways of preserving the environment in general and the forest and its resources in particular. These elders should also explain to the population the dangers of losing important plant species used for treatment of diseases through reckless exploitation of the forest. For the young who are still to build their own houses and to give birth to children and nurture them, education campaigns will make them see reason to use the forest wisely and preserve it so that when they grow up they will use its resources to build houses and to feed their own children.

The government of Cameroon should also learn from the British policy of forest regeneration, which was introduced during the colonial era. Timber exploitation in the reserve was carried out in organized groups and regulated by the Provincial Forest Officer for Bamenda Province through a pit saw-

ing scheme.[9] The lumbermen used the handsaw and fell trees over a dug hole, which was physically demanding and exhausting. There were four gangs of sawyers one of which was composed of sawyers entirely from Bu, a village located in the forest reserve.[10] Between 1952 and 1956 alone over 37,616 cubic feet were felled.[11] During the colonial period there was a simultaneous effort at the regeneration of the Kom/Wum Forest Reserve by the Native Authority (NA). Nursery men of the NA grew seedlings of trees of economic value for regeneration using abandoned pits. The *khaya* and *entandrophrama* plants were planted on these disused pits. Forest guards regularly patrolled the boundaries of this Reserve to carry out maintenance work and also watch out for illegal deforestation by Laimbwe and other neighboring people. This has long been abandoned by the Cameroon government. Besides, the Wum and Fundong councils should copy the good practice of the NAs and invest in the forest reserve considering its importance to the livelihood of the people.

The divisional services in charge of forestry and wildlife in Menchum and Boyo Divisions of the North West Region of Cameroon should do a lot more to create a partnership with the local population in both divisions to manage this forest sustainably. At the moment a lot of illegal timber exploitation is carried out by people from the neighboring Bafut sub-division who come at night and before it is dawn they have sawn and transported timber across the River Menchum. Other illegal hunters also come in from other areas and exploit resources in the reserve with impunity while the local population is prevented from doing so. The Laimbwe people like other communities in Cameroon have on several occasions petitioned for total declassification of reserves to be registered to the communities since they consider the reserve as their territory (Oyono *et al* 2010: 157) The social impact of this like elsewhere in Cameroon is environmental degradation and marginalization of indigenous communities (Cameroons Troubled Timber Industry 2007:1) There is therefore need for more trained forest guards who should be able to save the forest reserve from extinction and cause the waters of the Rivers Meteh and Menchum to dry up with negative consequences on the population.

CONCLUSION

This paper has attempted to discuss the importance of sustainable management of forests so that the people located around it can benefit from shelter, food and clothing. The Kom/Wum Forest Reserve, one of the reserves in the grasslands of Cameroon is very important to thousands of people for its rich biodiversity. It is more or less a source of livelihood for the people of the Laimbwe community and other towns and cities of Cameroon. Its importance in a savannah region of Cameroon cannot be over-emphasized. People with montane forest need to be more careful in its exploitation because failure to manage the forest well will lead to the emergence of a desert, the drying up of water catchment areas and the multiplier effect of all of this on climate, on livelihood and the security of the population.

The livelihood of the Laimbwe people of Cameroon was tied to the Kom/Wum Forest Reserve even before the British declared it a reserve in 1951. Its establishment as a reserve laid a foundation for internecine conflicts over the use of the resources in this forest by the people. When the forest was designated a government reserve, movement into it to exploit resources came under the control of the forestry department. This rigid control and limitation of farmland from the reserve contributed to the Laimbwe women's revolt against the colonial administration between 1957 and 1959. The women questioned the demarcation between farmland and the reserve and in protest destroyed the boundary stones or cairns planted by the government. The result was the arrest of the leaders and not long after women were to come to terms with the reality that access into the forest was no longer as free as before.

After independence and following an increase in population and in the demand for material to build houses, many more conflicts were registered between the people who needed forest resources and offi-

[9] File No. 106, Ci (1950)1, Annual Reports (Report of 1952 enclosed) Also, 1951, 1953 and 1954, Wum Division, NAB.
[10] Annual Report 31 August 1950- 31 September 1951, NAB.
[11] File No. Ci (1957)3, Annual Reports Wum Division 1955, 1956 and 1957, NAB.

cials of the forestry sector who wanted a regulated exploitation of these resources. There were other conflicts within and between the communities over the illegal exploitation of highly prized plant species like the *prunus Africana*. To handle these conflicts and to continue to preserve the forest for socio-economic and cultural significance, it is important for all the stakeholders in the forest sector to work in synergy towards managing this montane natural ecotone for many more generations to come. Young Laimbwe boys and girls could be selected trained in sustainable management of the Kom/Wum Forest Reserve. From the training, they can lead other youths in planting economically rewarding trees in areas that have already been destroyed. At the level of the Laimbwe villages it will be important to set up a forest management committee consisting of farmers, hunters, herbalists and the chiefs who will each make suggestions on the proper use of the forest and its resources.

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SAŽETAK

Ovaj rad istražuje izazove s kojima se ljude plemena Laimbwe susreću u korištenju životnih resursa u prašumskom rezervatu Kom/Wum u Kamerunu. Rezervat je nastao 1951. godine i od tada iskorištavanje njegovih resursa reguliraju i čuvaju rendžeri, koji kažnjavaju prekršitelje. Porast populacije u selima oko rezervata prisilio je mnoge stanovnike da hranu i druge resurse potraže ovdje. Protuzakonito korištenje rezervata za hranu i sklonište dovodi do naglog krčenja šuma i sve više sukoba između korisnika šume i službenika Ministarstva za očuvanje šuma i divljih životinja. Vlada traži održivo korištenje šuma i njezinih resursa za dobrobit nacije, lokalnog stanovništva, te drugih čimbenika u sektoru šuma.

BUILDING THE RESILIENCE OF CROATIAN AGRICULTURE TO ENVIRONMENTAL AND ECONOMIC SHOCKS

IZGRADNJA OTPORNOSTI HRVATSKE POLJOPRIVREDE NA EKOLOŠKE I EKONOMSKE ŠOKOVE

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Summary

*This essay summarizes the research and recommendations resulting from a Sustainable Food and Farming project in Koprivnica, Croatia, in the spring and summer of 2014.***1** *A collaborative effort between researchers at Arizona State University and scholars, government officials, business leaders, farmers, and other stakeholders in Koprivnica and the larger Podravina region, this project assessed the historical foundations and current conditions of the local food and farm system and made recommendations for how to build resiliency and sustainability into that system over the next 30 years. Developing a sustainable local food system involves far more than good farming with strong environmental protection measures; it includes considerations of quality of life, the economics of the food system, policy and governance, cultural heritage, and social justice. We start by characterizing the contemporary food system sustainability challenges in Podravina; then we assess obstacles and opportunities for building a sustainable and resilient farm and food system in the region; and we end with practical recommendations for strengthening sustainable farming and food systems in Koprivnica-Križevci County and the broader Podravina region.*

Key words: Sustainability, sustainable agriculture, farm policy, resilience, food systems, Croatia, Koprivnica

Ključne riječi: održivost, održiva poljoprivreda, politika poljodjelstva, otpornost, sustavi hrane, Hrvatska, Koprivnica

INTRODUCTION

As we sat with the Popović family following a tour of one of their farm plots, they brought out a diverse procession of fresh foods, homemade treats, and at least two types of šlivovic, a plum-based homemade brandy—of course, it is culturally offensive not to partake, even when conducting business. The checkered backdrop of fecund garden plots, as well as this family's seemingly inexhaustible generosity, stood as a potent irony as we discussed the apparently ill-fated outlook for their farm. Once everything was laid out on the picnic table, our discussion began, intermittently between nibbles and sips.

[1] This project was funded in part by grants from the Walton Sustainability Solutions Initiatives at Arizona State University, USA, the municipality of Koprivnica, and Podravka, Inc.

After thirty years of operation, the end of the Popović's farming lifestyle is in sight. Despite planning to grow enough produce to supply the local markets, they are unable to sell all of what they grow. The family cannot make use of their excess production and cannot make a good living with what they do sell. Like good neighbors and generous citizens, they donate the remainder to Red Cross. While some farming operations have the ability to make products like jams or cheeses, the Popovićs lack the time, money, and skills to pursue value-added products. Unfortunately this also eliminates a potential source of income. Some members of the family have other jobs to supplement their farming income—they are unable to support themselves on the revenue from farming alone.

These economic difficulties are widespread in the region, and have implications for local citizens purchasing fresh fruits, vegetables, and dairy products as well. When faced with the choice between mass-produced imported produce and sometimes more expensive local produce, many simply cannot afford the extra expense. With the expectation that the low prices of imported vegetables will undercut the local producers, the Popović's view of the future is not optimistic. With her chin in her worn brown hands, the matriarch of the family explains that she now encourages her two daughters to perform well in school, rather than raising them to follow in her footsteps—she wants them to have a better, easier life. As the two young girls assist in translating our discussion with ease, we have no doubt that they are well on their way to successful careers outside the farm.

Our discussion of measures the family is taking to adapt to climate change was a short one; any adaptations would require additional financial investments. In the view of the Popovićs, who are already straining their financial limits, climatic impacts would simply mean an even earlier end to their farm than they had intended. The general mood of the family is one of resignation, though accompanied by a cautious feeling of hope for their children.

This is an example of one family's experience with the underlying threats to the resilience of agriculture in Croatia—and there are a number of threats converging. Croatia is still recovering from the global economic recession following the 2008 financial crisis. While even the most stable economies were impacted by the recession, the ability of Croatia to cope with the downturn was inhibited by unresolved administrative and infrastructural issues remaining from the previous transition from a centrally planned economy to a market economy, which took place in the early 1990's. In addition, the emerging agro-economic transition resulting from EU accession is likely to further exacerbate instability, making farming an economically unreliable choice for farmers responsible for supporting their families.

As the above account demonstrates, younger generations will leave rural areas to pursue education and higher wages with increasing frequency. Not only does this threaten the demand for local produce, it also means that there is no sustainable source of farming labor, and fewer people to continue farming traditions. The farming population is aging due to the decreasing attractiveness of the farming lifestyle. Rather than barely subsisting through farming in rural areas, younger generations move to Croatia's capital Zagreb, or other urban areas, to attend school or find employment in a more secure sector.

As a long-standing tradition, farming is culturally significant in Croatia, with many traditions surrounding the production and consumption of food. Farmers take pride in providing healthy food, and the population of Koprivnica knows the value of locally sourced products. Food brings people together; families farm together, the community convenes at open-air markets, and heritage foods are a key part of local festivals. The decrease in, or even loss of, farming practices is more than just an economic transition; it portends the loss of customs that shape the lives and identities of members of farming communities, beyond just those who engage in farming activities. Finding ways to sustain the viability of farming in the Koprivnica region would promote not only economic security but also political stability, cultural vitality, and psychological and social well-being.

With so many factors contributing to this food systems sustainability problem, and so many stakeholder groups, solutions are complex and elusive. Our guiding challenge for this research project in Koprivnica was to develop a practical, locally implementable strategy for building and maintaining a sustainable, socially responsible food and farming system in the face of globalization, declining rural population, Croatia's accession to the European Union, and climate change challenges. Developing a

sustainable agricultural model involves far more than good farming with strong environmental protection measures; it includes considerations of quality of life, the economics of the food system, policy and governance, cultural heritage, and social justice. Only the integration of all of these will achieve sustainability in the long term. The EU Commission recently proposed a similarly comprehensive strategy for »smart, sustainable, and inclusive growth« in its *Europe 2020* report (European Commission, 2010). Because sustainability solutions must be complex and integrated, this study places food and farming into its larger social, economic, political, and cultural context, suggesting that policymakers should focus on agriculture at the local level to support economic and social resilience at the local *and* national levels in preparation for climate change, globalization, and economic shocks.

FOOD AND AGRICULTURE PRODUCTION IN PODRAVINA—HISTORICAL CONTEXT

Podravina stretches from the Drava River lowlands in the north and east to a series of gently rising uplands to the south and west. The soil is deep, fertile, and relatively easy to cultivate. Koprivnica is the most populated part of the Podravina region and the most suitable location for farming at about 140 meters elevation along Koprivnica creek. It is located just 92 km from Zagreb, 269 km from Budapest, and 339 km from Vienna, providing many commercial opportunities. Many other towns and villages are scattered across this verdant landscape of farms and forests (Kurtek 1966, 116-117; Feletar 1990, 11-18).

Written records of agricultural production in the region exist from the 17th and 18th centuries, documenting a wide variety of grains produced and traded as well as meat, bacon, flour, garlic, butter, honey, wine and brandy (Petrić 2005). The grains cultivated in the Koprivnica region included rye, wheat, barley, millet, sorghum and buckwheat (KCA, CCR). In the 17th and 18th centuries, several new world crops joined these traditional European crops. Corn was introduced to the Slavonian Military Border region in 1612 and to the town of Koprivnica in 1617, but it did not gain importance as a major commercial crop until much later in the century (STLA, Militaria, 1612, 1617). From the mid-18th century onwards potatoes, tomatoes and peppers also appeared in the crop mix and became increasingly prominent over time. In addition to commercial food products, locals grew many common vegetables in kitchen gardens, such as onions, garlic, kale, Brussels sprouts, cabbage, broad beans (v*icia faba),* green beans, peas, carrots, turnips, pumpkins, and beets. Poultry and dairy products were common, too, including cheese (fresh, dried and smoked); cream (sweet and sour) and butter. Sunflowers were grown for food, oil, and poultry feed. Pork meat was smoked in the attic and pig fat kept in earthen jars and wood buckets. In addition to food products, flax was quite popular for weaving cloth and pressing oil from the seeds. Clearly this region has enjoyed a long and richly diverse commercial and subsistence farm economy (KCA, CCR).

During the 18th and especially the 19th century, the countryside in this part of Croatia witnessed a characteristic transformation from late feudalism into new, capitalist relations. It was also marked by a productive and organizational transformation of farming in general. Although corn was grown in the Podravina region as early as the 17th century, it became dominant only in the 19th century, along with potatoes and a strengthening of cattle breeding, which together significantly increased agricultural production and economic and demographic growth in Podravina. A 3-crop rotational system of tillage with extensive periods of fallow dominated farming into the 19th century, but as the new capitalist-state relations emerged, duties and taxes on farmers significantly increased leading to more commercial production and less fallowing of croplands. Despite this general economic growth, the living standards of the population of Koprivnica and its surrounding agricultural villages remained poor. Farm economics remained at the subsistence level for most people, with just enough crops offered for trade to pay taxes (KCA, CCR).

Towards the end of the 19th century, wheat, corn, and potatoes increasingly dominated the crop economy (Gabričević 1977). The old traditional grain cultures such as rye, meslin, millet and buckwheat, quickly declined in importance. The commercial sale of wheat in particular provided one of the main sources of cash for taxes and other purchases for rural households. In fact, farmers often sold their wheat

while eating corn bread at home (KCA, CCR). The School of Economy and Agriculture, founded in Križevci in 1860 (Seleš 1985), provided a major boost to wheat yields as well as total agricultural production in Podravina. However, poor soil management, weak labor and market organization, inadequate financial resources, and other factors led to very low average crops yields and the continued dominance of autarkic (subsistence) farming (Feletar 1988).

For centuries, orchard and vineyard fruits and nuts have comprised a significant part of the subsistence economy and a small part of local/regional trade networks. There is great potential for expanding fruit production. Nineteenth-century Koprivnica records show that the most common fruits were apple (*ječmenika* red, and *zelenika* green varieties etc.), pear (*tepka* variety and others), plums, rowan, cherry, walnut, chestnut, peach, and currants. Some fruits were used to make brandies. Several wine grape varieties were cultivated, too. The idyllic slopes of Kalnik and Bilogora and hilly parts of the southern and western suburbs have long been used for viticulture. Attesting to the importance of this craft, Koprivnica town administrators leased a wine cellar in the mid- 19th century and the records of 1854 mention vineyard guards (KCA, CCR). Unfortunately, like much of the rest of Europe, wine production in Podravina experienced a deep crisis in the second half of 19th century due to the epidemic grapevine disease phylloxera (Gospodarski list 1880, 124).

With new phylloxera-resistant rootstock available in the 20th century, viticulture experienced a revitalization. Many urban families acquired household vineyard and orchard cottages (small wooden shacks) in the foothills surrounding the towns that served both as a supplemental source of sustenance and as a resting place for older folk who could no longer work hard in the fields. These establishments are the foundation of a thriving informal viticulture community today (KCA, CCR). These quiet rural vineyards and orchards also provided artistic inspiration for self-taught artists of the naïve art style, such as Koprivnica's famous Mijo Kovačić (http://www.mijokovacic.com/biography/).

Industrial agriculture came to Koprivnica in the early 20th century, in part stimulated by World War One, but the villages surrounding Koprivnica remained largely outside the scope of intensive technical progress until the food company Podravka developed after World War Two. Likewise, until the second half of the 20th century the cultivation and care of livestock was rather inefficient, even though improvements in breeding and production began in the late 19th century. The exception to this was horse breeding. Because people used horses for work and for transportation, efforts to improve horse breeds accelerated in the late 1700s and early 1800s. Well-developed horse breeding in Koprivnica was mentioned in 1817, and in 1865 the town gave prizes for breeding success (KCA, CCR).

One of the most important developments of the 20th century in the agricultural economy of Koprivnica and its surrounding region was the rise of agricultural cooperatives. The predominance of relatively small, dispersed farmsteads stymied technological advancement, organization, and efficiency, and cooperatives were an alternative to land consolidation as a means to overcome this limitation. The first cooperatives in the area began in the late 19th century and then grew significantly between the two world wars, helping Podravina to become one of the most advanced agricultural areas of Croatia (CNA).

After the World War Two, under socialist rule, a policy of protecting family farmers from dispossession due to land consolidation strengthened this trend toward cooperatives. A new rule was introduced that prevented one family from owning more than 10 hectares of farm land. On the one hand, this limited the ability of farmers to gain economies of scale in their production, but on the other hand it preserved the family farm as well as traditional polycultures and biologically diverse crop systems (CNA).

More industrial forms of agricultural production came to the region in the 1970s with a consequent decline in crop diversity. During that decade, the Koprivnica region had 32,000 hectares of sown land; 41% of corn, 31% of wheat, and 28% of all other cultures—mostly potatoes and fodder crops. Hence, in just a few decades the once widespread production of rye, barley and oats had severely declined, replaced by a handful of monocultures (Archive of Croatian Bureau for Statistics). The predominance of cereals in crop production is characteristic for regions neighboring Koprivnica, too. Despite the predominance of grains, vegetable production on small private peasant properties remained poly-cultural because every

household with corn and wheat continued to grow a dozen or so other species of vegetables and fruits intended for their own household needs (Feletar 1973).

As mentioned above, the growth of cooperatives and increasing agricultural efficiency in the first half of the century led to a full-scale transformation of agriculture in Yugoslavia after the Second World War, facilitated significantly by the corporation Podravka through a socially owned factory system called *socialist workers' self-management (*CNA).

Podravka controlled 7% of arable land in the Koprivnica region, while the rest was owned by small individual farmers. Consequently, the company organized purchases of agricultural products from private producers and their cooperatives. This especially intensified at the beginning of the 1970s. A comparison of the data on agricultural products purchased by Podravka from private farmers from 1967 and 1976 shows that in those nine years, the purchase increased six-fold (Feletar 1980).

The close connection between the food industry and private farmers created a large number of purchase agreements with individual farmers holding subcontracts for their produce. The volume of subcontracts peaked in 1971 when 5,121 individual households had cooperative purchase agreements with Podravka. At that time the Podravina region had a population of some 60,000 inhabitants. By 1981, the number of subcontractors was reduced to 3,031 families, and in 1988 this declining trend continued with the number of family subcontractors at only 2,385 (Podravka company archive).

After 1990, Yugoslavia broke apart into separate republics and neoliberal capitalist policies replaced the socialist cooperative economy. A steady decline in agricultural productivity and livelihood sufficiency ensued. Podravka's agricultural production operations were spun off into a separate company, privatized, and eventually went bankrupt. For the food processing side of the business, Podravka's well-developed cooperative relations from the socialist period closed down as the company increasingly bought its raw food products from the cheapest sources, which often meant purchasing produce from the EU and China rather than supporting local and regional farms (Podravka company newspaper).

This caused a dramatic shrinkage of the local farm economy and is at the heart of the sustainability, resilience, and livelihood sufficiency challenges the region now faces. While Podravka continues to acquire most of its raw materials from agricultural areas outside of the Podravina region, there is recent interest in revitalizing the regional farm economy and re-activating farm marketing cooperatives to provide more of Podravka's raw materials for its processing facilities (Podravka company archive; http://www.podravka.com/).

BARRIERS TO RESILIENCE

A research team of eight post-graduate students and two faculty members from Arizona State University (ASU) traveled to Koprivnica in Summer 2014 as part of the Walton Sustainability Solutions Initiatives. Two of the authors of this essay, Barry and Hirt, were part of the ASU team. We began our research with the knowledge that small-scale agriculture at the local level was suffering. The goal of our work was to determine the causal factors at play in its breakdown, to assess opportunities for improvement, and to communicate these results to our partners and stakeholder groups. Two weeks of fieldwork with farmers and municipal administrators was conducted in the town of Koprivnica, after which co-author Megan Barry conducted additional research on macro-level policy issues through interviews with experts in Croatia's capital Zagreb, as well as EU researchers outside of Croatia. From this work, we developed a strategic plan for a sustainable farm and food system in Koprivnica.

Interviews allowed us to interact closely with participants and understand how stakeholders comprehend and respond to sustainability challenges. The majority of interviews with farmers were conducted on their farms, providing valuable context into their lives and work environments. Farmers' sense of pride, attachment to the land, and comfort with farming was clearly evident as we walked through rows of peach trees and heads of lettuce, or picked cherries from the trees as we spoke. The size of farm plots is a complex variable in the discussion of resilience. Many of the farmers we interviewed felt that the size of plots was too small for them to produce enough to make an adequate living. One peach farmer in

particular, our self-identified »euroskeptic,« felt that the small sizes of farming plots hindered his ability to compete in the larger European market. As of 2010, about one half of all farm holdings in Croatia were less than two hectares, while the average size of farms throughout EU-27 at this time was 14.4 hectares (Eurostat, 2013).

Alternatively, plots can also be too large. The largest plot of any farmer we interviewed was seventy-five hectares –with forty-five hectares being his own land, and the rest being provided by the state for him to cultivate. He produced primarily corn and wheat with a target market of larger commercial vendors—his produce was not for the consumption of the local population. While he was more optimistic about his ability to compete in a larger market, the only way he could do so was to mass-produce a less diverse selection of crops than is typical of the region. From a perspective of agricultural resilience, this is rarely conducted in a sustainable manner as it is usually chemical-intensive monoculture farming that contributes to the depletion of soil nutrients, water pollution, and unintended negative impacts on ecosystems and beneficial species like honeybees (Tilman et al, 2002). In addition to the negative impacts on ecosystems, monoculture farming makes it far more difficult for the population to meet much of its food needs from local sources. Of the 79,000 hectares of agricultural land available in Koprivnica-Križevci County, where our interviews were conducted, only 574 hectares are used for vegetable production, while the majority is wheat and corn. If more of this land was devoted to diverse crops, the population would have a more reliable regional food supply in the future.

The size of farm plots is connected to another aspect of sustainable agriculture: the dependence on chemical inputs. Among farmers that we spoke with, the use of fertilizers and pesticides was not uncommon, and according to members of Podravka, globalization has been increasing the pressure to use these chemicals locally. In terms of pure agricultural resilience, these management practices are not ideal. While chemical inputs can increase crop production, they also increase nitrates and toxins in surface ground water (Tilman et al, 2002, Horlings and Marsden, 2011). It can also lead to negative consequences for human and environmental health in the long run, and this clearly has implications for the general population as well, beyond just farmers and their families. Croatia enjoys relatively high environmental quality, but that may be compromised by the increased use of agricultural chemicals as farm sizes increase. Given the significant economic opportunities afforded by Croatia's reputation for environmental quality, the damages associated with extensive and repeated use of pesticides and fertilizers should be avoided.

It was rare in our interviews to see people younger than 40 engaged in farming activities. One younger farming couple, new to the practice, inherited a farm and began to explore the potential to produce organic crops for local markets. Aside from this one example, the majority of farmers were older. Producers with younger children were often not actively passing on farming skills and practices to their children, with the understanding that, like the Popović children, their offspring would be leaving the farming tradition. If the farming population ages without the incoming younger generation to maintain the tradition, imported products from the European market will likely fill the gap locally. The benefits of local agriculture for small communities will be lost.

A contributing factor to the aging population on farms is the fact that farm incomes are both inadequate and unstable. The majority of interviewees were unable to survive solely on farming and had to supplement their incomes with other occupations, either personally or through the contributions of their extended family members. In a discussion at the local farmer's market, the market organizer stressed that they had not raised the cost of renting booths for ten years in order to encourage maximum farmer participation—one of the main obstacles in getting more farmers to sell at the market is the fact that farmers cannot be certain of a return on their investment. Without a bulk vendor or wholesale purchaser, there is no guaranteed income from week to week, since it cannot be guaranteed that one's produce will sell at the local markets. The occupation of farming is also uncertain by nature – with no pun intended. Not only are prices unknown and unstable, but a change in any agricultural input – with climatic factors being one of the most obvious variables – could result in a crop failure. In a country where agriculture comprises much of the livelihood activities, if those employed by it are fairing poorly, the rest of the economy suf-

fers as well. It is no wonder that younger generations, like the Popović children, see the struggles of their parents and want to turn to an occupation with more economic stability.

In general, many of these issues, which are common to small-scale agriculture in general, are manageable with sufficient social and policy support. Unfortunately, in Koprivnica it was clear in many cases that a lack of local capacity and limited farmer understanding of policy options inhibited the ability of farmers to achieve greater wellbeing. During our research we sensed uncertainty about where funding for agricultural activities came from, and whose policies were being adhered to, Croatia's or the European Union's. According to multiple policy experts that we interviewed, this may be in part because the agri-policy goals often do not match the real priorities of farmers, which in turn makes the policy goals unclear to stakeholders. On this topic, one of our farmer interviewees commented that they [farmers] were already marginalized in terms of representation, and it was his expectation that the situation would worsen as Croatia further integrates with the EU, and becomes marginalized itself, with »everything coming from Brussels« (Personal communication, 2014).

This issue is closely related to the impact that the lack of organization has on the local agricultural markets. Among farmers, there is a lack of trust that keeps them from organizing and communicating effectively with each other. This is a problem for value-added products in particular. We interviewed a beekeeper who noted that a lack of cooperation made it very difficult for value-added producers to compete in larger markets; they produced too little alone be able to sell successfully in the EU market. The peach farmer we interviewed suggested that he would consider value-added products, but only *if* there were cooperative organizations that provided opportunities and resources, such as in the form of joint facilities for processing, or collection points to facilitate distribution. He stated that there were existing cooperatives for communication and publicity, but not to directly facilitate the kinds of coordination that would truly make a difference. Interestingly, both farmers and policy experts attributed the failure to organize to the fact that prior to Croatia's transition to a market economy in the 1990s farmers were accustomed to a central authority providing market coordination and regulation functions. Too many farmers still expected the state to monitor production and guarantee prices, and were not prepared for the transition to less regulated markets (Franic and Mikuš, 2013). This mentality still persists in some form today.

OPPORTUNITIES AND REASONS FOR OPTIMISM

Despite these inhibiting factors, there are many reasons to be hopeful about the future of farming in Croatia. A number of opportunities can be leveraged to promote success in the future. For example, one policy expert, Dr. Ornella Mikuš of the University of Zagreb, noted that Croatia is environmentally rich, with high quality land, water, soil, and air. Environmental conservation has been a national priority historically, and continues to be a priority for future development (World Bank, 2014). There is an abundance of agricultural and forested land; as of 2013, Croatia had 874,276 hectares of arable land (Croatian Bureau of Statistics, 2013). In comparison to other EU member states, its utilization of agricultural land is relatively low, however, averaging 20-40%, while other nations like France and Germany use more than 60% (Eurostat, 2014). Not only is Croatia's verdant landscape beneficial to agricultural resilience, but it provides the foundation for a number of additional economic opportunities. Croatia has many crops and specialty food items that could be marketed as heritage products for tourists. Examples include wines, cheeses, pršut (prosciutto), honey, and pumpkin seed oil, an artisanal product that we saw—and ate—quite frequently during our stay in Croatia.

Agro-tourism was a frequent topic of discussion during our research, despite the fact that there is currently no direct funding for farm tourism at the national level (Demonja & Baćac, 2012). The popularity of agro-tourism has increased slowly but steadily, and it is a viable sector to create opportunities for rural development and to supplement farm income. In addition to providing supplemental income to family farms while preserving the local heritage, agro-tourism opens the door for a new view of the family farm and offers an attractive opportunity for young people to return to the farms. By 2007 the total number of registered tourist rural family households in Croatia was around 352, with the highest registered members

in the counties of Dubrovnik-Neretva and Istria—which is to be expected as these are the very popular coastal tourism areas of Croatia. However, as of 2009 some agro-tourism was found in eastern Croatia as well, according to the Ministry of Tourism, with four agro-tourism sites located in the Koprivnica-Križevci County where we conducted our research (Croatian Ministry of Agriculture, Fisheries and Rural Development, 2009).

When we asked interviewees to consider potential problems for the future, climate change and extreme weather were mentioned more frequently than we expected, and, we suspect, more frequently than these topics would be mentioned by farmers in the United States. The potential negative impacts of climate change aside, Croatian farmers' awareness of climate change impacts on the horizon is encouraging. Many of our farmer interviewees acknowledged that they have already seen significant climate change affecting their farming during their lifetimes. One couple has already begun preparing, going as far as choosing a climate resilient crop, the Jerusalem artichoke, to protect the stability of their income source. Another farmer, with a fruit tree orchard, not only uses nylon mats to protect his crops from hail, but also has a climate station that measures temperature and moisture. These examples indicate a willingness to consider and implement adaptation measures. However, farmers indicated that they cannot prepare to the desired extent due to the expenses associated with adaptation.

Despite difficulties with communication and collaboration between local institutions, local administration, and farmers, there *is* a notable amount of town-level financial support in Koprivnica. Many farmers mentioned receiving town support in the form of direct payments—usually a per-hectare payment. The City Economic Department told us of their support for rural development measures, with examples such as the provision of greenhouses, which encourage longer growth seasons as well as participation in a community garden by interested community members lacking their own farm plots. There are also classes that teach, for example, about activities like beekeeping. A beekeeper we spoke with explained that the beekeeping school, now in its fourth generation of students, receives a 40 percent subsidy from the town to help alleviate startup costs, and that professors from Zagreb University travel to Koprivnica to teach the trade. As opposed to providing only a direct payment, this strategy in particular builds knowledge and skills, giving farmers and non-farmers alike the ability to take initiative and to have more control over their livelihood activities.

There are an even greater number of farmers taking advantage of national financial support. As mentioned previously, Croatia provides state land to increase the size of farms; a dairy-farming family interviewed for this research received both land and cows for their production. Our peach farmer benefited from national support when the Ministry of Agriculture purchased all of the plants he needed to start his farm in 2003. He and his wife continue to receive support for planting in the form of tree seedlings from a nursery.

In addition to financial support at the local and national levels, there is significant social support for farming, and values that are conducive to the longevity of small-scale farming in Koprivnica. Consumers that we spoke with at the local market clearly preferred local produce to generic corporate produce, saying that knowing both your producers and the conditions in which your food is produced is a guarantee that your food is »real and natural.« As children ran around the playground at the farmer's market, parents cited the health of their family as an important reason for buying local. In addition to the local open-air markets, it is common for consumers to go directly to the houses of farmers and producers to buy from them directly. This finding was supported by interviewee Dr. Mikuš, who indicated that the demand for local and organically produced goods is increasing throughout all of Croatia. Freshness and variety of produce are qualities that consumers have come to value and expect nationwide.

In terms of existing infrastructure, one of our primary collaborators in Koprivnica was Podravka, the previously mentioned food processing company, which had employed much of the town's population in the past. Podravka was a frequent topic among farmers; many of them previously employed by the company before turning to farming. Only a few farmers now sell their produce to Podravka for processing. One benefit of companies like Podravka for this particular municipality, and for many other areas of

Croatia, is that the associated infrastructure, networks, and supply chains can be leveraged and expanded upon moving forward.

Podravka hopes to serve as a source of innovation in Koprivnica. They are developing a Center of Competence, and through this they hope to facilitate the transition to an agricultural model that integrates consumer values and farmer needs. This innovation is representative of a larger trend of increasing research on agricultural resilience in tandem with Croatia's recent accession to the European Union. Prior to the early 2000s, there was not enough support for this sort of research, but state funding for sustainable agricultural development and scientific research has increased over the last decade (Mikuš et al, 2010).

In addition to an appreciation for heritage foods and farming traditions, farmers young and old are intrigued by opportunities like value-added production and expansion to the EU market. Interviewees provided an extensive list of desired tools and funding needed for success along these lines. For example, one community gardening NGO expressed the desire for additional plots of land, a tool shed, and a playground to serve the dual purpose of increasing the number of families participating as well as incorporating farming into the lives of children. The previously mentioned farmers of Jerusalem artichokes expressed the desire for an irrigation system and a tiller for the same reason that the majority of interviewees wished for mechanization and tools: they want to scale up production sustainably in order to penetrate the larger EU markets.

In terms of agricultural resilience, the tradition of a small farming regime in Croatia can also be framed as a strength. Small farms inhibit corporate land consolidation and small farmers are more likely to be better land stewards (D'Souza and Ikerd, 1996). As previously mentioned, the plots in Koprivnica, averaging about five hectares according to the City Economic Department, are currently not large enough for most farmers to produce enough to support themselves and their families. This could change, however, if municipalities and farmers in Croatia were to strengthen cooperatives and take advantage of particular funding schemes provided by the European Union.

The EU offers many mechanisms to support small- and mid-sized farms. Most of these measures were not fully in effect in Croatia yet in 2014, but are in transitional stages as the state only joined the European Union in 2013. Fortunately, in joining the EU, Croatia has become subject to its Common Agricultural Policy (CAP), which underwent revisions in 2013 to safeguard against many of the more problematic agricultural impacts of EU accession. One of our interviewees currently benefitting from EU funding is the larger-scale farmer of corn and wheat, previously mentioned, who receives 200 euros per hectare for his farm. The majority of other farmers interviewed for this research were availing themselves of national and local level support. However, as the accession process progresses, national funding will be phased out and replaced with EU funding. When combined with increasing communication and knowledge about funding opportunities, the number of farmers receiving EU support should increase.

SWOT Analysis:

In order to process and condense the results of interviews conducted with farmers, policy experts, and academics, we conducted a SWOT analysis, which consists of a consideration of **S**trengths, **W**eaknesses, **O**pportunities, and **T**hreats to the current agricultural system. Below is a chart that organizes interview responses into the SWOT categories. Many of the responses of participants—farmers, academics, and policy experts—echoed the findings in existing literature. This suggests that these particular issues are persistent and require attention. However, there were many instances where responses provided new insights. The chart below is a condensed and more comprehensive collection of the SWOT factors discussed in the narrative above.

Strengths	Weaknesses
Environmental	**Economic**
High water quality	Local markets more expensive than supermarkets, fewer able to buy local
High land quality	Prohibitive cost of mechanization
High soil quality	Prohibitive cost of climate adaptation
Promotion of organic farming	Instability of income
Access to both state-owned and private agricultural land/ forests	Pre-existing economic downturn
Legislation regulating pesticides	Negative agri-food trade balance
Policy EU-level:	Pressure to specialize
CAP goal of stability, health, and affordability	Local market flooded
CAP update theme of climate resilience	**Environmental**
International consensus on importance of sustainable agriculture	Use of pesticides and fertilizers
Rural Development Program to support small-scale farming	Inability/failure to adapt to climate change
Policy National-level:	**Sociocultural**
Pre-existing national insurance scheme	Ex-socialist dynamic (people more inclined to follow than innovate), lack of trust in others
Sociocultural	Disorientation with modernization of technology and IT
Awareness of coming changes, amongst farmers and organizations	Lack of understanding and awareness (in emerging opportunities, environmental integrity, clarity of policy goals)
Pre-existing organizing structures (effectiveness questionable)	**Infrastructural**
Pre-existing social support for local agriculture	Size of farms too small for value-added market
Genuine enjoyment in farming, persistence	Size of farms too small to penetrate international market
Preference for locally-sourced products	Fragmentation of farm plots
Infrastructural	**Administrative**
Pre-existing food processing industry	Slow payment/return when selling to larger vendors
Administrative	Ineffectiveness of cooperatives, lack of organization amongst farmers
Payment plan to ease cost burden of selling at local markets	Lack of collaboration and communication *among and between* stakeholder groups
Increasing amount of research in environmental quality and agricultural economics	Too much administrative burden, logistically and economically

Opportunities	Threats
Economic	**Economic**
Agro-tourism	No funding for farmers to lobby at EU-level
Value-added products	Undercutting of local market by less expensive imported food
Farming as alternative for unemployed and younger generations	Prohibitive start-up costs for niche markets
Environmental	**Environmental**
Developing agro-environmental alternatives to pesticides	Climate change
Utilizing fragmentation of farms to build climate resilience*	Globalization impacts (monocultures, disease, increasing non-organic practices)
Interest in organic/sustainable	**Sociocultural**
Policy EU-Level	Aging farming population
Funds for younger generations	Desire for children to leave farming industry
Funds for Less-Favored Areas*	Depopulation of rural areas
Funds for climate adaptation	Lack of collaboration and communication *among and between* stakeholder groups
Funds to preserve environmental and cultural integrity	Lack of knowledge and awareness (in emerging opportunities, environmental integrity, clarity of policy goals)
National-level flexibility for allocation of EU funds	**Infrastructural**
General	Size of farms too small to penetrate international market
Availability of subsidies	**Administrative**
Desire to incorporate stakeholders	Lack of research (monitoring, mapping, evaluation)
Sociocultural	Ineffective channels for stakeholder representation
Desire for organization and support (cooperatives)	
Desire for knowledge	
Development of Center of Competence**	
Valuing healthy sustainable food	
Infrastructural	
Beneficial modernization and adaptation	
Desire for mechanization	
Administrative	
High administrative potential, large number of municipalities	

DISCUSSION AND RECOMMENDATIONS

The following recommendations for how to foster the resilience of Croatian small-scale agriculture to environmental and economic shocks are drawn from stakeholder interviews, scholarly literature, and EU policy documents.

Support to Small-Scale and Young Farmers

Two of the more worrisome trends identified through this research are 1) the inability of smaller farms to compete in the larger EU market, and 2) the outflow of younger generations to less rural areas of Croatia. While *some* farmers in Koprivnica were availing themselves of EU Common Agricultural Policy funding, it was relatively few in comparison with those benefitting from national support. As previously mentioned, this number will increase over the next few years, with many potential benefits. The objectives of the 2013 CAP update include »viable food production,[2] sustainable management of natural resources, and climate action and balanced territorial development«[3] (European Commission, 2013). All of these objectives suggest that EU policymakers are aware of and seeking to address concerns about the economic outlook of small-scale farmers and the aging of the farming population.

The Common Agriculture Policy traditionally structures the provision of funding into two pillars: the first pillar provides direct payments to farmers, while the second offers support programs for rural infrastructure and eco-farming. The updated CAP maintains these pillars, but also increases the link between them. There now exists flexibility in how each European Member State can apply funds under the Common Agricultural Policy, with allocation to »depend upon the choices made by Member States« (European Commission, 2013). To provide an example of this flexibility in action, in November 2013, the German Ministry of Agriculture unanimously agreed to provide additional support to small and medium-sized farms, while providing less funding to larger producers. Small farmers would receive an additional 50 euros per hectare for the first 30 hectares of land. A similar measure is being taken with younger farmers under 40 years of age now receiving an additional 50 euros per hectare, limited to the first 90 hectares of land per owner and for a maximum of five years (Euractiv, 2013).[4] In the effort to support small-scale farmers, as well as ensure continuing interest from younger farmers, Croatia could consider implementing similar measures to prioritize and target their spending as they feel best suits their unique priorities (European Commission, 2013). For families like the Popovićs, the implementation of this funding scheme could make all the difference. The knowledge that their children could qualify for additional support, for both the size of their farm and for their younger age, might encourage the family to stay in the farming business, with the hopeful prospect of prosperity rather than hardship.

Facilitating Collaboration

As previously alluded to, a common concern in farmer interviews was a lack of collaboration and trust among themselves, and a desire for increased cooperation. The CAP update specifically outlines measures that can be taken to facilitate collaboration among producers and improve the competitiveness of farming by »reducing costs, improving access to credit and adding value to the primary sector« (European Commission, 2013). Increasing collaboration would have two benefits. A number of farmers interviewed for this research indicated that they did not pursue activities like value-added processing because they could not afford equipment on their own. Croatia is fortunate in that a very wide variety

[2] In the context of CAP, viable food production includes environmental sustainability, but also competitiveness, innovation, and food chain functionality.

[3] In the context of CAP, balanced territorial development refers to the efforts to facilitate the demographic, economic, and social development of less favored rural areas, which are prone to depopulation.

[4] Beginning in 2015, farmers under 40 years of age entering the sector will be eligible to receive an additional first pillar payment *in addition* to start-up aid under the second pillar (European Commission, 2013).

of fruits—a category including olives—can be produced (Mikuš et al, 2010). Expanding the selection of what is grown, as well as what it is processed into, could open up greater economic opportunities. The ability to create nationally or regionally distinctive value-added products would allow Croatia to be more competitive on an international level.

EU support exists for these products in particular, in the form of Protected Geographical Indication status for specialty products »closely linked to the geographical area« when »at least one of the stages of production, processing or preparation takes place in the area« (European Commission, 2014). Some products within Croatia already benefit from this status, for example »Bregovska pita,« which originates from a particular village, and there is no reason that the same status cannot be achieved for other heritage products.

The use of CAP funds for this purpose would make production of value-added goods possible by facilitating the development of centralized facilities that could be shared by many local producers. A cooperative processing facility would provide valuable options for farmers like our peach grower, who claimed he could not manufacture products like jams because he lacked sufficient capital to build the processing facility. (Coincidentally, Podravka's earliest incarnation before World War Two was as a jam producing facility taking advantage of local orchard production.)

Farmers also indicated that they could not produce a large enough quantity of value-added products to be competitive in the larger-scale export markets. Financial incentives under the second pillar of CAP funding (intended for rural development[5]) would provide support to set up producer groups and collection points, which would improve the functionality of the food supply and distribution chain. It would also increase promotional activities, on-farm processing, and differentiation of products by expanding possibilities beyond raw produce.

Local municipalities can take steps to encourage this type of cooperation through promotion, facilitation, and financial incentives. For example, England has used its Pillar II funding under the reformed CAP to support a number of collaborative initiatives, including the establishment of a »European Innovation Partnership on Sustainable Agriculture,« along with the strengthening of farm advisory services and the funding of cooperative activities to support farmers and rural businesses (Department for Environment, Food & Rural Affairs, 2013). Croatia can take a similar approach, scaling up the role of farm advisory services to create community facilities and machinery and develop collaborative institutions that, for example, facilitate collection of agricultural products for larger markets and purchasers. The proposed Center of Competence in Koprivnica is a perfect example of a blossoming organization that will greatly benefit from the use of these funds and could serve an instrumental role in the future. In terms of resilience, this level of collaboration increases the capacity of rural farmers to adapt to new opportunities and impending challenges resulting from changes in the market and climate conditions.

Agricultural Resilience

Sustainability is an important criterion for the Common Agricultural Policy in stimulating resilient food systems. The Green Payment structure created under the CAP update further rewards farmers for respecting three agricultural practices: (1) Maintenance of permanent grassland, (2) Ecological focus areas, and (3) Crop Diversification (European Commission, 2013). If farmers demonstrate that they are meeting these criteria, they gain access to funds under the Green Payment Scheme. Producers like the young farming couple we interviewed who create their own organic pesticides and use integrated pest management, are examples of practices that are eligible under the Green Payment Program.

The CAP update also includes policies on Green Infrastructure to provide »additional guidance for authorities and decision makers, civil society, private business and conservation practitioners to ensure the full mobilization of ecosystem-based approaches to [climate] adaptation« (An EU Adaptation Strategy. . ., European Commission, 2013). This approach supports agricultural resilience in a way that is sustainable

[5] See Figure 1 of Appendix A for details on EU CAP Rural Development Priorities.

by leveraging the strengths of Croatia's ecosystems.[6] A number of examples of measures that fall into these categories can be found among our interviewees, for example creating organic pesticides, choosing climate resilient crops, and maintaining the traditionally diverse crop selection in Croatia.

Informational and Training Programs

One of the greatest barriers to implementation of rural development schemes is a lack of understanding of what national and international financial support translates to at the local level. An increase in knowledge about how large-scale policy will impact the day-to-day operations of individual farmers would greatly increase the effectiveness and acceptance of these policies. The framework currently used to support programs like the aforementioned beekeeping school could be expanded to include programs to inform farmers about the implications of shifting agro-economic policies. Not only would this alleviate challenges resulting from unpreparedness and disorganization, it would increase awareness of new opportunities when they become available. It is likely that such programs would be eligible for funding under Pillar 2 of the EU CAP update,[7] particularly if they were undertaken in tandem with the development of organizations like Podravka's Center of Competence.

Agro-tourism

Rural tourism is a viable opportunity for rural development (Ammirato & Felicetti, 2013). In the United States, agro-tourism has increased 25 percent over the last five years, generating $700 million in revenue in 2012, and is seen as an important tool for revitalizing rural economies (Frommer, 2014). It can include hospitality, meal provision, farm tours, on-site processing of agricultural goods, pick-your-own crop activities, and more. In addition, it can support the development of other local activities such as nature related tourism, adventure tourism, educational tourism, and cultural tourism (Croatian Ministry of Agriculture, 2009). There are a number of producers interested in the economic potential for agro-tourism, but the necessary investment of both time and money is prohibitive for small family-owned farms.

As a result of EU accession, Croatia will have at its disposal 373 million euros for direct payments to farmers and 330 million euros for rural development projects between 2014-2020. These funds could be used, through the development of agro-tourism, to help co-finance and improve living conditions in the countryside to help keep youth in rural areas. Each approved rural development project can be co-financed with EU funds up to 50 percent, and, for young farmers who have at least five years of experience in farming, EU support can increase to 75 percent (to encourage young farmers). Taking advantage of the co-financing could be a potential approach for farmers to receive enough funding to invest in a new business opportunity to support the diversity of their farms.

In addition to providing supplemental income to family farms while preserving local heritage, agro-tourism can open the door for a new view of the family farm and offer an attractive opportunity for young people to return to the farms. Through a revitalized perspective on farming, rural tourism can integrate individuals to the farming system not only as farmers, but as key actors and cultural heritage experts in the tourism sector. According to Sanda Renko, a professor of economics at the University of Zagreb, a side-benefit of this funding scheme is that it adds to farmers' desire to engage in sustainable practices.

Preparing For Extreme Events

In addition to a new land-based and producer-support approach, one of the most important aspects in the 2013 CAP update is a focus on climate change; CAP seeks to recognize and reward farmers for the positive nonmarket benefits they provide to society, one of which is climate stability. While the Green

[6] For a more detailed visual of the Green Payment Structure, see Figure 3 of the Appendix.
[7] See to Figure 2 of Appendix A.

Payment structure will be beneficial in supporting climate resilience, the CAP update goes further, creating a reserve of EUR 400 million per year to be used to cope with crises. It also provides a risk management toolkit, which includes insurance options for crops and animals. These measures assist in adaptation to a changing climate and are another opportunity for accessing EU funds, but should not be viewed as an alternative to taking preemptive action by maintaining a resilient local agricultural system.

In sum, we recommend that Croatia:

- Provide support to small-scale and young farmers
- Facilitate collaboration and communication amongst stakeholders
- Support activities conducive to agricultural resilience
- Develop informational and training programs for farmers
- Expand agro-tourism
- Prepare for extreme events

Why It Matters

Beginning in September of 2014, with tragically coincidental timing, parts of Croatia were inundated with extreme flooding. Koprivnica-Križevci County, where our farmer interviews were conducted, was one of the most heavily impacted areas, creating a critical situation where a number of villages had to be evacuated. This was the second major flooding event in just four months (Croatia Week, 2014). The Prime Minister, Zoran Milanović, stated that those impacted by the floods should not expect to receive assistance from the government, placing the burden of responsibility on small municipalities.

This example demonstrates the need for strong resilient communities. The idea of resilience necessitates a comprehensive approach, which we have attempted to embody in this assessment by considering the potential economic and environmental threats, and developing a wide range of recommendations. In the simplest of terms, resilience represents the ability for components of a system to continue functioning in the face of challenges.

The lackluster management of economic transitions in the past has left Croatia at a disadvantage, decreasing its ability to cope with the recent recession, as well as events like the extreme flooding described above. As history demonstrates, crises and unexpected system shocks have negatively harmed Croatian agriculture and the economy. The impacts of years of violent conflict during the war for independence in the early 1990s still manifest today, both socially and physically, in the form of shattered buildings and hidden landmines in the countryside. The future may be no less stable. The ongoing process of globalization will contribute to an even more interconnected food system, while population increases will add to the perceived need to mass-produce food. These factors further complicate the unpredictable impacts that climate change will have on Europe.

Groups likely to be impacted by extreme events, whether caused by humans or nature, are communities with low levels of social protection (insurance, health services, infrastructure, etc.), marginalized groups, and those with fragile or inadequate incomes—all factors related to limitations on the capacity to act and adapt, all of them describing the farming population. In developing recommendations, our approach was two-fold. We sought to create a suite of measures that builds resilience through leveraging the many resources that do exist in Croatia, thereby increasing the capacity to act and »own« resilience-building activities locally. However, given the fragile state of the population under consideration, and the strained economic condition of Croatia, external aid is probably necessary and certainly desirable. We have suggested the application of particular policies, many of which include the flexibility to implement them as national and local officials see fit. With the application of these recommendations, it is our hope that families like the Popovićs will be embedded in prosperous communities that have the necessary economic, social, and environmental resources to endure the challenges that the future will bring.

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APPENDIX A: EU COMMON AGRICULTURAL POLICY 2013 UPDATE

1. Fostering knowledge transfer and innovation in agriculture, forestry, and rural areas
2. Enhancing farm viability and competitiveness of all types of agriculture in all regions and promoting innovative farm technologies and sustainable management of forests
3. Promoting food chain organisation, including processing and marketing of agricultural products, animal welfare and risk management in agriculture
4. Restoring, preserving and enhancing ecosystems related to agriculture and forestry
5. Promoting resource efficiency and supporting the shift towards a low carbon and climate resilient economy in agriculture, food and forestry sectors
6. Promoting social inclusion, poverty reduction and economic development in rural areas

Figure 1. *CAP Rural Development Priorities*

PILLAR I	TARGETED ACTION	PILLAR II*
Green payment	ENVIRONMENT	Agri-environment-climate Organic, Natura 2000
Top-up payment	YOUNG FARMER	Business development grants Higher investment aid
Top-up payment	AREAS WITH NATURAL CONSTRAINTS	Area payments
Alternative simplified scheme	SMALL FARMER	Business development grants
Improved legal framework	PRODUCER COOPERATION	Aid for setting up producer groups Cooperation and short supply chain

Figure 2. *CAP Pillar Structure*

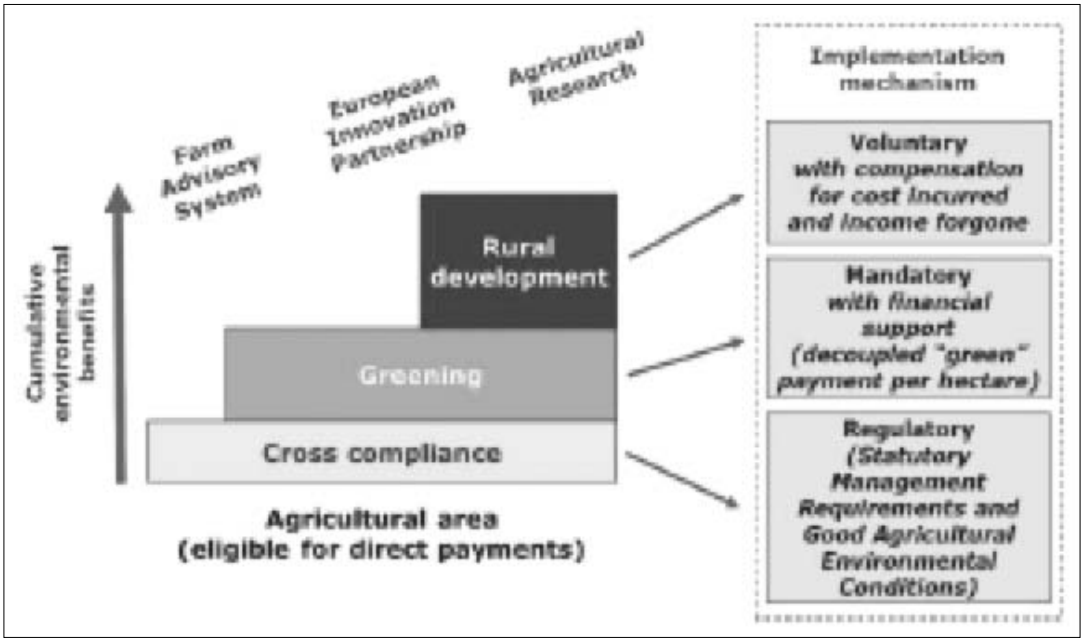

Figure 3. *CAP Green Payment Structure*

APPENDIX B: PROJECT PARTNERS

ASU Participants

1. Lead instructor and project co-director: Dr. Paul W. Hirt, Professor and Senior Sustainability Scholar, Global Institute of Sustainability.
2. Co-instructor and sustainable food and farm consultant: Greg Peterson, green living and sustainability innovator, founder of the Urban Farm in Phoenix.
3. Project assistant: Katie Thompson, ASU student in the Master of Arts in Sustainability program.
4. Megan Barry: ASU student in the Masters of Sustainability Solutions program.
5. Spencer Bolen: ASU student in the Masters of Urban and Environmental Planning program.
6. Mich Lyon: ASU doctoral candidate in Urban Planning and Faculty Associate in the School of Politics and Global Studies.
7. Emmanuel Ramirez, ASU student in the Master of Science in Agribusiness Management program.
8. Daina Rasutis, ASU Master of Science student in Civil, Environmental, and Sustainable Engineering.
9. Natalia Rodriguez: ASU Master of Sustainability Solutions student.
10. Nick Di Taranto: ASU Master of History student.
11. Vid Micevic: language assistant and ASU undergraduate student in sustainable engineering.
12. Marta Hulley Friedman: Program Manager, Walton Sustainability Solutions Studios.

Koprivnica, and Koprivnica-Križevci County Participants

City of Koprivnica, Koprivnica-Križevci County etc.

1. Helena Hećimović, project co-director and member of the Koprivnica City Council
2. Vesna Želježnjak, mayor of Koprivnica
3. Mišel Jakšić, vice-mayor of Koprivnica
4. Željkica Oštrkapa Međurečan, Senior Expert Advisor, Croatian Agricultural Advisory Service
5. Tomislav Mesić, Expert Advisor, Croatian Agricultural Advisory Service
6. Marijan Štimac, Head of Department for Economy and Public Utility Services of Koprivnica-Križevci County

Podravka

1. Emir Džanić, Innovation Manager, Research and Development
2. Tanja Cvetković, Director of Product Development (R&D)
3. Zdravko Matotan, Director of Agricultural Division (R&D)
4. Lana Horvat, Ecology Department (R&D)
5. Snježana Šlabek, Human Resources
6. Vesna Kadija Cmrk, Agricultural Division (R&D)

Academic Experts

1. Hrvoje Petrić, Professor of History, University of Zagreb and president of Croatian Society for Environmental History and Economic History
2. Sanda Renko, Professor of Economics, University of Zagreb
3. Josip Haramija, President of Croatian Society of Agronomists

Community Stakeholders

1. Udruga Kopriva, community organizing and gardening NGO
2. Matija Hlebar—founder of UZOR Hrvatske, recycling NGO
3. Goran Šafarek—photographer, naturalist, and president of Koprivnica Ecological Society

Local Farmers

1. Marijan Hrženjak--beekeeper and educator
2. Zdenko and Nives Vrgoč -- Jerusalem artichoke, tubers, and various vegetables
3. Željko Tonklin-- wheat, corn, rapeseed, and sugar beets
4. Zlatko and Antonio Panić-- dairy, beef, and grains
5. Davor Miklošić—«Jara« fruit tree orchards, including apple, peach, and cherry
6. Mijo Popović and family—vegetables and fruits
7. Ivan Smiljanić -- peach orchard
8. Mijo Petrić, wine maker and President of Wine makers association »Sveti Vid«, Draganovec, Koprivnica

SAŽETAK

Ovaj članak sažima istraživanja i preporuke koje proizlaze iz Projekta održive prehrane i poljodjelstva održanog u proljeće i ljeto 2014. godine u Koprivnici, Hrvatska. Projekt je nastao u suradnji Sveučilišta Arizona State iz SAD i znanstvenika, vladinih dužnosnika, poslovnih ljudi, poljoprivrednika i drugih učesnika u Koprivnici i široj regiji Podravine, temeljeći se na povijesnim i sadašnjim uvjetima lokalnog sustava proizvodnje hrane i poljoprivrede. Projekt je rezultirao preporukama kako izgraditi otpornost i održivost u tom sustavu u narednih 30 godina. Razvoj održivog lokalnog sustava prehrane uključuje daleko više od kvalitetne poljoprivrede i snažnih ekoloških mjera u očuvanju prirode; uključuje razmatranja o kvaliteti života, ekonomiji sustava prehrane, politike i upravljanja, kulturne baštine i socijalne pravde. Započinjemo određivanjem postojećih izazova i problema u održivom sustavu prehrane u Podravini; zatim procjenjujemo prepreke i mogućnosti za izgradnju održivog i otpornog sustava farmi i proizvodnje hrane u regiji; završavamo praktičnim preporukama za jačanje održivih ustava proizvodnje hrane i poljoprivrede u Koprivničko-križevačkoj županiji i široj regiji Podravine.

Vineyard Cottage road

Peach orchard

Petrić cottage

Jagnjedovec consulting

Popović farm

Popović family

CREATING NEW OPPORTUNITIES FOR AN OLD MINING REGION: THE CASE OF IDRIJA (SLOVENIA)

STVARANJE NOVIH MOGUĆNOSTI ZA STARU RUDARSKU REGIJU: PRIMJER IDRIJE U SLOVENIJI

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Summary

Five hundred years of mercury mining in the town of Idrija in western Slovenia resulted in a highly polluted and degraded landscape. In recent decades and especially since the closure of the mine in the mid-1990s, the town experienced a somewhat successful transition into other more environmentally friendly industries. The mine itself underwent a transition into a museum and, together with the wider region, became a »geopark« and a UNESCO World Heritage Site.

Key words: regional development, mercury, pollution, cultural heritage, UNESCO, Idrija, Slovenia
Ključne riječi: regionalni razvoj, živa, zagađenje, kulturna baština, UNESCO, Idrija, Slovenija

1. HISTORICAL OVERVIEW: IDRIJA AS THE SECOND-LARGEST MERCURY MINE IN THE WORLD

Mercury and its derivatives have been used since antiquity for ointments, in cosmetics and jewelry making, and as a pigment and an ingredient in pharmacopoeia. However, at that time only small quantities of mercury were needed.[1] In the mid-sixteenth century, a large-scale amalgamation process for refining silver was developed by the Spaniard Bartolomé de Medina (1527–1580). This invention made mercury the key element in the silver and gold extraction systems; hence its production heavily influenced the European economy.[2] Mercury was also later used in the chemical industry, agriculture, the war industry, medicine, and the electrical industry. It was one of the most versatile metals for industrial use for centuries, but it has gradually been replaced by less toxic substitutes.[3]

Over the last half millennium, the town of Idrija (Figure 1 and 2) was one of the major European exporters of mercury. The discovery of mercury ore in 1490 and its exploitation proved decisive for Idrija's

[1] Heritage of Mercury: Almadén and Idrija, 2011. URL: http://www.idrija.si/images/datoteke/strateski_dokumenti/MERCURY%20HERITAGE%20VOL%20I%20y%20II.pdf (20. 12. 2013).
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[3] Leskovec, I., Peljhan, M. 2009: Idrija: Zgodba o petstoletnem srebrnem studencu. Idrija, Rudnik živega srebra, 86 p.

economic development, especially for its early industrialization.[4] At that time, Idrija was under Venetian rule but mining rights were also granted to the Germans, who brought their mining technology to the town.[5] After the war between the Venetians and the Habsburgs at the beginning of sixteenth century,[6] the mine was nationalized in 1575 and came under the direct administration of the Habsburg court. At that point large-scale expansion and modernization of the company began.[7] During its five hundred years of operation, the Idrija mine produced 147,000 tons of mercury, accounting for 13% of global output.[8] The value of mercury and its transportation routes varied with regard to production circumstances at the world's largest mercury mine in Almadén, Spain, international political agreements, the importance of major European ports, and the global demand for mercury, especially in the Americas.[9]

Trading mercury was a risky business. The largest southern German and Venetian trading companies already traded this valuable metal in the sixteenth century. These companies entered into monopoly contracts with entrepreneurs and the region's noblemen to transport large quantities of mercury. Competition from the Spanish mercury mines, high excise duties, road tolls, and the high costs of insurance for transporting the metal overseas often resulted in uncertainty for the Idrija mine, and those that traded in it often recorded losses. The merchants were thus in danger of going bankrupt if they did not cancel their contracts at the right moment; consequently Idrija's entrepreneurs had a difficult time finding new merchants to take up the failed business. Such interruptions in trade also affected the miners; they lost their jobs and payment for their work.[10]

Until the mid-seventeenth century, Idrija's mercury was transported mainly through the town of Tolmin in western Slovenia and Cividale in eastern Italy to the port of Venice, and from there exported overseas. The increase in transport tariffs in Venice gradually resulted in a new route towards the north, via Salzburg toward the port of Amsterdam.[11] Over time, Trieste became a principal port for exporting Idrija's mercury. From 1736 onwards, all of the overseas trade took place from there.[12] These routes served for more than exporting mercury; from the opposite direction, important supplies and food were brought to Idrija. Newcomers, travelers, miners, mining experts, scientists, and medical experts came to the town, resulting in the production and exchange of knowledge. Continuous modernization of mining infrastructure (expansion of the mine, new shafts, and mine buildings) and technological development, closely related to accessing ore deposits, caused constant landscape changes in Idrija.[13]

The mercury ore deposit is below the center of the town of Idrija (Figure 2). The entire mine network is 700 km long, spread across fifteen levels, 382 m deep.[14] Mining was closely associated with water. Water was the most valuable energy source, but at the same time it caused many difficulties by breaking into the shafts and hindering ore extraction. A pumping system had to be built to pump pit water out of the shafts and to raise and lower cargo into and out of the mine. These pumps were driven by water from the dammed Idrijca River through a 3.5 km millrace that powered a large water wheel 13.6 m in diameter

4 Urbanc, M., Nared, J., Bole, D. 2012: Idrija: A local player on the global market. In: Locality, Memory, Reconstruction: The Cultural Challenges and Possibilities of Former Single-Industry Communities. Newcastle upon Tyne, Cambridge Scholars Publishing, pp. 101–122.

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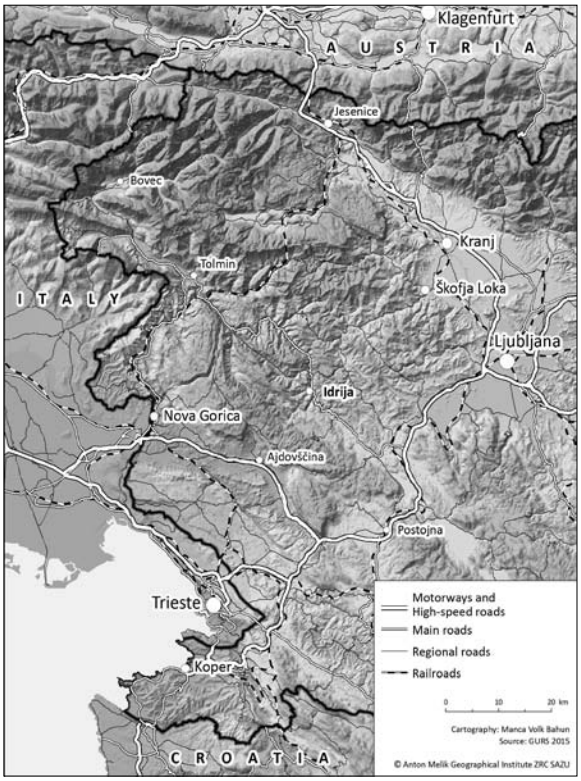

Figure 1: *Idrija is located in the narrow Idrijca Valley in western Slovenia.*

Figure 2: *Idrija around 1750 (source: Balthasar Hacquet, Oryctographia Carniolica II, 1781).*

(known as the *kamšt*).[15] This waterwheel had a rotation speed of four to five turns a minute and pumped three hundred liters of pit water per minute from 283 meters below the surface.[16]

Wood was another essential resource for Idrija's economy. Five hundred years of mining required vast quantities of timber for the mine's architecture, supporting pillars, machines, and smelting ore, as well as for supplying the town's residents.[17] After the nearby forests had been cut, the forests from the hilly surroundings were exploited. For this purpose, the first logging sluices (known as *klavže*) were built on nearby rivers in the sixteenth century (Figure 3). The largest ones preserved can be found on the Idrijca River. Timber was piled in the river and, when the sluicegates were opened, the released water drove the timber downstream to the valley, where it was retrieved from the water for use.[18] The sluices were associated with certain environmental effects, such as the formation of reservoirs behind them or artificial flood waves, which had great erosion force after the sluicegates were opened.[19] The reservoir with the largest sluice was 785 m long and contained 210,000 m^3 of water. When the sluicegates were opened,

[15] Pipan, P. 2012: Kamšt. In: DEDI - digitalna enciklopedija naravne in kulturne dediščine na Slovenskem. URL: http://www.dedi.si/dediscina/462-kamst (20. 12. 2013).

[16] Heritage of Mercury: Almadén and Idrija, 2011. URL: http://www.idrija.si/images/datoteke/strateski_dokumenti/MERCURY%20HERITAGE%20VOL%20I%20y%20II.pdf (20. 12. 2013).

[17] Zelenc, A. 2000: Rudniške elektrarne. Idrijski razgledi, 45 (2), pp. 69–77. Zelenc, A. 2001a: In vendar se giblje: katalog obnovljenih rudniških strojev in naprav. Idrija, Mestni muzej, 79 p.

[18] Brate, T. 1985: Idrijske klavže. Kulturni in naravni spomeniki Slovenije, 136. Maribor, Obzorja, 22 p. Kladnik, D. 2010: Klavže na Idrijci. In: DEDI - digitalna enciklopedija naravne in kulturne dediščine na Slovenskem. URL: http://www.dedi.si/dediscina/385-klavze-na-idrijci (20. 12. 2013).

[19] Zwitter, Ž. 2014: Okolje na Kranjskem v 17. stoletju po Slavi vojvodine Kranjske. In: Studia Valvasoriana: zbornik spremnih študij ob prvem integralnem prevodu Die Ehre Deß Hertzogthums Crain v slovenski jezik. Ljubljana, Zavod Dežela Kranjska, p. 642.

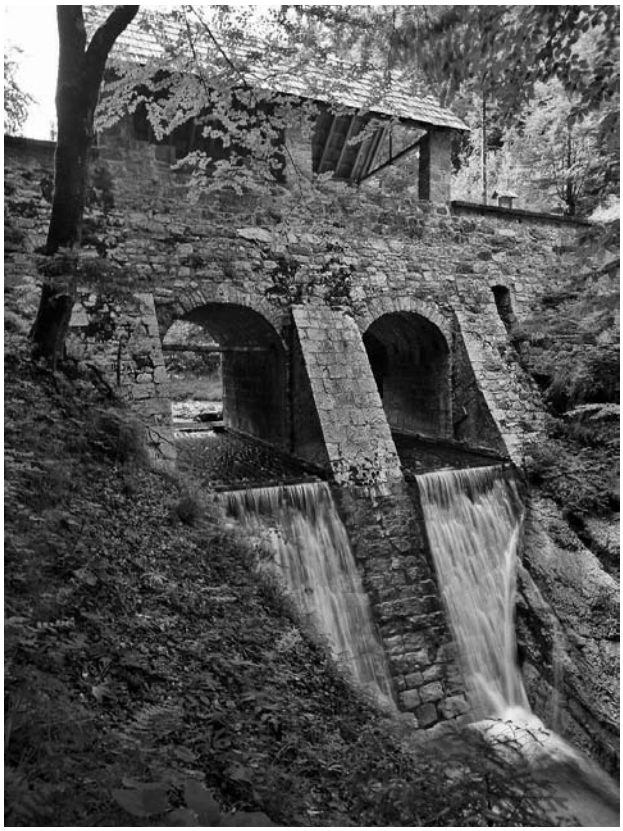

Figure 3: *Logging sluices were built on rivers from the sixteenth century onwards for moving timber downstream for use by the mine. The photo shows the Brus Sluice (also known as the Belca Sluice; photo: Bojan Erhartič).*

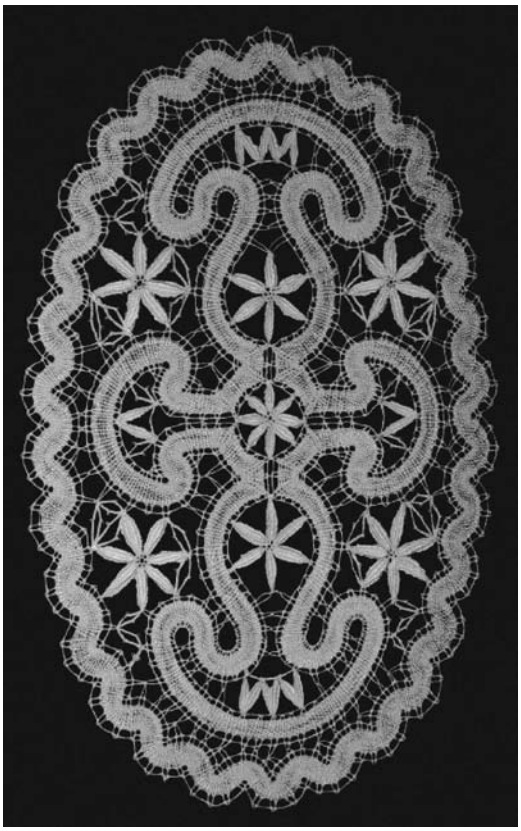

Figure 4: *Idrija lace (source: Idrija Lace School).*

it emptied in 15 to 20 minutes and approximately 13,000 m^3 of timber could be driven downstream to Idrija in a single release.[20] The released water and timber caused a tremendous booming noise along the valley. Before the timber was released downstream, all the obstacles were removed from the riverbeds: large rocks were pulled onto the banks or blown up, fallen trees were removed, and the riverbanks were reinforced, so that they did not collapse while driving logs. Locust and willow trees were planted along the riverbanks to reduce gravel erosion. The flood wave carried a great amount of gravel.[21] Piling the wood and transporting it also affected the river fauna, and historical sources report the complete devastation of the fish population downstream from the sluices. To compensate for this loss, a special trout farm was established in the vicinity and its hatchlings were transferred back into the rivers every year. Riverside meadows and fields along the logging route were regularly flooded, covered in wood and river sediments; therefore the owners received financial compensation.[22]

From nationalization in 1575 until the First World War, the Idrija mine was one of the most profitable state-owned companies.[23] Using steam engines, mechanical drilling, improved furnaces, and electrifica-

[20] Čar, J. 1991: Klavže. In: Enciklopedija Slovenije, 5. Ljubljana, Mladinska knjiga, p. 90.

[21] Mohorič, M. 2006: Vodni transport lesa in idrijski rudnik. Idrijski razgledi, 51 (1-2), pp. 80–81.

[22] Mazi, S. 1955: Klavže nad Idrijo. Ljubljana, Tehniški muzej Slovenije, 70 p.

[23] Urbanc, M., Nared, J., Bole, D. 2012: Idrija: A local player on the global market. In: Locality, Memory, Reconstruction: The Cultural Challenges and Possibilities of Former Single-Industry Communities. Newcastle upon Tyne, Cambridge Scholars Publishing, pp. 101–122.

Figure 5: *Idrija lace makers during the interwar period (source: Idrija Municipal Museum).*[*]

* Terpin Mlinar, M. 2010: Idrijska čipka. In: Na prelomnici: razvojna vprašanja Občine Idrija. Ljubljana, Založba ZRC, p. 199.

tion, the facilities maintained high production and achieved a record in 1913 with 820 tons of mercury.[24] Two experts from Idrija, Josip Čermak and Vincenc Špirek, designed a well-known furnace for smelting mercury ore that was resistant to the extremely high temperatures. At that time, the Čermak–Špirek furnace was the apex of mercury-smelting technology and was also applied to the world's largest mercury mine in Almadén.[25]

Idrija was a place where many important scholars worked and contributed to the technological advancement of the town and Europe as a whole. Their work was manifested in the early development of education, the arts, and science in Idrija.[26] Early establishment of educational facilities shows that a successful school system requires not only money and a regulatory basis, but also support of a local society that appreciates greater general knowledge and practical training for young people. A Protestant primary school was opened in 1581, a technical metallurgical and chemistry school operated from 1763 to 1769, and later there was also a mining primary school. The first Slovenian intermediate secondary school was established in Idrija in 1901.[27]

The development of the natural sciences in Idrija traces its roots to the sixteenth century. One scientist that left his mark on Idrija was Giovanni Antonio Scopoli (1723–1788), a polymath of global importance, a pioneer of European medicine at the workplace, and an important name in botany, geology, mineralogy, and chemistry.[28] Another prominent individual was Balthasar Hacquet (1739/1740–1815), who lived in Idrija between 1766 and 1773. He was a doctor, surgeon, and world-class naturalist. Idrija is also known for its early and well-organized healthcare and social care systems for workers.[29]

Although Idrija's miners earned similar wages to those working in other Austrian mines, they were worse off. Idrija lacked a fertile hinterland and food had to be imported from distant places. On many occasions, the basic wages did not even suffice for the bare necessities and only side jobs made it possible for miners to get ahead. Many miners worked as carpenters, bricklayers, and joiners, but from the

[24] Leskovec, I., Peljhan, M. 2009: Idrija: Zgodba o petstoletnem srebrnem studencu. Idrija, Rudnik živega srebra, 86 p.

[25] Heritage of Mercury: Almadén and Idrija, 2011. URL: http://www.idrija.si/images/datoteke/strateski_dokumenti/MERCURY%20HERITAGE%20VOL%20I%20y%20II.pdf (20. 12. 2013).

[26] Ibid.

[27] Pavlič, S. 1993: Idrijsko šolstvo skozi stoletja. In: Idrijska obzorja: Pet stoletij rudnika in mesta. Idrija, Mestni muzej, pp. 101–112.

[28] Heritage of Mercury: Almadén and Idrija, 2011. URL: http://www.idrija.si/images/datoteke/strateski_dokumenti/MERCURY%20HERITAGE%20VOL%20I%20y%20II.pdf (20. 12. 2013).

[29] Pfeifer, J. 1993: Zgodovinski razvoj medicine dela pri idrijskem rudniku. In: Idrijska obzorja: Pet stoletij rudnika in mesta. Idrija, Mestni muzej, pp. 93–100.

seventeenth century onwards the most common additional income came from lace (Figure 4) created by miners' wives (Figure 5).[30]

After the Second World War, the mine declined due to a drop in mercury prices on the world market and a decline in ore quality.[31] The Idrija mercury mine was one of the oldest operational mines in Europe until 1988, when a gradual closure process was launched.[32] The closure of the mine coincided with the collapse of communism and the breakup of Yugoslavia.

2. ENVIRONMENTAL IMPACTS OF MINING

Archeological finds indicate that the first practical application of cinnabar[33] was associated with its color; for example, in prehistoric cave drawings. The first advanced cultures used cinnabar primarily for its intense red color. Mercury was found in Egyptian tombs and was most likely used for religious rituals. In the first century BC, mercury was extracted by roasting mercury ore. In the Middle Ages, mercury was also used for alchemy and medicinal purposes.[34]

The first reports of miners poisoned by high mercury concentrations go back to the sixteenth and seventeenth centuries, when working hours also began to be shortened for miners working at more exposed sites. However, the awareness of the impact of mining and ore processing on the natural environment developed considerably more slowly.[35]

With regard to the impact on the natural environment, one should distinguish between primary or natural »pollution,« in which special natural conditions form due to the mercury-bearing rock on the surface, and secondary or human-caused pollution, which can have a severe environmental impact on people and the environment. Even the two simple mercury extraction procedures of rinsing and roasting ore caused intense uncontrolled pollution around the rinsing and roasting sites; roasting polluted the air and large quantities of mercury were rinsed into the surrounding streams.[36] The roasting residues were initially discarded around the roasting sites; later on, they were used for filling various relief depressions, and in the nineteenth century the majority of mining waste was discarded on the banks of the Idrijca River, which flushed it away regularly when the water was high. Some of this waste was used for building and surfacing roads, and partly for construction.[37]

The well-known alchemist and physician Theophrastus von Hohenheim, better known as Paracelsus, also spent two years in Idrija (from 1523 to 1524) and wrote the following about Idrija in his book on mining diseases:[38] »*Everyone that lives there is bent and paralyzed, partly asthmatic and partly chilled through, without hope of ever being completely healthy again.*« In the first half of the eighteenth century, the German travelogue writer Georg Keyssler wrote the following on the environmental impact of Idrija

[30] Batista, E. 2010: Idrijska čipka. DEDI - digitalna enciklopedija naravne in kulturne dediščine na Slovenskem. URL: http://www.dedi.si/dediscina/46-idrijska-cipka (20. 12. 2013).

[31] Urbanc, M., Nared, J., Bole, D. 2012: Idrija: A local player on the global market. In: Locality, Memory, Reconstruction: The Cultural Challenges and Possibilities of Former Single-Industry Communities. Newcastle upon Tyne, Cambridge Scholars Publishing, pp 101–122.

[32] Heritage of Mercury: Almadén and Idrija, 2011. URL: http://www.idrija.si/images/datoteke/strateski_dokumenti/MERCURY%20HERITAGE%20VOL%20I%20y%20II.pdf (20. 12. 2013).

[33] Mineral of mercury sulphide; Pavšič, J. (ed.) 2006: Geološki terminološki slovar. Ljubljana, Založba ZRC, p. 51.

[34] Čar, J., Dizdarevič, T. 2003: Pisna poročila o vplivu rudarjenja na naravno okolje v Idriji do konca 18. stoletja. Idrijski razgledi, 48 (1), p. 14.

[35] Ibid., p. 15.

[36] Ibid., pp. 18–19. Dizdarevič, T., Čar, J. 2009: Zgodovinski opisi posledic pridobivanja in predelave živosrebrne rude na okolje v Idriji od 16. do prve polovice 20. stoletja. Idrijski razgledi, 54 (2), p. 48.

[37] Kobal, A. B. 1995: Vplivi rudnika živega srebra na okolje in prebivalce v Idriji. Idrijski razgledi, 40 (1/2), p. 13.

[38] Čar, J., Dizdarevič, T. 2003: Pisna poročila o vplivu rudarjenja na naravno okolje v Idriji do konca 18. stoletja. Idrijski razgledi, 48 (1), p. 18–19. Dizdarevič, T., Čar, J. 2009: Zgodovinski opisi posledic pridobivanja in predelave živosrebrne rude na okolje v Idriji od 16. do prve polovice 20. stoletja. Idrijski razgledi, 54 (2), p. 45. Paracelsus 1527: Von der Bergsucht und anderen Bergkrankheiten. Neuburg.

ore roasting sites:[39] »*the smoke from these furnaces is so destructive for the plants that no fruit tree grows nearby and even the cows do not touch the hay coming from the surrounding meadows. The local farmers do raise calves, but they are stunted in their growth. The workers at the smelting plant change every week, so that everyone takes their turn once a year.*« After 1760, ore roasting was increasingly postponed to winter because it was believed that the roasting smoke was then less dangerous for the surrounding flora because the soil was covered in snow.[40] In the second half of the eighteenth century, the Idrija physician Balthasar Hacquet wrote a book on cattle poisoning,[41] in which he wrote that the harmful effects of mercury and sulfur in Idrija sickened cattle when they ate fodder from locations near the roasting sites. He also mentions the cattle being poisoned by the water that ran through the piles of waste from the roasting or rinsing sites. Wastewater flowed into the Idrijca River, where he mentions fish kills.[42]

In the seventeenth century and the first half of the eighteenth century, the first complaints were recorded regarding damage caused to sown crops, fodder, and cattle near the roasting sites. At the same time, efforts were taken to improve the roasting procedures, but these were mainly economic and had nothing to do with environmental awareness. It was not until the significantly increased production in the second half of the eighteenth century that the health and environmental conditions deteriorated to the extent that even the mine administration (Figure 6) had to admit that the gaseous emissions were harmful. In 1788, it began paying out damages to the landowners affected. This was probably the first »environmental annuity« in Carniola paid out regularly over the course of several years. A special mine committee was even established to assess the damage caused by smoke and determine eligibility for damages.[43] At the end of the eighteenth century, production decreased and new, more economical furnaces were introduced, which had a beneficial effect on environmental conditions (the sources indicate that people began raising sheep again) and subsequently also reduced the number of damage recipients. The payment of damages was cancelled after the major fire and production standstill in 1803. During the nineteenth century, landowners sought to reestablish the payment of damages, but the mine administration refused their claims with the »*findings*« that »*the smoke primarily affects the environment through its stench*« and that »*experience shows that mercury vapors settle extremely quickly.*« It was not until the 1880s that the mine administration acknowledged the harmful effects of gases and started paying annual »*support*« to the landowners.[44] Articles on environmental pollution published in various newspapers strongly influenced to this change of policy by the mine administrators.[45] There were several reports on two major fires (in 1803 and 1846) and the wastewater that then severely polluted the Idrijca River and killed the fish.[46] The contamination of the Idrijca also caused downstream contamination of the Soča River and even the Gulf of Trieste. It was only in the 1970s that depositing mine waste in the Idrijca was finally abolished.[47] The total quantity of mercury deposited in the alluvial sediments in the lower reaches of the Idrijca is estimated at over 2,000 tons, which amounts to approximately 5% of all the mercury released in the environment due to mining. In addition, it is estimated that approximately 2,500 tons of mercury

[39] Ibid., p. 20. Ibid., p. 46.

[40] Ibid., p. 21. Ibid., p. 46.

[41] Hacquet, B. 1779: Beobachtungen und Heilungsmethoden einzelner Hornvierhkrankheiten, welche durch Gifte aus der drei Reichen der Natur verursacht werden. Sammlung nützlicher Unterrichte. Laybach, Joh. Friedrich Eger, Landschaftl. Buchdrucker.
It is interesting that the same author claimed exactly the opposite in his 1781 book Oryctographia Carniolica–that it is not unhealthy to live in Idrija (Čar, J., Dizdarevič, T. 2003: Pisna poročila o vplivu rudarjenja na naravno okolje v Idriji do konca 18. stoletja. Idrijski razgledi, 48 (1), p. 22).

[42] Čar, J., Dizdarevič, T. 2003: Pisna poročila o vplivu rudarjenja na naravno okolje v Idriji do konca 18. stoletja. Idrijski razgledi, 48 (1), pp. 22–23.

[43] Ibid., p. 24.

[44] Dizdarevič, T., Čar, J. 2009: Zgodovinski opisi posledic pridobivanja in predelave živosrebrne rude na okolje v Idriji od 16. do prve polovice 20. stoletja. Idrijski razgledi, 54 (2), pp. 47, 49–50.

[45] Perger, H. 1873: Über die Schädlichkeit des idrianer Hüttenrauches. Österreichische Zeitschrift für Ber- und Hüttenwesen, 21.

[46] Dizdarevič, T., Čar, J. 2009: Zgodovinski opisi posledic pridobivanja in predelave živosrebrne rude na okolje v Idriji od 16. do prve polovice 20. stoletja. Idrijski razgledi, 54 (2), p. 48.

[47] Ibid., p. 50.

was washed into the Gulf of Trieste.[48] In the central part of the Adriatic Sea, more than 500 km from the mine, approximately 50% of the total mercury content in marine sediments is still of Idrija origin.[49]

During the entire operation of the mine, approximately 38,000 tons of mercury was released into the environment; predominantly in the form of vapors, roasting residues, and wastewater.[50] During the period of intense production (from 1968 to 1972), 7 to 10 tons of mercury was released from the smelting plants' chimneys.[51] Mercury concentrations in the air[52] were between 300 and 4,000 ng/m^3 (but also up to 8,000 ng/m^3); in approximately the same period, mercury concentration in the air in Ljubljana was 5 ng/m^3. Mercury concentrations in water, plants, animals, and people were also elevated.[53] Concentrations in the Idrija water supply system were up to three times higher than after the mine was closed, and concentrations in various organs of adult Idrija residents that did not work in the mine were up to sixty times higher than elsewhere in Slovenia in the 1970s.[54] Another problem was also elevated concentrations of radioactive elements (U-238, Ra-232) within the roasting residues.[55]

After production was stopped, mercury concentrations in the air and water decreased significantly, but mercury deposits in alluvial sediments and the soil have remained problematic.[56] Accordingly, pregnant women

Figure 6: *Gewerkenegg Castle in Idrija was built between 1522 and 1533. It was occupied by the mine administration for more than 400 years and now houses the Idrija Municipal Museum* (photo: Bojan Erhartič).*

* Gewerkenegg Castle – The Idrija Municipal Museum. URL: http://www.muzej-idrija-cerkno.si/index.php/en/locationsexhibitions/permanent-exhibitions/grad-gewerkenegg.html (10. 12. 2014).

48 Žibert, G., Gosar, M. 2005: Koliko živega srebra je akumulirano v poplavnih sedimentih reke Idrijce? Geologija, 48 (1), p. 103.

49 Gosar, M., Teršič, T. 2012: Environmental geochemistry studies in the area of Idrija mercury mine, Slovenia. Environmental Geochemistry and Health, 34 (1), p. 39.

50 Kobal, A. B. 2009: Pregled spoznanj o vplivu delovanja rudnika in živega srebra na zdravje prebivalcev v Idriji v preteklih stoletjih. Idrijski razgledi, 54 (2), p. 21.

51 Kobal, A. B. 1995: Vplivi rudnika živega srebra na okolje in prebivalce v Idriji. Idrijski razgledi, 40, p. 13.

52 In areas remote from industry, atmospheric levels of mercury are about 2 to 4 ng/m^3, and in urban areas about 10 ng/m^3. This means that the daily amount absorbed into the bloodstream from the atmosphere as a result of respiratory exposure is about 32 to 64 ng in remote areas, and about 160 ng in urban areas (Air Quality Guidelines for Europe, 2000. WHO Regional Publications, European Series, 91. Copenhagen, World Health Organization, p. 157. URL: http://www.euro.who.int/__data/assets/pdf_file/0005/74732/E71922.pdf (5. 3. 2015)). The World Health Organization has estimated a tolerable concentration of 0.2 µg/m^3 for long-term inhalation exposure to elemental mercury vapor, and a tolerable intake of total mercury of 2 µg/kg body weight per day (Exposure to Mercury: A Major Public Health Concern, 2007. Zürich, World Health Organization. URL: http://www.who.int/phe/news/Mercury-flyer.pdf (5. 3. 2015)).

53 Kobal, A. B. 1995: Vplivi rudnika živega srebra na okolje in prebivalce v Idriji. Idrijski razgledi, 40, pp. 14–19.

54 Kobal, A. B. 2009: Pregled spoznanj o vplivu delovanja rudnika in živega srebra na zdravje prebivalcev v Idriji v preteklih stoletjih. Idrijski razgledi, 54 (2), p. 27.

55 Ibid., p. 26.

56 Gosar, M., Čar, J. 2006: Vpliv žgalnic živosrebrne rude iz 16. in 17. stoletja na razširjenost živega srebra v okolici Idrije. Geologija,

and children continue to be advised against eating fish from the lower reaches of the Idrijca River and vegetables grown near the mine's smelting plant or ventilation shafts.[57]

At least from the second half of the nineteenth century onwards, mining was accompanied by subsidence. Some buildings already had to be pulled down at the end of the nineteenth century. In the 1970s and 1980s, subsidence over the mine was up to 10 cm/year.[58]

As shown, the five hundred years of mining have had a strong impact on people and the environment. In this regard, Paracelsus wrote »*how greatly Idrija's treasure turned into a poison for the people of Idrija*.«[59]

3. ECONOMIC TRANSFORMATIONS

Mining in Idrija also experienced its ups and downs, just like any other industry. During the great economic boom at the end of the eighteenth century, when the mine worked together with the Spaniards for several decades, 1,350 workers produced 600 to 700 tons of mercury a year, which covered 5% of the total expenditure of the Habsburg Empire. The mine retained an important role among the most productive state enterprises up until the First World War; through ongoing modernization the mine maintained its high production rates and, as already mentioned above, it achieved a record in 1913 with 820 tons of mercury.[60]

During the interwar period, when this region belonged to Italy, the mine stagnated, and it was completely disabled by air raids at the end of the Second World War. After several years of restoration, it managed to get running again and increased production to 500 to 600 tons a year, which lasted until the 1970s. That was when a crisis on the global mercury market began because mercury was increasingly replaced by substitutes that were friendlier to people and the environment, and mercury prices fell by a factor of eight. Due to unprofitable operations, production was even temporarily halted in 1977.[61] After several years of discussing and analyzing development opportunities, a decision was reached at the end of the 1980s to gradually close the mine due to continued low prices of mercury and the fact that a large part of the mine was located immediately below the town and surface movements were recorded.[62]

Even before the power of the mine began to wane, individual enterprises began operating in Idrija that gradually grew in importance over the following decades. At the beginning of the 1960s, Kolektor, a company producing commutators, was founded. It has now developed into a global corporation that supplies a large portion of the automobile industry and produces parts for household appliances and electric manual tools. Its development has been especially rapid in the past twenty years, during which it has turned into one of the leading international manufacturers of commutators.[63] From only a few dozen employees in 1963, it has grown into a corporation with more than twenty subsidiaries in Europe, the US, the Middle East, and Asia, which employ more than 3,000 people. Only in the past twenty years, the

49 (1), p. 100. Palinkaš, L. A., Pirc, S., Miko, S. F., Durn, G., Namjesnik, K., Kapelj, S. 1996: The Idrija mercury mine, Slovenia, a semi-millennium of continuous operation: an ecological impact. In: Environmental Toxicology Assessment. London, Taylor & Francis, pp. 317–341. Teršič, T., Biester, H., Gosar, M. 2014: Leaching of mercury from soils at extremely contaminated historical roasting sites (Idrija area, Slovenia). Geoderma, 226-227, pp. 213–222.

57 Kobal, A. B. 2009: Pregled spoznanj o vplivu delovanja rudnika in živega srebra na zdravje prebivalcev v Idriji v preteklih stoletjih. Idrijski razgledi, 54 (2), p. 21.

58 Dizdarevič, T., Čar, J. 2009: Zgodovinski opisi posledic pridobivanja in predelave živosrebrne rude na okolje v Idriji od 16. do prve polovice 20. stoletja. Idrijski razgledi, 54 (2), p. 50.

59 Kobal, A. B. 2009: Pregled spoznanj o vplivu delovanja rudnika in živega srebra na zdravje prebivalcev v Idriji v preteklih stoletjih. Idrijski razgledi, 54 (2), p. 32.

60 URL: http://www.rzs-idrija.si/zgodovina_vec.htm (1. 1. 2014).

61 Ibid. URL: http://www.rzs-idrija.si/zapiranje_vec.htm (1. 1. 2014).

62 Ibid.

63 Kolektor 45 let. Informator, junij 2008. URL: http://www.kolektor.com/resources/files/doc/komunitator/InformatorJunij08.pdf (10. 12. 2014).

corporation increased its sales by a factor of fifteen, its profits by several hundred times, and its added value per employee by three to four times.[64]

At the same time, another company important for Idrija was established: Hidria, a company that produces and assembles central heating, plumbing, and air conditioning. It has become one of the largest European corporations specializing in air conditioning, heating, and ventilation. It currently has thirty subsidiaries across the globe, employing over 2,000 people. Its R&D institutes create innovations that contribute to higher quality of life, comfortable living, and green mobility. The company has also focused on the automobile industry and is now an important provider of innovative solutions for car engines and vehicle steering systems, and hence an important partner of the majority of European car brands.[65] Thanks to its strong R&D focus, Hidria was declared Europe's most innovative company among the 15,000 companies vying for the 2013 European Business Awards.[66]

Idrija managed to restructure itself from an old industrial (mining) town into a vital new industrial area due to the international profile generated by its mine and its inclusion in the global trade. Many additional factors contributed to the successful transformation of Idrija: extensive technical expertise (which was put to good use by local companies), openness to the rest of the world and welcoming many international experts, human resources, a strong local identity, and financial incentives for restructuring that the mine (in contrast to other Slovenian mining centers) received during the early mining crisis.[67]

In addition to the rich technological heritage, it is also necessary to highlight the importance of the values that, according to research among the residents,[68] transformed Idrija and its residents into an environment focused on development and progress that helped Idrija become and remain a global economic center: technical expertise (Idrija had one of the most advanced mines, accumulating diverse knowledge from many European centers; e.g., Idrija was the world's leading knowhow and innovation center in ore smelting), flexibility, adaptability, quick response, openness to international markets, knowhow, and new ideas, the population's creativity (evidenced by numerous innovations during both the mining and industrial eras), and so on. Although new areas of economic activity arose, the people of Idrija continue to be open to the rest of the world and receptive to its influences. Specific historical development of the town seems to have resulted in the formation of a creative milieu described with characteristics such as openness to new ideas and knowledge, strong interpersonal relations, a high level of communication, solidarity, a strong identity and tacit knowledge, a sense of belonging, active participation in civil society, and intense face-to-face contacts.[69] Close connections to the global market for more than five centuries have shaped a resilient and creative community open to the influx of ideas and innovations.[70]

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64 Rupnik, P. 2012: Že 50 let poganjamo prihodnost. Informator, december 2012, pp. 2–3. URL: http://www.kolektor.si/resources/files/doc/komunitator/informator_%20december12.pdf (10. 12. 2014).

65 Hidria skozi zgodovino. URL: http://si.hidria.com/si/o-nas/ozadje/ (10. 12. 2014).

66 Hidria razglašena za najinovativnejše podjetje v Evropi (7. 6. 2013). URL: http://si.hidria.com/si/o-nas/novice-dogodki/7191/detail.html (10. 12. 2014).

67 Kavaš, D., Koman, K. 2010: Razvoj in stanje gospodarstva v Občini Idrija. In: Na prelomnici: razvojna vprašanja Občine Idrija. Ljubljana, Založba ZRC, pp. 131–142.

68 Urbanc, M., Nared, J., Bole, D. 2012: Idrija: A local player on the global market. In: Locality, Memory, Reconstruction: The Cultural Challenges and Possibilities of Former Single-Industry Communities. Newcastle upon Tyne, Cambridge Scholars Publishing, pp. 101–122. Razpotnik Visković, N., Nared, J., Urbanc, M. 2008: Pogovor v kavarni: soočenje teorije in prakse. Geografski vestnik, 80 (1), pp. 119–126. Zumaglini, M., Nared, J., Alfarè, L., Razpotnik Visković, N., Urbanc, M. 2008: Participation process in regional development: DIAMONT's perspective. Quaderni, 52. Bolzano, Accademia Europea, 146 p. Razpotnik Visković, N., Urbanc, M., Nared, J. 2009: Prostorska in razvojna vprašanja Alp. Georitem, 12. Ljubljana, Založba ZRC, 94 p. Nared, J., Bole, D., Razpotnik Visković, N. 2014: Tradition and development: the case of Idrija, Slovenia. Regions, 293 (1), pp. 17–20.

69 Fromhold-Eisbith, M. 1999: Das »kreative Milieu« - nur theoretisches Konzept oder Instrument der Regionalentwicklung? Raumordnung und Raumforschung, 57 (2-3), pp. 168–175. Rösch, A. 2000: Kreative Milieus als Faktoren der Regionalentwicklung. Raumordnung und Raumplannung, 58 (2-3), pp. 161–172.

70 Urbanc, M., Nared, J., Bole, D. 2012: Idrija: A local player on the global market. In: Locality, Memory, Reconstruction: The Cultural Challenges and Possibilities of Former Single-Industry Communities. Newcastle upon Tyne, Cambridge Scholars Publishing, pp. 101–122. Razpotnik Visković, N., Nared, J., Urbanc, M. 2008: Pogovor v kavarni: soočenje teorije in prakse. Geografski vestnik, 80 (1), pp. 119–126. Zumaglini, M., Nared, J., Alfarè, L., Razpotnik Visković, N., Urbanc, M. 2008: Participation process in regional development: DIAMONT's perspective. Quaderni, 52. Bolzano, Accademia Europea, 146 p. Razpotnik Visković, N.,

After the demise of mining, Idrija thus reoriented itself into industries that were based on technical expertise.[71] This has ranked it among Slovenia's most developed towns, but the question is whether this reorientation might have a negative impact on Idrija's economic sustainability in the future. The companies enabled a very smooth transition[72] to a market economy benefiting from a skilled work force adapted to an organized industrial work style; but, on the other hand, the success of such companies has silently tied employees to existing job opportunities and thus created hidden dependency. Idrija remained a traditional industrial society with a prevailing secondary sector attracting high-profile technical experts on the one hand, and unskilled and semiskilled workers from the wider region on the other. Although most people can find relatively secure jobs in the local community, work is not guaranteed for those educated in non-technical fields, who often move away from the region or commute daily to distant employment (or service) centers such as Ljubljana.[73]

Furthermore, the security provided by such companies hinders the development of specialized high value-added services, such as business consultancy, financial and legal services, and services linked to extensive knowledge of mercury, as well as private initiatives and small-scale entrepreneurship. Due to the high level of employment, it is very difficult to obtain workers for services such as the catering industry, which operate on different principles with regard to their organizational scheme and work time. For them it was easiest to work for the mine and, in recent times, is still easiest to work for the two electrical appliance companies. Circumstances did not compel residents to create their own opportunities, but only to utilize the opportunities created by others.[74]

Thus, with regard to economic sustainability, the main challenge Idrija is facing today is its monostructured economy and two other problems that could threaten the town's long-term development: lack of space for further development and poor accessibility (Figure 1).[75]

4. NEW SUSTAINABLE OPPORTUNITIES

Industrial and technical capital are not the only advantages Idrija has to offer. In terms of sustainable opportunities, the competitive advantages of the area are rich in historical and technical heritage, a wealth of geological and geomorphological features, and a diverse and attractive landscape.[76] Its cultural heritage was internationally acknowledged in 2012, when »mercury heritage« (Figure 7) in Idrija was included on the UNESCO World Heritage List together with the Spanish town of Almadén. To acknowledge geoheritage, the »Idrija Geopark« was established in 2010,[77] and in 2013[78] it was accepted into the European Geoparks Network[79] and the Global Network of National Geoparks.[80] With these achievements, Idrija is

Urbanc, M., Nared, J. 2009: Prostorska in razvojna vprašanja Alp. Georitem, 12. Ljubljana, Založba ZRC, 94 p. Nared, J., Bole, D., Razpotnik Visković, N. 2014: Tradition and development: the case of Idrija, Slovenia. Regions, 293 (1), pp. 17–20.

71 Straus, M. 2010: O ustvarjalni kulturi mladih: za živahno prihodnost mesta. In: Na prelomnici: razvojna vprašanja Občine Idrija. Ljubljana, Založba ZRC, pp. 189–194.

72 Heritage of Mercury: Almadén and Idrija, 2011. URL: http://www.idrija.si/images/datoteke/strateski_dokumenti/MERCURY%20HERITAGE%20VOL%20I%20y%20II.pdf (20. 12. 2013).

73 Urbanc, M., Nared, J., Bole, D. 2012: Idrija: A local player on the global market. In: Locality, Memory, Reconstruction: The Cultural Challenges and Possibilities of Former Single-Industry Communities. Newcastle upon Tyne, Cambridge Scholars Publishing, pp. 101–122.

74 Ibid.

75 Urbanc, M., Nared, J., Bole, D. 2012: Idrija: A local player on the global market. In: Locality, Memory, Reconstruction: The Cultural Challenges and Possibilities of Former Single-Industry Communities. Newcastle upon Tyne, Cambridge Scholars Publishing, pp. 101–122.

76 Kavaš, D., Koman, K. 2010: Razvoj in stanje gospodarstva v Občini Idrija. In: Na prelomnici: razvojna vprašanja Občine Idrija. Ljubljana, Založba ZRC, pp. 131–142.

77 Geopark Idrija. URL: http://www.geopark-idrija.si/si/geopark/75/kdo-smo/ (12. 12. 2014).

78 Dragoš, Š. 2013: Svetovno priznanje ob domači neresnosti. Primorske novice (9. 9. 2013). URL: http://www.primorske.si/Primorska/Goriska/Svetovno-priznanje-ob-domaci-neresnosti.aspx (12. 12. 2014).

79 European Geoparks Network. URL: http://www.europeangeoparks.org/ (12. 12. 2014).

80 Global Network of National Geoparks. URL: http://www.globalgeopark.org/index.htm (12. 12. 2014).

Figure 7: *Anthony's Main Road (»Antonijev rov«) is the oldest part of the Idrija mine and is one of the oldest preserved entrances into any mine in the world; it was excavated only a decade after the initial discovery of mercury.* Today this is the entrance to the Mine Museum (photo: Matija Zorn).*

* Kavčič, M., Peljhan, M. 2010: Geological heritage as an integral part of natural heritage conservation through its sustainable use in the Idrija region (Slovenia). Geoheritage, 2, p. 150.

gaining many opportunities: a more comprehensive approach to protecting and using natural and cultural heritage, a place on the world map of tourist destinations with rich natural, cultural, and technical heritage, development of tourism and related activities (catering, hotels, and souvenir production and sales), and enhanced regional awareness.[81] The economic potential of heritage can be reflected in increased tourism flows and resulting multiplier effects. In 1994, the oldest part of the mine was opened to the public. About 25,000 visitors visit each year, predominantly school groups (42%) and other groups (23%).[82]

Technical heritage is mainly concentrated in the urban part of the municipality; that is, the town of Idrija and its nearby surroundings. However, the development of the rural hinterland and its close connection to the town should not be ignored. Some valuable activities for developing local cultural tourism products in rural areas, especially on the Črni Vrh Plateau in the southern part of the Municipality of Idrija, are already showing positive results and active participation of the locals in this process. This was carried out by introducing responsible tourism practices, which primarily emphasize the social aspect of tourism developed within the context of environmental sustainability.[83]

5. CONCLUSION

Idrija is Slovenia's oldest mining town. The locals used to say: *»The town is a mine, the mine is a town.«* The town grew along with the development and expansion of the mine below ground. The buildings and streets (Figure 8) tell the stories about development, ups and downs, the people that lived and worked in the town over the centuries, their attitude towards the environment, culture, and more.[84] After five hundred years of intensive mining, the mine is now shut down and today only provides some main-

[81] Nared, J., Erhartič, B., Razpotnik Visković, N. 2013: Including development topics in a cultural heritage management plan: Mercury heritage in Idrija. Acta geographica Slovenica, 53 (2), p. 401.

[82] Kavčič, M., Peljhan, M. 2010: Geological heritage as an integral part of natural heritage conservation through its sustainable use in the Idrija region (Slovenia). Geoheritage, 2 (3), p. 150.

[83] Bole, D. 2014: Developing responsible tourism in the countryside using local culture and cultural heritage. In: Managing Cultural Heritage Sites in Southeastern Europe. Ljubljana, Založba ZRC, pp. 102–105.

[84] Gorjup-Kavčič, M., Režun, B., Eržen, U., Peljhan, M., Mulec, I. 2010: Natural, cultural and industrial heritage as a basis for sustainable regional development within the Geopark Idrija project (Slovenia). Geographica Pannonica, 14 (4), p. 139.

Figure 8: *Miners' houses and apartment blocks from the end of the nineteenth century are an important part of world heritage (photo: Bojan Erhartič).*

tenance and tourism functions. The town is prospering from its newly developed electrical industry and it is using the heritage of its mercury mine to develop cultural tourism.[85]

Investment and restructuring activities in the 1970s and 1980s allowed Idrija's soft transition into one of Slovenia's most successful centers for electrical products, and the town is known for its high-tech firms.[86] Because of this, there was no economic and social crisis after the mine shut down.[87] Idrija's new industries are very much in line with modern economic trends. Idrija's industry is strongly export-oriented, innovative, and highly productive. The main problem is its monostructured economy, which is prone to significant risk because a recession could push the Municipality of Idrija into a critical situation. In addition, two aspects of natural conditions could also threaten the town's long-term development and economy: due to its location in the deep narrow Idrijca Valley, Idrija lacks suitable land for settlement and economic development, and it faces transportation difficulties because it is cut off from major transport axes (Figure 1).[88]

Just as in the past, when it was generally held that the town was synonymous with the mine, a close mutual dependence between the town and local companies is evident today. Companies' economic success has been reflected in favorable social development because, despite Idrija's unfavorable natural conditions, its inhabitants remain in the region. Thanks to its industry, Idrija is an important employment center offering job opportunities to both local residents and people from neighboring areas.

However, it is the highly successful economic situation in particular that has created some negative side effects: high dependence on two major enterprises, a low level of self-employment, and a lack of entrepreneurship. The poorly represented service sector offers limited job opportunities for highly educated people from fields other than engineering. In the long run, this could lead to an unfavorable economic situation (especially if a crisis arises in this specialized area or if companies decide to move their facili-

[85] Zelenc, A. 2011b: Tehniška dediščina Rudnika živega srebra Idrija. Geografski obzornik, 58 (1), p. 12.

[86] Zumaglini, M., Nared, J., Alfarè, L., Razpotnik Visković, N., Urbanc, M. 2008: Participation process in regional development: DIAMONT's perspective. Quaderni, 52. Bolzano, Accademia Europea, 146 p.

[87] Gorjup-Kavčič, M., Režun, B., Eržen, U., Peljhan, M., Mulec, I. 2010: Natural, cultural and industrial heritage as a basis for sustainable regional development within the Geopark Idrija project (Slovenia). Geographica Pannonica, 14 (4), p. 139.

[88] Urbanc, M., Nared, J., Bole, D. 2012: Idrija: A local player on the global market. In: Locality, Memory, Reconstruction: The Cultural Challenges and Possibilities of Former Single-Industry Communities. Newcastle upon Tyne, Cambridge Scholars Publishing, pp. 101–122.

ties due to lack of available land for building new industrial structures or higher labor costs compared to some other countries).[89]

Another problem is a lack of workforce. Both companies are focusing their efforts on improving their development centers, which is why they will need a great number of experts–who are, however, unavailable in this part of Slovenia (both companies' projections exceed the number of mechanical engineering students expected to graduate in Slovenia in the next ten years).[90]

Importing experts from abroad seems like a possible solution but, despite its typical openness, Idrija is not in favor of this because it could threaten its identity and traditions.[91] Despite all the changes Idrija's residents still believe that the town's profile continues to be based on the mining tradition and lace[92].

Despite all of the open questions that Idrija is currently grappling with, one cannot ignore the fact that the closed mine and its five hundred years of history strongly shaped Idrija's residents and imprinted a number of characteristics into their minds that, even under altered economic conditions, ensure that Idrija continues to be integrated into global currents. This leads to the conclusion that historical experience is key to the performance of modern economic activities in Idrija, although there is no direct connection between current industry and mining. Idrija thus serves as an excellent example that confirms the role of »soft« development factors such as social and human capital, the image of the region, and quality of life. At least with regard to Idrija, these factors can fully substitute for the natural conditions (e.g., available construction land, natural resources, and energy) and location factors (e.g., infrastructure, good transport connections, and financial resources) that were considered key by traditional economic geography.[93]

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[89] Ibid.

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[91] Ibid.

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SAŽETAK

Petsto godina rudarenja žive u gradu Idrija u zapadnoj Sloveniji rezultiralo je jako zagađenim i degradiranim okolišem. U posljednjih nekoliko desetljeća, a posebno od zatvaranja rudnika sredinom 1990-ih, grad je doživio donekle uspješnu tranziciju u druge, ekološki čistije industrije. Sam rudnik pretvoren je u muzej i zajedno sa širom regijom postao »geopark«, te mjesto svjetske baštine UNESCO.

SUBSISTENCE, PROSPERITY AND ABANDONMENT OF ALPINE ISOLATED FARMS IN THE DYNAMIC 17TH CENTURY ENVIRONMENT: CASE STUDY FROM THE UPPER SAVINJA VALLEY WITH SPECIAL EMPHASIS ON TENANTS' INVENTORIES

OPSTANAK, PROSPERITET I NAPUŠTANJE OSAMLJENIH GOSPODARSTAVA U DINAMIČNOM OKOLIŠU 17. STOLJEĆA (PRIMJER DOLINE GORNJE SAVINJE S POSEBNIM NAGLASKOM NA OSTAVINSKE INVENTARE KMETOVA)

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Summary

Archival sources, mostly tenants' inventories presented in the context of further documents from archives of seigneuries, state and ecclesiastical administration, prove that environmental, economic and societal changes in the dynamic 17th century did not affect mountainous isolated farms in the western part of Eastern Karawanks and in central Kamnik-Savinja Alps in a uniform way. I presented opportunities and pitfalls of this kind of analysis of tenants' inventories. The method for assessing environmental loading of the 17th century animal husbandry is based on comparison of tenants' inventories with descriptions of farms. Its fundamental components include the weight of the 17th century livestock and the relationship between feed requirements of different animal species, obtained from seigneurial accounts and visitation proceedings. I analysed cereal production with special emphasis on species diversity, quantities of home-grown grain and cereal stocks. Trade in and lending of cereals took place. Inventoried ploughing implements and damage caused by slope processes prove unsustainable use of some fields. In the case of environmentally or socially caused economic difficulties lenders were in many cases able to provide lacking resources or tolerated arrears, but the scale and characteristics of tenants' indebtedness differed greatly. On the figure representing the sums of values attributed to livestock, cereals and of active debts from which debts are subtracted, environmental impact of bad harvests in the Late Maunder Minimum can be observed, but further factors, e.g. the extent and quality of agricultural land, non-agricultural sources of income, dowries and shares of inheritance, caused the non-uniform distribution of positive and negative balances of different farms. Population statistics prove that in comparison with the 19th century considerable numbers of inhabitants lived in the area even in the late 17th century.

Key words: environmental history, historical climatology, agricultural history, soil history, agroecosystems, demographic history, livestock weight, rural credit, wealth studies, probate inventories, Early Modern Period, Alps

Ključne riječi: povijest okoliša, povijesna klimatologija, poljoprivredna povijest, povijest tla, agroekosustavi, demografska povijest, težina stoke, ruralno kreditiranje, studije bogatstva, ostavinski inventari, rani novi vijek, Alpe

1. INTRODUCTION

The observed territory (Figs. 1–3) is situated on the south-easternmost edge of the Alps, in northern Slovenia. Isolated farmsteads[1] are spread on altitudes ranging from almost 500 to above 1 300 m a.s.l., a lot of pastures and alpine meadows lay higher, some of them above the upper forest line. Growing of cereals is still possible at 13 °C as mean July temperature where the mean annual precipitation is around 1 000 mm, or at mean July temperature of 16 °C at 1 400–1 500 mm mean annual precipitation (Zwittkovits 1983, 47). These are rough estimations, but they make clear why in some periods of climatic history these farms were highly climatically vulnerable, even though the altitudes of the highest ones are not extreme in the broader Alpine context. In the period of 1961–1990 mean July temperature of a considerable number of farms in the **region of Solčava** lay below 16 °C (Cegnar 1998, 103) – in the period 1971–2000 even below 14 °C – at annual precipitation exceeding 1 600 mm, in the western part of the mentioned region even 1 800 mm in both periods (Environmental Atlas…). The majority of precipitation falls in the growing season of spring-sown cereals (Meze 1963, 235). In the **region of Luče**, the mean July temperature on the majority of farms in the periods 1961–1990 and 1971–2000 was 16–18 °C, in some parts even below 16 °C, at more than 1 600 mm mean annual precipitation characteristic at least for the majority of the inhabited parts of this region (Cegnar 1998, 103; Environmental Atlas…). In the mid-20th century cereals were cut in August on the low farms in the region of Luče, mostly in September on the highest farms of the same region and on many farms in the region of Solčava, where harvest on the highest farms continued till the beginning of October, often after the first snow cover. According to data from the same period, the first grass was cut after 10 June on the low farms of the region of Luče and in the beginning of July on the highest farms of that region, in the middle of July at Strevc (Fig. 3, no. 52) and the neighbouring farms in the region of Solčava, but not before the beginning of August at the hundred-metre higher Bukovnik (Fig. 3, no. 62). The second mowing began after 10 July on the low farms of the region of Luče; on a well-situated farm at the entrance of the valley Robanov kot in the region of Solčava, it was cut before the first mowing at Bukovnik. On the highest farms of the region of Luče the aftermath was cut in the beginning of September, whereas it could not be mown on the highest farms in the region of Solčava (Meze 1963, 234–35, 249; Meze 1965, 202).

Late onset of the growing season was an advantage in the case of weather induced damage in spring. In 1673, for instance, 9.000 specimens of young plants were bought in Luče by the seigneury of Gornji

Figure 1: *Territory observed (black lines) in a broader Alpine context. For easier orientation, boundaries are represented in their present-day outline*

Source of background: Žerovnik 2001, additions: Ž. Zwitter.

[1] In words from the 17th century: »*populu[s] inter rupes et alpes longe dispersu[s]*« (NŠAL, KAL, fasc. 43, U 25, Visitation proceedings, 27 July 1668).

Figure 2: *Isolated farms of the former Luče AU (Amt) of the seigneury of Gornji Grad, behind the gorge snowy forest clearings of high-situated farms in the region of Solčava Photograph: Rok Dovjak, 2009.*

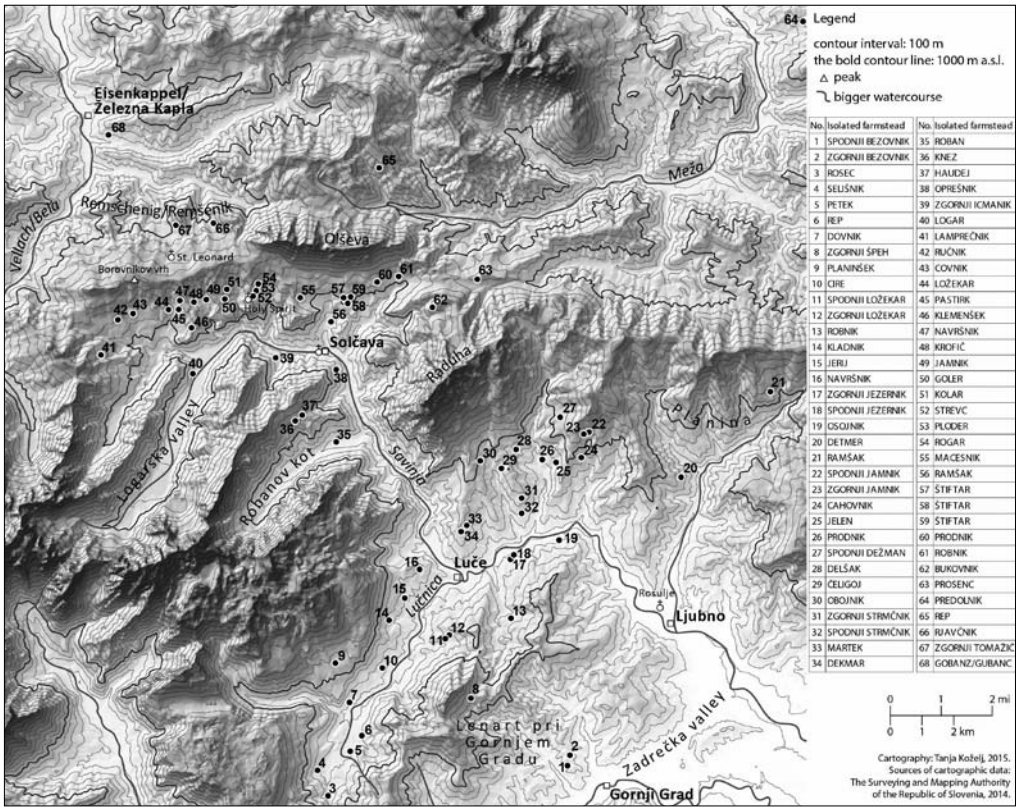
Grad to replace those on the demesne destroyed by hail or rain in April (NŠAL 20, box 39, account 1672/73, Lit. C).

Climatic differences at mezzo- and micro-level are considerable. The case of isolated farms in and above the valley of Robanov kot in the region of Solčava is instructive. There were, namely, better conditions for cereal growth at Knez (Fig. 3, no. 36), the highest farm there (1 220 m a.s.l.) than at Roban (Fig. 3, no. 35), which lies five hundred metres lower at the bottom of the valley (Fajgelj 1953, 132). However, it was often only possible to start ploughing in spring on the same days on the highest farms above Robanov kot (Fig. 3, nos. 36, 37) as at Bukovnik (Fig. 3, no. 62), the highest farm in the region of Solčava, situated hundred metres higher, but the cereals ripened even a week later above Robanov kot (interview with Ančka and Marija Prepotnik, Haudej farmstead (Fig. 3, no. 37), 21/12/2012).

The agricultural land of a typical isolated farm extends over different altitudes and mostly lies on slopes, fields were almost exclusively confined to soils on impermeable rocks (Meze 1963, 228; Meze 1965, 191–92). Despite the considerable extent of the farms, the area suitable for permanent fields was limited (Dodgshon 2011, 145, 159). The main advantage of steep fields was favourable insolation, but there were also disadvantages. Despite the high mean annual precipitation drought could affect the harvest (Gams 1993, 7–9). In the early 20th century, slope processes, in particular, threatened fields, climbing slopes with inclinations up to 30° (Gams 1959, 26). Landslide hazard is characteristic for the observed territory. Even nowadays there is a possibility for landslides to appear on almost 64%[2] of the Savinja river basin above Ljubno (Komac, and Zorn 2007, 152), but the extent of treeless area was much greater in the 17th century.

Only the livestock of some of the isolated farms in the regions of Solčava and Luče in the 17th century grazed on common alps; individually managed alps were also present (Zwitter 2014a, 217–19). Additionally, there was no collaboration between farms in connection with field rotation as field pattern of compact holdings was ubiquitous. Thus the rural community played only a small role—if the community existed at all. The role of help among neighbours and relatives was pronounced (Vilfan 1980, 73–74). The vicinity of all permanent fields, characteristic for the field pattern of compact holdings, caused high vulnerability to events such as hailstorm (Sieferle, and Müller-Herold 1996, 140) or landslide. There were hailstorms on the observed territory in the 17th century; just before its beginning hail caused damage to cereals in fields southwest of Luče in 1597, it also caused great damage at least to the isolated farm

[2] Additionally, 34 % are so steep that soil cover is interrupted–if it exists at all.



No.	Isolated farmstead	No.	Isolated farmstead
1	SPODNJI BEZOVNIK	35	ROBAN
2	ZGORNJI BEZOVNIK	36	KNEZ
3	ROSEC	37	HAUDEJ
4	SELIŠNIK	38	OPREŠNIK
5	PETEK	39	ZGORNJI ICMANIK
6	REP	40	LOGAR
7	DOVNIK	41	LAMPREČNIK
8	ZGORNJI ŠPEH	42	RUČNIK
9	PLANINŠEK	43	COVNIK
10	CIRE	44	LOŽEKAR
11	SPODNJI LOŽEKAR	45	PASTIRK
12	ZGORNJI LOŽEKAR	46	KLEMENŠEK
13	ROBNIK	47	NAVRŠNIK
14	KLADNIK	48	KROFIČ
15	JERIJ	49	JAMNIK
16	NAVRŠNIK	50	GOLER
17	ZGORNJI JEZERNIK	51	KOLAR
18	SPODNJI JEZERNIK	52	STREVC
19	OSOJNIK	53	PLODER
20	DETMER	54	ROGAR
21	RAMŠAK	55	MACESNIK
22	SPODNJI JAMNIK	56	RAMŠAK
23	ZGORNJI JAMNIK	57	ŠTIFTAR
24	ČAHOVNIK	58	ŠTIFTAR
25	JELEN	59	ŠTIFTAR
26	PRODNIK	60	PRODNIK
27	SPODNJI DEŽMAN	61	ROBNIK
28	DELŠAK	62	BUKOVNIK
29	ČELIGOJ	63	PROSENC
30	OBOJNIK	64	PREDOLNIK
31	ZGORNJI STRMČNIK	65	REP
32	SPODNJI STRMČNIK	66	RJAVČNIK
33	MARTEK	67	ZGORNJI TOMAŽIČ
34	DEKMAR	68	GOBANZ/GUBANC

Figure 3: *Locations of the isolated farmsteads and selected other settlements mentioned in the article*

Ramšak north of Solčava in 1627 (Fig. 3, no. 56), or in one of the previous years, along with other similar events (Zwitter 2013, 348–50). The presence of swidden cultivation, proven by the sources from the 17th century (Zwitter 2014a, 221–23), contributed to the dispersion of agricultural land. Its consequence was increased variety of fields' spatial distribution and altitudes, lowering the probability of bad harvest on all the fields (Pfister 1984, 50).

Selecting a remote Alpine area (Fig. 2) for territory of the case study on the one hand rises the probability of being able to prove considerable environmental impact on society by studying the written sources, but on the other hand promises to show considerably different environmental impact on individual farms according to unequal socio-economic but also environmental conditions at micro- and mezzo-level.

The main emphasis is placed on 23 inventories referring to eight isolated farms in the north of the region of Solčava, in the 17th century a part of the Carinthian seigneury of Eberndorf/Dobrla vas.[3] Additionally, 10 inventories referring to ten isolated farms from the AUs of Solčava and Luče from the seigneury of Gornji grad[4] were analysed. Although it is not a number representative for all the 17th century isolated farms in the Upper Savinja valley, it significantly upgrades the information on the topic obtained from other kinds of sources.

[3] Farms Krofič (Fig. 3, no. 48), Jamnik (no. 49), Goler (no. 50), Kolar (no. 51), Strevc (no. 52), Ploder (no. 53), Rogar (no. 54) and Macesnik (no. 55). References to their inventories begin with »StiASP, Eb., A.«, except for the »StiASP, Eb., A., fasc. 16«. The name of the tenant installed on Rogar farm in 1688 after the displacement of Simon Rogar was »*Bläßius Oschounigg*«, the well-off tenant, who died there in 1693, was »*Pangräz Rogger*«. However, the facts that Pangraz in 1693 possessed a copy of Simon's inventory from 1688 as well as the minute that Simon's home in 1688 was a big house suggest that both inventories—from 1688 and 1693—refer to the same farm; the fact that a big house (»*dß … grosse gebeÿ*«) is mentioned there in 1688 as Simon's home does not make the explanation possible that Simon, whose possession was so much smaller, only possessed a small part of that isolated farm (StiASP, Eb., A., fasc. 41, L. 27, no. 13; Eb., B. 155, 5 November 1688). However, this problem has not been entirely solved yet, so the conclusions drawn from Rogar's 1693 inventory should be addressed with caution throughout the article.

[4] In the region of Luče: Rep (Fig. 3, no. 6), Dovnik (no. 7), Ložekar (no. 11 or 12), Kladnik (no. 14), Jerij (no. 15), Martek (no. 33), Delšak (no. 28), Prodnik (no. 26) or Jelen (no. 25) or both of them together; in the region of Solčava: Knez (no. 36), Ramšak (no. 56) farm together with another house in the same region. References to their inventories begin with »StLA, GB I, 3388–89«.

2. ISOLATED FARMS IN THE DYNAMIC 17TH CENTURY ENVIRONMENT WITH SPECIAL EMPHASIS ON PROBATE INVENTORIES

2.1 Importance of 17th century peasant inventories as sources for agroecosystems

Inventories are lists of chattels possessed. Their most frequent form represent probate inventories, but also indebtedness, change of the tenant, tutelage or marriage could present the cause for an inventory (Pöttler 2002, 254). Some of them record only the movable possession, others also the immovables in tenure (Roth 1979, 408). It is possible for the property of cohabitants and other people or institutions to be mentioned too–mostly, but not necessarily, if it was to be found on the deceased's farm (Garrard 1980, 62–63; Kuuse 1980, 314).

Probate inventories give basic insight into agricultural production. Was, for instance, a certain territory at a certain time oriented extremely towards stockbreeding, towards cereal production, or were both of them well represented? Which species of cereals were grown, did winter-sown or spring-sown cereals prevail, or were they both common (Overton 1980, 210–11)? These are some of the crucial elements for environmental assessment of the past agriculture and its climatic vulnerability. In order to avoid the influence of grain trade, the information on the crops grown in a certain year should be obtained from inventories dating from the time when cereals ripen. If farmers grew autumn-sown as well as spring-sown cereals, only inventories from summer time before the harvest of the former are often suitable sources for it (Baulant 1975, 508; Overton 1980, 211–12), but the harvest could in reality be severely influenced by weather conditions afterwards. Measurement units should be converted carefully as they varied in time and space (Pöttler 2000, 272–73). Were any of those agricultural implements in use which by means of their very presence testify to the existence of certain cultivation practices or are important from the point of view of the history of soil erosion? Additionally, inventories are valuable sources for agricultural improvement, though some terminological difficulties can make the picture less clear. Clover, for instance, could be recorded as 'grass', 'hay', 'stover' or 'fodder' (Overton 1980, 213), maize as millet, broad bean, etc. (Montanari 1998, 136). Especially with regard to the date of introduction of innovations, it should be stressed that as probate inventories were written after possessor's death, the overrepresented old people were certainly not among groups inclined to introduce innovations, thus there is a delay in the occurrence of innovations in probate inventories (Pöttler 2002, 255; Roth 1979, 417; Overton 1980, 213). If there are sufficient numbers of scythes, sickles, rakes and hayforks listed, there was a better possibility to cope with most crucial tasks also in case of predominately rainy summer and autumn (Lischke 1991, 84), if only enough manpower was available. Regarding the documented livestock, inventories do not tell us the average numbers characteristic for observed farms, they only provide information on the herd at a certain point in that particular year (Overton 1980, 212). Several inventories enable us an insight into supplementary activities on farms, such as crafts, and contain information on the importance of trade in peasant economy (Garrard 1980, 57; Roth 1980, 44) as well as on the role of trade for mitigation of human vulnerability to environmental processes.

Especially if inventories for the same farms from different time are preserved, they are extremely important sources for investigation of the changing rural wealth, of the unequal environmental impacts and of the changing resilience to the dynamic environmental conditions. The fact that not all deaths resulted in an inventory affects these results (Overton 1980, 209, 211).

The 17th century probate inventories thus provide valuable insight into the following aspects, characterizing sustainability of agro-ecosystems: Was the production per unit of land relatively stable, without declining yields? Were the crops grown as well as agricultural operations diverse, which limited risk and strengthened stability? Was the system characterized by resilience to short-term and seasonal disturbances? Did the system enable producers an acceptable way of life? Did their savings suffice to cover the expenditures and to invest the capital needed for maintaining long-term productivity (cf. Haberl et al. 2009, 10–11)? In order to provide general conclusions, a large number of inventories enabling quantitative analysis should be studied (Overton 1980, 210). Further general remarks on opportunities and pitfalls of inventories are given in the chapters 2.2.2, 2.4, 2.5.1 and 2.6.

2.2 Farming in the dynamic 17th century environment

2.2.1 Animal husbandry

Livestock converted biomass not suitable for human nutrition as well as some wastes into human food, raw materials (e.g. fleece, skin) and traction. By producing manure animals crucially contributed to the allocation of plant nutrients from pastures, meadows and forest and their concentration on cropland, but animal digestive system also transformed plant biomass into forms better available for cultivars (Krausmann 2004, 756). The contribution of litter extraction to the allocation of nutrients was considerable as well. Ruminants could use land not suitable for cropping (Krausmann 2008, 33, 38), however, overgrazing was a frequent problem in preindustrial Europe (Marquardt 2006, 175).

The **live weight** of early modern animals is among the crucial data for the environmental assessment of animal husbandry. Even approximate pieces of information are often lacking (Overton 1980, 212). The economic accounts of the seigneury of Gornji Grad and the visitation proceedings from 1665 provide some data for the late 17th century Upper Savinja Valley.

Slaughter weight is defined as weight of meat of the butchered animal except for head, hide, legs beneath knees and entrails. It also includes the fat from within the body (tallow) (Löser and Zeeb 1876, 248). It corresponds in a high degree to the way of recording the weight of slaughtered animals, at least as far as cows and oxen are concerned, in financial documentation of the seigneury of Gornji Grad from 1680s.

The accounts from 1681/82 and 1686/87 include information on weight of 11 cows. The minimal recorded weight was about[5] 53 kg[6], the maximal one about 80 kg, with an average value of 66 kg (NŠAL 20, box 39, account 1 April 1681–31 March 1682, tables; NŠAL 20, box 40, account 29 April 1686–28 April 1687, expenditures for beef). The common weight of 6 cows butchered at the end of 1686 is recorded as 750 pounds (420 kg). It says in the following chapters that 270 pounds of the same meat were eaten soon afterwards; the other 480 pounds were smoked. So it was only the flesh with a part of bones. Thus a considerable quantity of (blood- or meat-?) sausages, made from the same cows, is not included in the weight of cows listed (Zwitter 2014a, 216). Additionally, for a cow weighing 130 pounds (73 kg) we are explicitly told that the weight stands only for meat (and probably a part of bones). The weight of this cow was above average, so the same criterion was used also while recording the weight of the others, for which there is also evidence that the weights listed were more or less wholly edible, except for the very probable amount of bones (NŠAL 20, box 39, account 1 April 1681–31 March 1682, tables). Meat from the legs is not listed separately, so it is probably entirely included in the recorded weights. Thus unlike the aforementioned definition, the numbers also comprise lower parts of legs, but the weights do not include tallow, which is recorded separately, its weight—if given—is not listed in a way enabling the calculation of that kind of fat for a single animal. However, it does not influence the calculations significantly.[7]

The accounts of the seigneury of Gornji Grad from 1681/82 and 1682/83 include information on weight of three oxen. The minimal recorded weight was 112 kg, the maximal one 172 kg, with an average value of 151 kg. The ox weighing 170 kg was entirely smoked later on, so it is a good approximation for slaughter weight. The same criteria were used for the heaviest ox, characterized as old, listed in the same source right in front of the one weighing 170 kg (NŠAL 20, box 39, account 1 April 1681–31 March 1682, tables). The lightest ox was 5 years old; this one was later on entirely smoked as well (NŠAL 20, box 39, account 1 April 1682–25 April 1683).

The account of the seigneury of Gornji Grad from the autumn of 1694 includes information on weight of 12 wethers. The minimal recorded weight was 10 kg, the maximal one 18 kg, with an average value of 15 kg (NŠAL 20, box 40, account 1694/95, *Wochen Zedl*).

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[5] The weight of 8 cows is given as weight of four pairs of animals; these cases include also the lightest and the heaviest cows mentioned in the article thus both values are only average weights per animal of two cows documented together.

[6] The value in pounds was multiplied by 0.56 in order to convert it into kilograms–see Vilfan (1954, 68).

[7] There were only 55 pounds (31 kg) of tallow obtained from 2 oxen, 5 cows and an unmentioned number of sheep in the year 1681/82 (NŠAL 20, box 39, account 1 April 1681–31 March 1682, tables).

The accounts of the seigneury of Gornji Grad from 1672/73, 1673/74, 1682/83, 1686/87, 1688/89, and 1694/95 include information on weight of 80 calves. The minimal recorded weight was about[8] 12 kg, the maximal one about 26 kg, with an average value of 17 kg (NŠAL 20, box 39, accounts 1672/73, Lit. A–D; 1673/74, Lit. B and C; 1 April 1682–25 April 1683; box 40, accounts 1686/87, expenditures for veal; 1688/89, slips; 1694/95 slips and *Wochen Zedl*). For some of the calves there is evidence that head and legs are not comprised within the weight listed as their purchase is mentioned separately. There are also such examples among those which were heavier than the average so this statement probably applies to all calves (NŠAL 20, box 40, accounts 1686/87, expenditures for veal; 1688/89, slips; 1694/95 slips and *Wochen Zedl*). The source contains information that weight includes bones of several calves, some of which were among the lightest ones, thus it is probably often the case, but it is explicitly mentioned only in some cases (NŠAL 20, box 40, account 1688/89, slips). Exceptionally, the hide or the entrails are reported to be included in the weight (NŠAL 20, box 39, accounts 1672/73, Lit. A; box 40, 1694/95 slips).

Table 1: *Livestock weight and feed requirements in the 17th century Upper Savinja valley.*

Animals	Cow	Ox A[1]	Ox B[2]	Wether	Calf
Average weight (kg) (chapter 2.2.1)	66	112	151	15	17
Slaughter weight (% of live weight) (Krausmann 2008, Table 14)	46 %	55 %	55 %	45 %[3]	55 %
Approximate live weight[4] (kg)	143	204	275	33	31
Minimum feed demand[5] (SE[6]/kg live weight/day) (Krausmann 2008, Table 14)	7.0	6.0	6.0	8.0	10.0
Standard feed demand[7] (SE/kg live weight/day) (Krausmann 2008, Table 14)	10.0	9.0	9.0	11.0	15.0
Minimum annual feed demand, 17th century, Upper Savinja Valley (kSE[8]), approximation	365	447	602	96	113
Standard annual feed demand, 17th century, Upper Savinja Valley (kSE), approximation	522	670	903	132	170

Source: data in the chapter 2.2.1.

1 The number of oxen is much too low to be representative. In the column Ox A the data refer only to the lightest ox.
2 The column Ox B represents the average of the three oxen.
3 All three pieces of information from this column where Krausmann 2008 is cited refer to sheep.
4 Average weights from chapter 2.2.1 taken as slaughter weights.
5 It is »an estimation for the required intake to maintain the stock at the assumed live weight, but allows only for very limited performance« (Krausmann 2008, 25).
6 Starch equivalents. »One starch equivalent … equals the digestive value of one gramme of starch« (Krausmann 2008, 11).
7 »Standard feed demand reflects the recommended feed intake based upon the assumed performance of nineteenth-century farm animals (concerning milk yield, weight gain, work)« (Krausmann 2008, 25).
8 Thousands of starch equivalents.

Table 2: *Grazing taxes paid to the priest of Solčava for different animal species according to the visitation proceedings from 1665*[1]

Animals	Cow	Heifer	Calf	Sheep	Goat
Grazing tax	20 kr	10 kr	10 kr	2 kr	3 kr
Grazing tax ratio to cow	1.00	0.50	0.50	0.10	0.15

Source: NŠAL, KAL, fasc. 43, U 22, fol. 14r.

1 The importance of local data is clearly revealed by the comparison with the different data of Marquardt: »Para otras especies [i.e. other than cows; Ž. Z.] existió una clave de conversión, de acuerdo con lo que cada especie consumía o deterioraba, por ejemplo, una vaca equivalía a tres cabras« (Marquardt 2006, 184).

8 In eight cases only the sum of weights of 2 or 3 animals is given, the weight of the lightest calf mentioned in the article is only the average weight of two animals in a pair.

Table 3: *Approximate annual livestock feed requirements for comparison with peasant probate inventories from the 17th century Upper Savinja Valley.*

Animals	Cow	Ox	Heifer	Calf	Sheep	Goat	Pig[1]	Horse[2]
Minimum annual feed demand (kSE)	365	447	146	146	37	55	114	492
Standard annual feed demand (kSE)	522	670	209	209	52	78	285	871

[1] The listed products from 6 pigs slaughtered in 1681/82 were: 76 pounds of smoked meat, 326 and 30 pounds of bacon, 18 and 44 pounds of grease, 12 shoulders and 112 sausages. It means 82 pounds (46 kg) plus a pair of shoulders and 19 sausages per animal but especially the weight of smoked meat is much lower than the fresh one (NŠAL 20, box 39, account 1 April 1681–31 March 1682, tables). The registered products from 8 pigs butchered in 1682/83 were: 146.5 pounds of smoked meat, 488 pounds of bacon, 61.5 pounds of grease, 16 shoulders and 140 sausages. It means 87 pounds (49 kg) plus a part of hams and 23 sausages per animal (NŠAL 20, box 39, account 1 April 1682–25 April 1683). Slaughter weight of a pig represents 75 % of its live weight (Krausmann 2008, Table 14), so the average live weight of each of the 6 pigs must have strongly exceeded 61 kg and the live weight of each of the 8 pigs 65 kg. The average weight of the 14 animals exceeded 63 kg. The weight of pigs can vary extremely with regard to the nutrition. An experiment showed that the well-fed individual weighed 127 kg, his malnourished twin only 26.5 kg after 8.5 months, thus only a fifth as much as his brother (Doll 2003, 153). So the values in Table 3 presuppose the surely too low live weight 39 kg (the average of 65 kg obtained from sources for the seigneurial seat and its fifth, i.e.13 kg), multiplied by 365 days and the standard and minimal daily feed demand for pigs according to Krausmann (2008, Table 14).

[2] Rough estimation based on the fact that the minimal feed demand of a light horse is about 1.1 times as high as of a light ox and standard feed demand about 1.3 times as high as of an ox (Krausmann 2008, Table 14).

The average cow from Großarl in Austrian Pongau weighed 230 kg in the first half of the 19th century (Krausmann 2008, 27). It is clear from Table 1 that cows in the 17th century Upper Savinja valley were much lighter.

We are not informed about the age of calves at butchering. Additionally, the wethers eaten at seigneurial seat were probably much heavier than an average sheep. Finally, data for some animal species are missing. These problems can partly be solved by the 1665 listing of grazing taxes collected by the priest of Solčava (Table 2).

In order to examine whether the 17th century livestock in the Upper Savinja valley did not exceed the carrying capacity, data on the maximal possible numbers of animals that could be sustained on single farms in their 17th century state as well as the feed demand of animals bred on the same farms in reality are needed. The former are provided by the description of the farms from 1665, the latter by the inventories and Table 3. Taking into consideration the previously mentioned fact that inventories do not provide the average annual numbers of livestock, only inventories from the barn-feeding period[9] were analysed for this purpose. Data in Table 3 are with exception of heifers and calves low in comparison with those in Table 1, a decision made in order to be sure not to show exaggerated environmental loading and thus be able to test the common notion that preindustrial agriculture did not overuse the natural potential. The average weight of cow from Table 1 is fairly low in comparison with the early 19th century Großarl, so the cow's feed demand from the same table is also included in Table 3. For oxen data from the Ox A column of Table 1 are used in further analysis.[10] For calves and heifers 2/5 of a cow feed demand are taken as the average of the calf/heifer-to-cow ratio from Table 1 (1/3 of the cow) and Table 2 (1/2 of the cow). For sheep 1/10 of the cow feed consumption was taken as suggested by Table 2 because the data on wethers in

[9] Approximately from 1 November to 30 April; for some data on the beginning of the grazing season on alpine pastures above the Upper Savinja Valley from the 16th to the early 18th century according to judicial sources see Zwitter 2014a, 220; according to a proverb from the region of Solčava, documented in the 20th century, grazing season began roughly on 24 April and ended on 11 November (Vršnik 2005, 172).

[10] Also the early 18th century information from the seigneury of Millstatt in Carinthia, if it refers to slaughter weight, proves that the column Ox A from Table 1 contains the right weight for our purpose: an average tenants' fattened ox weighed 130 kg (Dinklage 1966, 130) but all the oxen in the Upper Savinja Valley were not fattened so the average weight was lower. The facts that live oxen weighing 196 kg and more are mentioned in 1675 and those weighing 225 kg and more in 1696, both in connection with livestock trade from Carinthia to Italy (Dinklage 1966, 136–37, 142), prove that the mentioned 130 kg from the early 18th century really refer to the slaughter weight.

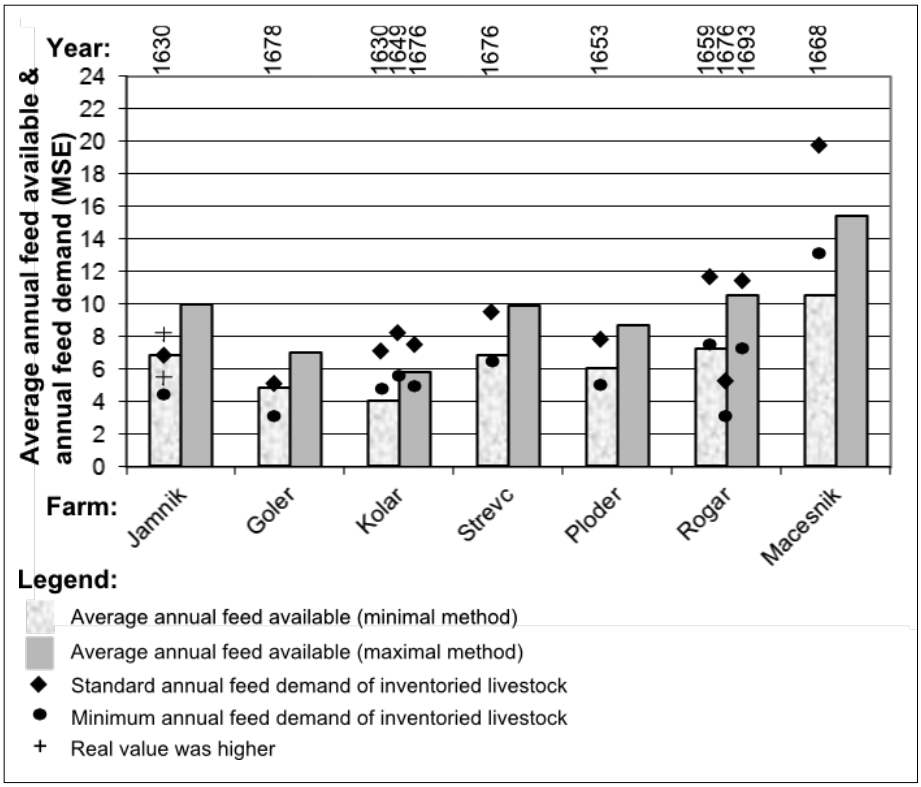

Figure 4: *Annual feed available according to the description from 1665 and annual feed demand according to inventories from barn-feeding periods for 7 isolated farms.[1] All values in MSE[2]. Conversion according to Table 3.[3]*

Sources: StiASP, Eb., A., fasc. 35, L. 11, nr. 62 & 112 & 115 & L. 13, nr. 76 & L. 14, nr. 141; fasc. 36, L. 15, nr. 204; fasc. 38, L. 19, nr. 14; fasc. 39, L. 21, nr. 14 & 15 & 17 & L. 22, nr. 35; fasc. 41, L. 27, nr. 13; StiASP, Eb., B. 4, pp. 685–89.

[1] The expression »*frischling*« was in the context interpreted as lamb (cf. Adelung 1808, 312; Mravljak 1932, 179). »*Terzel*«, »*terzen*« are counted as calves or heifers, which used to be the meaning of this word in Carinthia; it is also possible that these animals were already three years old (Grimm, Grimm 1935, 261–62), but according to the already mentioned principle to be sure not to present the data in an exaggerated way, the first explanation was used. For the same reason »*stierlein*« was interpreted as calf (Grimm, Grimm 1941, 2864). The same for other diminutives, although some of these animals were probably older but of small constitution–there is, for instance, a pair of four-year-old »*stierlein*« listed on Rogar farm in 1633 (Fig. 3, no. 54); but in this case the age of 2 years was initially recorded, additionally corrected to 4 (StiASP, Eb., A., fasc. 35, L. 12, no. 7). The feed demand of bulls is presupposed to be equal to that of oxen, mares equal to horses. Lambs, kids, young pigs and horses played a subordinate role, a half of the feed demand of the adults was counted as their feed demand. The inventory referring to the Rogar farm in 1633 containing information on livestock from the barn-feeding period is incomplete. Namely, rearing of church livestock is mentioned but its numbers are not recorded, thus that inventory is not included in the Fig. 4.

[2] Mega starch equivalents.

[3] Within the category of cattle the description does not distinguish between cows, oxen and bulls. As cows and oxen were common, the conversion factors 406 kSE for minimal feed demand and 596 kSE for standard feed demand as averages of values for cows and oxen were used in Fig. 4. It is possible that the columns are higher than the real nutritive value of fodder available in an average year in the early or middle 1660s. There are namely 8 cows, 2 heifers, 5 oxen and 4 *terzen* (19 animals altogether only counting the cattle) listed in the inventory of Krofič (Fig. 3, no. 48) from 3 June 1681 (StiASP, Eb., A., fasc. 39, L. 23, no. 27). Referring to this inventory it says in the early 18th century manorial minute that 19 heads of cattle can be kept on this farm in the summer time (StiASP, Eb., B. 151, 1032). The data in the description from 1665 were not collected from the older inventories, they are based on field work (Zwitter 2014a, 207), but it is possible that the numbers of animals which could be kept on a farm are unloaded sums of young animals and adults.

Table 1 are most probably much above an average sheep. And for goats 3 halves of the sheep feed demand are used in accordance with the visitation proceedings. Values for pigs and horses are rough estimations; fortunately, their numbers on the territory observed were extremely low.

In Fig. 4, the right column represents the fodder available on each farm in an average year according to the description of farms from 1665 if the animals were supposed to meet the standard feed demand; the left one represents the fodder available on the same farm if the herd was supposed to meet only the minimum feed demand. Points represent minimal feed demand of the real herd, diamonds its standard

feed demand according to the inventories from the barn-feeding period.[11] Where there are data from barn-feeding periods in different years, they are represented in chronological order from left to right.

Despite the roughness of these estimations Fig. 4 proves the existence of considerable spatial, but also temporal differences in **livestock related environmental loading**. Especially situations where the spot is close to the right column probably already resulted in loss of weight due to malnutrition (cf. Krausmann 2008, 25) because of the minimal method used for calculations, but also in exceeded carrying capacity and important environmental consequences unless the herd was considerably reduced or additional fodder bought. Among those rearing close to as much or more livestock than their farm could sustain there was no uniformity. On the one hand there are cases near the edge of or exceeding the carrying capacity. This group is represented by Kolar farm in the 17th century (Fig. 3, no. 51), which was repeatedly in difficult economic situation. According to the inventory from the early March 1676 this tenant reared considerable numbers of foreign livestock–26 sheep, 2 oxen, 2 *terzen* and 2 heifers apart from the cow and 20 sheep, belonging to the church, and his own small herd (StiASP, Eb., A., fasc. 39, L. 21, nr. 17). If the animals were malnourished, the rate of growth as well as milk production declined. When to cows, which consumed barely enough fodder to suffice for moderate milk production, only a small number of additional cows were added, the total milk production of the herd declined sharply (Pfister 1984, 38, 91–92, 96; Vasey 1992, 55). Rearing other farmers' animals was either a source of income or a way of settling one's debts. The situation of Macesnik farm (Fig. 3, no. 55), where the herd present in December 1668 could possibly also not have met standard feed demand till the end of the barn-feeding period, was entirely different. This well-situated farmer did not feed foreign animals, but had additional four oxen, not included in Fig. 4, reared at other farmers, most probably at Logar in the Logarska Valley (Fig. 3, no. 40) and Pasterk above the valley of Vellach/Bela in Carinthia[12] (StiASP, Eb., A., fasc. 38, L. 19, no. 14). He could afford to buy additional fodder or use a part of the extensive cereal stocks to feed selected animals.[13] While interpreting Fig. 4 one should not forget that the columns refer to the early or mid-1660s, but these values were not constant during the whole 17th century. In the case of rainy periods when hay was drying, the columns in Fig. 4 would be much lower.

The vital source of feed was grazing, where pastures on clearances or in forest played an important role, along with fields and meadows after harvest (Krausmann 2004, 746–47). In the warm part of the year, **grazing rights** were in some cases resilient enough **to overcome intervals of unfavourable weather conditions**, mainly occasional formation of snow cover on alpine pastures.[14] The judgement from 1588 ordered preservation of the old custom referring to some alpine pastures above Planinšek farm (Fig. 3, no. 9)—herders were allowed to take livestock to a shelter that lay lower, but higher than Planinšek farmstead, in the case of unfavourable weather[15] (NŠAL 20, box 97, Various tenants' cases, 16th–19th century: 1588). Nine years earlier a severe decrease in use of some high alpine pastures is documented in the western Karawanks due to frequent snow cover (Zwitter 2014b, 669).

The farms of the seigneury of Eberndorf/Dobrla vas in the region of Solčava, with the exception of Macesnik, had the right to graze the herds on the alpine pasture of the seigneury of Hagenegg, extend-

[11] The plus at Jamnik (Fig. 3, no. 49) marks that the number should be higher as the presence of young pigs is mentioned but their number is not recorded. The sums for Ploder (Fig. 3, no. 53) could also be lower according to the inventory because the livestock belonging to the widow in accordance with the wedding agreement was included in Fig. 4; the interpretation that this livestock was not present but a part of the possession assessed to the same value was excluded from the inventory and attributed to her cannot be entirely excluded. In this case the point would lie at 4.0 MSE, the diamond at 6.2 MSE.

[12] »*Lager*« in the region of Solčava and »*Pastierkh Vbieli*« (»V Beli« means in Slovene »in (the valley of) Vellach/Bela«).

[13] See chapters 2.2.2 and 2.5.

[14] On 14 June 1882, e.g., farmers had to take their livestock kept on alpine pastures on the Menina plateau (south of Gornji Grad; Figs. 1, 3) home for a couple of days because on 13 June considerable snow cover formed in altitudes down to about 1100 m a.s.l., locally even some hundreds of meters lower. According to the eyewitness report animals were exhaused when they reached the valley because they were so hungry (ŽA Ljubno, Chronicle, year 1882).

[15] »*… die jenigen, so Irer F[ü]r[stlichen] G[naden]* [= to the seigneury of Gornji Grad where prince bishop of Ljubljana was the feudal lord] *dß albm recht reichen, wan ein vngewitter angefallen, ir viechl als vnder ainen schermb herab, wo er* [Planinšek] *im ain aigenthumb zu rechnet, getriben, dabeÿ solle es noch als von alter heer khumen ist, beleiben*«.

ing mostly on the upper part of the north-facing slope of the ridge splitting the region of Solčava and the Remschenig/Remšenik valley (Fig. 3). It extended about 3.8 km in the east-west direction between the forest and the alpine pasture of Rogar on the eastern edge (Fig. 3, no. 54) and Borovnikov vrh or its vicinity on the western edge (Fig. 3). The record on the state of this alp copied in 1677 from an older source,[16] reveals that a third of the territory was entirely **treeless**[17] (StiASP, Eb., B. 4, 689 & B. 183, fol. 88–89) **although** lying much **below the natural upper forest line**[18], proving the human impact. According to the Franciscean Cadastre map pastures extended over quite a similar proportion of the mentioned territory[19], but these were pastures with trees, thus the treeless area was at the time, to which the in 1677 copied inscription refers, probably even greater than in the early 19th century (AS 177, C 101, A01–04; Kärnten Atlas: Franziszeischer Kataster). The mentioned (over)grazing belonged to the ways of creating, or at least, maintaining the extensive clearings.

Slope processes in some cases caused temporal changes in spatial distribution of pastures and meadows. After the medieval colonisation and prior to 1665 accumulation as a result of debris flow covered a nice meadow, a part of Macesnik farm (Fig. 3, no. 55), leading to abandonment of agricultural use of that plot. Combination of archival sources, geological data and geomorphic evidences obtained by field work proved that this meadow lay below the colluvium beneath the ravines that formed on the steep southern slope of Olševa north of Macesnik farmstead (Fig. 3). During heavy rain events regolith carried through stream flow down the steep slope together with material, accumulated in colluvium, and water form alpine debris avalanches which in some cases cover hundreds of meters of gentler slope beneath, apparently also the mentioned meadow (Mrak, Novak, Zwitter forthcoming).

Scythes were probably not available on all the farms in numbers which would have enabled the optimal use of manpower in the period of optimal stage of plant development or even in case of only few days of dry weather in the time of mowing. The number of scythes in those inventories, where they are explicitly recorded (76 % of inventories), ranges between 1 and 4 (StiASP, Eb., A., fasc. 35, L. 11, nos. 112 & 115 & L. 12, no. 7 & L. 13, nos. 13 & 76 & L. 14, no. 141; fasc. 36, L. 15, no. 204; fasc. 38, L. 19, nos. 14 & 59; fasc. 39, L. 21, nos. 15 & 17; fasc. 40, L. 25, nos. 39 & 40; fasc. 41, L. 27, no. 13; fasc. 42, L. 28, no. 24; StLA, GB I, 3388–89, Delšak, Dovnik, Prodnik (Jelen), Jerij, Kladnik, Knez, Ložekar, Martek, Rep, Schetteÿ). The quality of the grass cut too late declined, the onset of rainy period made the situation even worse as a great majority of nutrients were lost, the taste declined, in extreme cases the hay could only be used for litter (Pfister 1984, 40–42) or the entire mown gras rotted (Makarovič 1982, 151; author's interview with Ančka and Marija Prepotnik, Haudej farmstead (Fig. 3, no. 37), 21/12/2012). Relevance of this kind of interpretation of farming equipment is attested by the description of the wet year 1882 by local priest who stated that for those farmers who failed to mow and dry enough gras on few appropriate days, there was no opportunity to do it later (ŽA Ljubno, Chronicle, year 1882).

Quantities of **winter fodder** were included in inventories only exceptionally. On Kolar farm (Fig. 3, no. 51) 8 wagons of hay and 9 wagons of straw of various cereal species, but no livestock belonging to the at that time displaced tenant, are recorded in September 1682. 40 wagons of hay are listed in the inventory of Rogar (Fig. 3, no. 54) in September 1688, but only about 12[20] wagons in the inventory of Strevc (Fig. 3, no. 52) from the same year, although the herds of both tenants were extremely small as a result of severe economic difficulties. Inventories do not prove reliably whether the »hay« recorded was only hay or hay and straw; in the inventory of Strevc from 1688 only hay is recorded, but in the range of the division of the property hay and straw of the same value as previously »hay« alone are mentioned (StiASP, Eb.,

[16] Probably from 1585 which contains a very similar description of the borders of this alp (cf. Wutte 1924, 102).

[17] *»Der drite thaill dises waldts ist bloß, daran khein holz stehet.«*

[18] The highest peaks of this ridge only reach 1 500 m a.s.l., natural upper forest line on the nearby Olševa would nowadays lie near 1 900 m a.s.l. (Lovrenčak 2007 [1984], 15–16) thus despite the climatic fluctuations it would not have lain 400 m lower in the 16th or 17th century.

[19] Exact borders of the alp will have to be studied in detail.

[20] Only the assessed value (12 fl) is given, not also the quantity, which is computed on the basis of the inventory of Rogar (Fig. 3, no. 54) from the same day.

A., fasc. 40, L. 24, no. 1 & L. 25, nos. 39 & 40). Inventories reveal two ways out if the stocks of fodder were insufficient. One either sold superfluous animals, or let them to farms with enough fodder, which is proven, for instance, by the inventory of Jamnik in 1696, whose debt to the nearby Klemenšek for feeding amounted to 1.33 fl[21] (Fig. 3, nos. 46, 49) (StiASP, Eb., A., fasc. 42, L. 28, no. 24). Fodder in form of dried tree-leaves recorded in the 17th century judicial source for the nearby Alpine territory (Kotnik 2003, 62) is not mentioned in the inventories, which still does not prove that it was not commonplace. At least some oxen were usually fed better than other animals as they had to be ready for ploughing in early spring (Krausmann 2004, 748, 761; Lerche 1986, 139).

Breeding of different animal species, cattle and sheep were prevailing, enabled better exploitation of natural resources. Cattle prefer grass, sheep prefer forbs (Dodgshon 2011, 153); the latter can graze on pastures not suitable for cattle and in winter they can be fed with fodder of lower quality than cattle (Razvoj… 2011, 55–56). The breeds of domestic animals were not uniform. On the territory observed, a judicial source from 1575 mentions a fair-haired ox with a white patch, a red ox with a white face and patches, a white-and-black ox, a brown ox. Red oxen and a black ox, along with a red pig and a black pig, are recorded in the inventory referring to an isolated farm in the nearby Zadrečka valley from 1614 (Zwitter 2014a, 216; Fig. 3). On Strevc farm (Fig. 3, no. 52) a black heifer is mentioned in 1676 (StiASP, Eb., A., fasc. 39, L. 21, no. 27). 15 »Italian« sheep at Strmčnik near Luče in 1683 (Fig. 3, no. 31 or 32) prove that crossbreeding with Italian sheep occurred as well (Zwitter 2014a, 216).

Trade in livestock played an important role. Every couple of years a pair of fattened oxen was sold from the majority of isolated farms, as suggested by the data for the AU of Luče from 1693 preserved in the archives of the Inner Austrian court's treasury, only taking into account the trade across the border of the land. Additionally, local trade in livestock flourished (Zwitter 2014a, 215).

Although quantities of **cheese** are only recorded in some inventories, they make clear that the provisions of cheese often (almost) ran out before the onset of the next pasturing period, it was not a common strategy to preserve considerable amounts of cheese to cover possible food shortages in the next year. There are 21 pounds (0.56 kg each) of cheese in the inventory from Jerij near Luče from 29 December 1664 (Fig. 3, no. 15), one small cheese in the inventory of Kolar in the region of Solčava from January 1630 (Fig. 3, no. 51), 16 pairs of cheese recorded at Kladnik on 14 May 1613 (Fig. 3, no. 14), 20 pairs of cheese at Martek above Luče on 22 May 1632 (Fig. 3, no. 33), 15 pounds of cheese at the homestead Ložekar near Luče on 31 July 1610 and additional 11 pairs of cheese in the alpine cottage (Fig. 3, no. 11 or 12). Among the debts of the tenant from Rogar farmstead (Fig. 3, no. 54), who was on his deathbed in 1633, there is a debt for 9 pounds of cheese to his brother Kolar (Fig. 3, no. 51) (StLA, GB I, 3388–89, Jerij, Kladnik, Ložekar, Martek; StiASP, Eb., A., fasc. 35, L. 11, no. 112 & L. 12, no. 7).

2.2.2 Agriculture in the context of weather, climate and slope processes

The oldest known tithe register for the region of Solčava contains data from the late 18th century. There are valuable 17th century data on **crops** grown on the observed farms in 14 inventories, listing cereals sown in the harvest time, shortly before it, clearly noting the crops in fields, or shortly after harvest mentioning the sheaves still waiting to be threshed. The inventories reveal that cereals were mostly spring-sown in the 17th century. Only on Macesnik farm (Fig. 3, no. 55), which lies on 1 100 m a.s.l. and does not belong to the highest ones, rye is mentioned in field in the inventory from 7 December 1668. It means that at least a part of rye was autumn-sown there, whereas all the other cereals, and most probably[22] the remaining rye, were sown in the spring of 1669 (StiASP, Eb., A., fasc. 38, L. 19, no. 14). Long-lasting snow cover, or its crusted upper part, freeze and drought are some of the factors causing damage on autumn-sown cereals in winter, especially on rye. On the other hand, on the territory where the majority of cereals were spring-sown, autumn-sowing increased the variability of the distribution of climatically

[21] *»Dem Clementschekh an der fuetereÿ«.*

[22] According to this inventory the volume of rye grain stored on 7 December was 25 times as high as the volume of the autumn-sown seed.

more sensitive phenophases of cultivars during the year. Autumn-sown crops ripened earlier and were thus independent of weather in September and October when spring-sown cereals were cut. Additionally, if winter caused great damage to autumn-sown crops, there was still time in spring to plough the fields again and sow something else (Pfister 1984, 36, 50). According to the data for the AU of Luče from 1579 cereal production in general did not decline with rising altitude of farms (Zwitter 2014a, 220–21).

The cereal species grown were moderately diverse. The diversity mitigated economic consequences if weather was unfavourable for one or some of them and reduced damage in case of diseases (Vasey 1992, 51). Even if the volume of unit for measuring oats was the same as for other cereals,[23] oat grain held the first place in all the ten inventories[24], enabling the calculation of the ratio among the crops sown, harvested or expected to be harvested; in 80 % of these cases the volume of grains of cereal species which held the second place did not reach, or only hardly exceeded, half of the volume of oats. It means that also in seven inventories, referring to the amount of cereals harvested, the prevalence of oats is not just a consequence of weather impact on yield in certain years or in certain microclimates, but it also reflects the predominance of oats among the cereals sown. It played an important role not only in animal, but also in human diet. For instance, a part of food pensions, assured in the inventories of Krofič (1654), Rogar (1676) and Goler (1678) was oats (Fig. 3, nos. 48, 54, 50); oat bread and rye bread were stolen from Macesnik farmstead in 1795 (Fig. 3, no. 55) (StiASP, Eb., A., fasc. 16, Sulzbach; fasc. 35, L. 14, no. 154; 39, L. 21, no. 15 & L. 22, no. 35), according to the mid-19th century data from the parish of Luče oat bread was eaten daily (ŽA Luče, Chronicle, 44). The advantage of oats is its adaptability to insolation, temperature and soil conditions, provided there is enough precipitation. Even in very wet summers the harvest of oats does not decline. Its weakness is the longest growing season among all the spring-sown cereals, preventing its maturity in years with low summer and autumn temperatures or extremely late spring, especially on high-lying farms.[25] The harvest of oats can be extremely low in case of drought in the early stages of plant development (Pfister 1984, 37).

Rye or wheat mostly held the second place regarding the volume of grain harvested.[26] Frosts in late spring or summer cut the grain growth. In the early autumn, long-lasting rainy periods just before the harvest caused germination of grain on stalks, deteriorating the nutritive value and causing difficulties in storing and baking (Pfister 1984, 36). According to the 20th century observations wheat did not ripen on all the farms every year[27] (author's interview with Marija and Jakob Zamernik, farm Sp. Dežman (Fig. 3, no. 27; 15/10/2009), it says in the description of Krofič farm from 1665 (Fig. 3, no. 48) that first snow

[23] See footnotes 38, 39 and note 1 below Table 4.

[24] The dates of inventories and quantities of grain recorded suggest the following division of the ten inventories: 1) seed sown: Krofič (3 June 1681; Fig. 3, no. 48), Strevc (6 July 1643; Fig. 3, no. 52), Goler (28 July 1672; Fig. 3, no. 50); 2) cereals harvested or expected to be harvested: Ložekar (31 July 1610: note on the 1610 crop from 10 March 1611; Fig. 3, no. 11 or 12), Strevc (18 August 1676; Fig. 3, no. 52), Rogar (16 September 1688; Fig. 3, no. 54), Kolar (22 September 1682; Fig. 3, no. 51), Jamnik (16 October 1696; Fig. 3, no. 49), Ploder (3 November 1653; Fig. 3, no. 53), and Rogar (4 November 1693; Fig. 3, no. 54) (StiASP, Eb., A., fasc. 35, L. 13, no. 13 & L. 14, no. 141; fasc. 38, L. 19, no. 59; fasc. 39, L. 21, no. 27 & L. 23, no. 27; fasc. 40, L. 24, no. 1 & L. 25, no. 40; fasc. 41, L. 27, no. 13; fasc. 42, L. 28, no. 24; StLA, GB I, 3388–89, Ložekar).

[25] Its relevance for the Upper Savinja Valley can be proven by the description of the bad harvest in 1864 in the chronicle of the parish of Luče. Northern winds carrying wet air and precipitation in forms of rain and snow were common in spring, summer and autumn; there was fresh snow cover on the alpine peaks each month. Due to cold weather ripening was delayed and cereals, oats in particular, had to be cut green on the high farms: »*Mensibus vernalibus, aestivalibus nec non autumnalibus flabant frequentes venti boreales, qui offerebant pluvias nivesque, ita ut singulis mensibus per annum alpium cacumina nive dealbata apparuerint ..., maturitas ob defectum calorum sufficientium diu procrastinabatur, ita ut rustici in montanis fruges, praecipue avenam adhuc viridem messuerint*« (ŽA Luče, Chronicle, year 1864).

[26] It was rye in four inventories reporting the cereal harvest, in two of them it shared the second place with other cereals (barley or both wheat and buckwheat), in the inventory of Goler from 1672 (Fig. 3, no. 50) the volume of rye seed shared the first place with wheat. Wheat held the second place in at least three cases of reported grain harvest (in the case of the Rogar inventory from 1693 (Fig. 3, no. 54) only oats, rye, wheat and barley are explicitly noted to be still in sheaves, so it is not clear whether the mentioned quantity of buckwheat was also harvested on that farm in that year or not; if we exclude it, this would be the fourth case) once together with both rye and buckwheat. The volume of units for measuring all the cereals is again presupposed to be equal.

[27] The information refers, for instance, to the farm Zgornji Špeh south of Luče (Fig. 3, no. 8).

cover often preceded ripening of cereals (Zwitter 2014a, 209). There were examples of massive lodging of cereals still in a sensitive phenophase caused e.g. by an early snow cover. The plants partially recovered, but grain turned black; it was impossible to bake normal bread from it (author's interview with Ančka and Marija Prepotnik, Haudej farmstead (Fig. 3, no. 37), 21/12/2012). When cereals could not ripen in fields but were also not stricken too early, the state of maturity could be partially ameliorated indoors, e.g. by drying it above the hearth (Winiwarter and Sonnlechner 2001, 72) or in an oven (ŽA Ljubno, Chronicle, year 1882); at least drying of wet cereals took place also in attics reached by warmth from hearths or ovens, in case of a house without a separate kitchen also by smoke. Warmth frequently led to undesired effects – grain started to germinate or was attacked by pest (Baš 1984 [1951/52], 105–6). Moreover, the size of successfully dried grain reaped unripe declined (author's interview with Silva Kotnik, Zgornja Šteharska Bajta in Tolsti Vrh, 7 & 9/8/2012). There is scarce evidence of harvestig unripe cereals in parts of western or southern teritory of lower Styria in the patrimonial court records of the seigneury of Gornji Grad from mid-1680s. The defendant stated in his favour that a member of plaintiff's family was a witch who admitted to have destroyed the bread and to have caused inability to bake bread the whole year long (StLA, GB I 3382, 1079, 1085–86, 1222–23).

Growing of the quickly ripening barley and buckwheat was not so important. Only according to Krofič inventory from 1681 (Fig. 3, no. 48) the volume of seed of the sown barley shared the first place with oats and just in one case, i.e. Jamnik farm in 1696 (Fig. 3, no. 49), barley held the second place regarding the volume of cereals harvested. Barley can be cut the soonest among all the main cereal crops, in some cases 60 days after the sowing. Except for the beginning of the growing season, it prefers cool weather. However, its yields are lower than those of other main cereals and too cold or too wet weather (especially in the summer) as well as inappropriate cultivation caused the greatest damage to it among all the main cereals (Pfister 1984, 37). Buckwheat only held the second place among the cereals sown at Strevc in 1643 (Fig. 3, no. 52), and shared the second place with rye and wheat among the cereals harvested at Rogar in 1688 (Fig. 3, no. 54).[28] On Ložekar farm near Luče (Fig. 3, no. 11 or 12) also the quickly ripening millet played a subordinate role in 1610 (StLA, GB I, 3388–89, Ložekar; duration of growing season: Valenčič 1970, 261).

The sowing of mixed cereals is proven, for instance, by the food pension promised in the inventory to the widow and children on Goler farm in 1678[29] (Fig. 3, no. 50) (StiASP, Eb., A., fasc. 39, L. 22, no. 35). It took advantage of the fact that owing to changing weather conditions sometimes the yield of one of the cereals from mixture was better, and sometimes the other (Pfister 1984, 50).

The strong dependence on oats was beneficial in very wet years, but especially due to its long growing season it was not always the optimal choice promoting acceptable way of life in the Upper Savinja valley in the late 17th century (cf. Pfister 1984, 59–60). The inventory referring to Strevc farm in 1676 (Fig. 3, no. 52) provides evidence that after harvest cereals were arranged in stacks and left in field to dry (StiASP, Eb., A., fasc. 39, L. 21, no. 27). If we compare the numbers of stacks of different cereal types at Strevc in 1676 with the quantity of stacks recorded in tithe registers from 1789–1792[30] (ZAC 536, box 84, tithe registers for Sv. Duh 1789–1792[31]), a vast difference is noticeable. Taking the number of oat stacks of each year as 1, the ratio of numbers of stacks of oats, barley, rye, wheat and buckwheat in 1676 was 1 : 0.15 : 0.5 : 0.75 : 0, however, in 1789–1792 it was 1 : 0.28–0.67 : 0–0.29 : 0–0.05 : 0–0.15. Thus an increase of

[28] For the case of Rogar in 1693 see footnote 3 and 26.

[29] Whereas the mentioning of the mixture in the food pension is obvious, it is not clear if »*Mischet getraÿdt noch in garmen*« referring to the whole cereal harvest of 1678 on Goler farm really characterizes cereals sown mixed or just different kinds of cereals were assessed together (StiASP, Eb., A., fasc. 39, L. 22, no. 35).

[30] It is clear from the sources referring to exactly the same tithe registers though preserved in different archives that the whole harvest of cereals is recorded, including those grown as swidden cultivation (NŠAL 20, box 68, Tithes: generalia, 1557–1795: *Eintheillung der staatsherrschafft Oberburger[isch]en weinn, und getraid zehende, wie solche zur versteigerung vorgeschlagen werden könnten* [1789], 2).

[31] The names of homesteads are not listed in these tithe registers, so the identification of house number (13) was done according to the contemporary Josephinian cadastre (AS 1110, Oberburg, CM Hl. Geist, Subrepartition Summarium).

the field proportion under the cool-liking and quickly ripening but sensitive barley, along with a strong decline of wheat and rye production, was characteristic at least for this farm.

The inventory referring to the farm Kladnik near Luče (close to 800 m a.s.l.; Fig. 3, no. 14) gives insight into the **sowing dates**. Before 14 May 1613, when the possession was inventoried, oats, rye and wheat had been sown, whereas two other cereal species stored, barley and buckwheat, had not been sown yet (StLA, GB I, 3388–89, Kladnik). For wheat and rye autumn- or spring-sowing would be possible. Climatic data of Thomas Chrön/Hren, bishop of Ljubljana, partially based on weather observations from the Upper Savinja valley, reveal that the winter 1612/13 was extremely mild, almost without snow even in the mountains. The next winter was entirely different, lasting from the end of November for almost five months, and unusually cold weather continued up to the middle of May (Zwitter 2013, 341–44, 372–75). The comparison of sowing dates according to the mentioned Kladnik inventory with the sowing rules from the 20th century[32] reveals that it was hardly possible to sow oats in 1614, at least on the high farms.

Like scythes, also **sickles** were probably not available on all the farms in numbers which would have enabled the optimal use of manpower in the period of optimal stage of plant development or even in case of only few days of dry weather in harvest time. The number of sickles in those inventories, where they are explicitly recorded (55 % of inventories), ranges between 2 and 8 (StiASP, Eb., A., fasc. 35, L. 11, no. 112 & L. 12, no. 7 & L. 14, no. 141; fasc. 36, L. 15, no. 204; fasc. 38, L. 19, no. 14; fasc. 39, L. 21, no. 15; fasc. 40, L. 25, no. 40; fasc. 42, L. 28, no. 24; StLA, GB I, 3388–89, Delšak, Dovnik, Prodnik (Jelen), Jerij, Kladnik, Knez, Ložekar, Martek, Rep, Schetteÿ).[33] The »*strosengsen*«, »scythe for straw« in the inventory of Rogar from 1688 (Fig. 3, no. 54), but also an exceptional recording of a »*strogabl*«, »strawfork« in the same source (StiASP, Eb., A., fasc. 40, L. 25, no. 40), most probably means that reaping was carried out at hight so that the straw had to be cut additionally.[34]

Cereals were arranged in **stacks** to dry as mentioned explicitly in the 1676 Strevc inventory (StiASP, Eb., A., fasc. 39, L. 21, no. 27). Its duration depended on weather, but lasted one or two, often three weeks (Medved 1961, 148; Predan 1956, 29; Petek 2007, 52; author's interview with Marija and Jakob Zamernik, farm Sp. Dežman, (Fig. 3, no. 27), 15/10/2009). Penetration of water into the interior in case of rainy weather was to a considerable degree prevented as the form of a stack promoted water to flow off along the exterior. Still, in case of a several-week-long rainy period in early autumn, the quality of grain and straw declined sharply and putrefaction began, grain started to germinate in sheaves (Pfister 1984, 120). Putrefaction of cereals e.g. destroyed the majority of harvest on high farms in the region of Ljubno in the wet year 1882 when only few grain dried indoors was saved (ŽA Ljubno, Chronicle, year 1882). Very wet summers promoted growth of grasses and other weeds in cereal fields; they were not removed at reaping, which, additionally, caused a prolonged period needed for sheaves to dry. Oat fields were most prone to weeds (author's interview with Silva Kotnik, Zgornja Šteharska bajta in Tolsti Vrh, 7 & 9/8/2012) – the very long growing season of this crop was thus in the case of a wet year followed also by a long drying

[32] The main cereals had to be sown before 25 May, otherwise they did not ripen, the oats was to be sown first (author's interview with Jakob and Marija Zamernik, Sp. Dežman farmstead (Fig. 3, no. 27) on 1 040 m a.s.l., 15/10/2009). The same date, 25 May, was considered a deadline to sow oats in the region of Solčava – harvest would have declined, if it had been sown later (Vršnik 2005, 171). Buckwheat was mostly sown at the beginning of June on the highest fields (author's interview with Ančka and Marija Prepotnik, Haudej farmstead (Fig. 3, no. 37), 21/12/2012), with increasing risk of a harvest failure, they sowed it in the region of Solčava until early July (Vršnik 1962, 23).

[33] According to ethnological data also implements from other farms were used to some extent as the cereals do not ripen at all the farms at the same time, thus the equipped manpower could be invited or even the implements lent (Makarovič 1979, 33, 35, 135).

[34] Both possibilities of traditional cereal harvest were mentioned by A. Heiss in the lecture Archaeobotany: Theory, Methods, and Application. The other less likely possibility is to translate the term in quotes as cradle. In comparison with sickle it would be an advanced method of reaping, known to have been used in oat fields in a part of the Alps in the 16th century already. Nonetheless, Oskar Moser could not find any older than 18th century examples in the inventories from Carinthia and it was not before the 19th century that reaping with cradle became the predominant way of cereal harvest in that neighbouring province (Moser 1984, 217–18, 222, 230, 232, 239–43). According to data from 1880s cradle was not used in the region of Solčava (Janisch 1885b, 1043) and an ethnological survey of southern part of the region of Luče states that sickle was the only piece of reaping equipment until mechanization (Petek 2007, 51).

period. Excessive damage was many a time a consequence of storms when strong winds destroyed stacks causing losses of grain which fell off when wind deposited the sheaves, at the same time allowing rain to soak them. Considerable damage to cereals in stacks was sometimes caused by mice as well (author's interviews with Ančka and Marija Prepotnik, Haudej farmstead (Fig. 3, no. 37), 21/12/2012 and with Marija and Jakob Zamernik, farm Sp. Dežman (Fig. 3, no. 27), 15/10/2009).

Table 4: *Approximate nutritive value (in gigajoules) of cereals in the inventories referring to three isolated farms with the exception of the inventories near the harvest time. Names of the farms are stated in brackets. The coefficient »a« stands for the share of a hectolitre represented by one Vierling.*[35]

Low stocks	Medium stocks	High stocks
(7 to[1] 8)a GJ (Kolar 18/12/1649) (Fig. 3, no. 51)	(10 to 11)a GJ (Rogar 1/3/1633) (Fig. 3, no. 54)	(67 to 77)[2]a GJ (Macesnik 7/12/1668) (Fig. 3, no. 55)
(5 to 6)a GJ (Kolar 6/1/1630)	(13 to 15)a GJ (Rogar 9/3/1676)	(45 to 52)a GJ (Rogar 3/1/1659)
(2 to 3)a GJ (Kolar 9/3/1676)		

Sources: StiASP, Eb., A., fasc. 35, L. 11, no. 112 & L. 12, no. 7 & L. 13, no. 76; fasc. 36, L. 15, no. 204; fasc. 38, L. 19, no. 14; fasc. 39, L. 21, nos. 15 & 17.

[1] The left value in Table 4 always represents the result if the *Vierling* (unit of volume) was uniform for all types of cereals, whereas the right value takes into account the seigneurial data from Griffen/Grebinj, where 1 *Vierling* of oats was equal to 1.28 *Vierlings* of the other cereals (Dinklage 1966, 102). The use of preposition »to« instead of »or« according to the data from footnote 39.

[2] For cereal mixture in this case representing a part of the cereal stocks only at Macesnik (Fig. 3, no. 55) the average nutritive value per *Vierling* of oats and rye as cereals with low nutritive value per unit of volume was taken into account in order to prevent exaggerated numbers.

Table 4 enables an insight into different **cereal stocks**. The ratio of cereal stocks in both inventories from December, i.e. of tenants Kolar and Macesnik, is 1 : 10. Despite the probably different demographic situation, it is clear that there were long-term cereal stocks on the extremely well-situated Macesnik farm. In spite of previous successive bad harvests,[36] the inventory nonetheless reveals that the farm was well capable of buying victuals, if needed. A considerable part of the stocks could also be stored to prevent possible shortage in case of further bad harvests. On the other hand Kolar farm is a representative of farms that in the 17th century often did not manage to store additional quantities of cereals, which caused higher climate and weather vulnerability of their inhabitants. It is proven by the repeatedly low values in Table 4, suggesting that the quantity of grain was not in exceptional cases around the zero point, at least at the onset of the harvest, unless additional grain was borrowed or purchased. The inventory of Kolar from 1630 proves his debt to Močnik in St. Stefan/Šteben in Jauntal/Podjuna in Carinthia for 1 *Schafl* of wheat (StiASP, Eb., A., fasc. 35, L. 11, no. 112), scarcely revealing the existing connections of mountain farms with distant flatland characterized by much more favourable conditions for cereal growth. The priest from Solčava was forced to buy cereals each year during the bad harvests in the mid-1660s (NŠAL, KAL, fasc. 43, U 25, visitation proceedings, parish of Solčava, 1668). Visitation proceedings for the parish of Solčava in 1696 report frequent purchases of cereals in Eisenkappel/Železna Kapla in that year

[35] Volume weight and nutritive value of rye (70 kg/hl, 11 MJ/kg), oats (44 kg/hl, 15 MJ/kg), wheat (75 kg/hl, 12.7 MJ/kg) and barley (62 kg/hl, 13.2 MJ/kg) according to Krausmann 2008, Table 13–rough estimations especially due to the time space (the values of volume weights are divided by 10 as there is a lapse in unit of volume weights in the work quoted: it is kg/1000 litres, not kg/hl). The volume weight of buckwheat (72 kg/hl) calculated from data published by Dinklage 1966, p. 102 and its nutritive value (14 MJ/kg) from Nutrition facts: Buckwheat flour: whole-groats–a rough estimation, affecting the results only slightly due to the subordinate importance of buckwheat. Volumetric conversion from *Schaffel/Schäffel* to *Vierling* (for barley (*schl.*) at Rogar 1676, rye, wheat and buckwheat (*schäfl*) at Kolar 1630 (Fig. 3, no. 51), wheat, buckwheat and barley (*schäfl, schafl*) at Rogar 1633) 4 : 1 according to the seigneurial data from Griffen/Grebinj (Dinklage 1966, 102).

[36] See chapter 2.5.2.

because of harvest failures[37] (NŠAL, KAL, fasc. 166, U 2–3). Loaning of cereals also took place among mountain farms. The inventory of Rogar from 1688 (Fig. 3, no. 54) proves his debt to »*Potuetschnigg*«, i.e. most probably his neighbour Potočnik, for 1 *Vierling* of oats (StiASP, Eb., A., fasc. 40, L. 25, no. 40). The data on Rogar from Table 4 provide a basic insight into the changing cereal stocks influenced by a combination of environmental and also human factors, the latter include breeding of a mare and two colts as important oats consumers in 1659, which represents an exception in the observed farms that should be noted; but a mare had also been kept there in 1633 (StiASP, Eb., A., fasc. 35, L. 12, no. 7; 36, L. 15, no. 204). Stocks of victuals had to be stored on safe locations (Haberl et al. 2009, 3). In order to mitigate the risk of burglars the tenant from the Krofič farmstead (Fig. 3, no. 48) bought a double lock for the granary at the end of the 17th or in the early 18th century (StiASP, Eb., A., fasc. 45, L. 34, *Verzaichnuß*).

In order to obtain a better insight into the quantities of **home-grown cereals**, six 17th century inventories from the seigneury of Eberndorf/Dobrla vas in the region of Solčava were analysed, dating from 18 August to 4 November and containing detailed data on cereals in fields or in sheaves shortly after harvest (StiASP, Eb., A., fasc. 35, L. 14, no. 141; fasc. 39, L. 21, no. 27; fasc. 40, L. 24, no. 1 & L. 25, no. 40; fasc. 41, L. 27, no. 13; fasc. 42, L. 28, no. 24). They reveal that importance of local cereal production was considerable. The rough approximation as result of a computation based on a series of presumptions[38] is that about 2.9 to 3.5 (1.8 to 2.1)[39] people could live on four of these six farms not suffering from malnutrition if one takes into account only the nutritive value of home-grown cereals. It is the case of Ploder farm in 1653, Strevc in 1676, Rogar in 1688 and Jamnik in 1696 (Fig. 3, nos. 49, 52–54); also animal products were definitely very important but were excluded from these calculations in order to assess local cereal production. Using the same method, the cereals harvested at Rogar in 1693 would have even sufficed for sustaining 5.5 (3.4) people,[40] which is evidence for an at least not too bad harvest of oats, barley and wheat,[41] unlike the bad harvest in 1682 proven by Kolar's inventory (Fig. 3, no. 51), at least of oats, unless it was a consequence of specific demographic situation; home-grown cereals would only suffice for 1.2 (0.8) persons there. The sample is small, some of the presumptions may not be entirely accurate, precise demographic data for the same farms from the same time are lacking, the same goes

[37] It is reported in an exaggerated way–the reason why only very few people came to church in Solčava on Sundays should be that they had to go to Eisenkappel/Železna Kapla in order to buy cereals due to the great scarcity of that year. They visited the mass there: »*Parochiani hoc anno ideo rariores comparuerunt diebus dom[inicis], quia plures coemendis granis in huius anni universali penuria Capellam excurrere debebunt, ibidemque missas interfuerunt*«. But it is most probably true that people from each farm had to visit this market-town many times because the journey was long, it took about 5 hours in each direction and it included considerable difference in altitude (passes in the north of the region of Solčava lie at about 1400 m a.s.l., Eisenkappel/Železna Kapla at about 550 m a.s.l.). However, it did not represent a severe obstacle for food supply. It was e.g. common for women in the 19th century to walk from the region of Solčava to Eisenkappel with empty vessels and to return in the same day carrying 30 kg and more commodities bought there (Vršnik 2005, 56–57; cf. author's interview with Marija and Jakob Zamernik, farm Sp. Dežman (Fig. 3, no. 27), 15/10/2009).

[38] 1) Volumetric conversions: 1 *Vierling* = 4 *Schaffel* = 75 litres for all the cereals except for oats, for which 1 *Vierling* = 5 piled *Schaffel* = 96 litres. These were the relations according to seigneurial data from Griffen/Grebinj (Dinklage 1966, 102) and it is only a possibility that equal or similar conversion factors were in use in the seigneury of Eberndorf/Dobrla vas. 2) Volume weight and nutritive values as in Table 4. 3) A rough estimation for the daily food requirement is about 9 MJ per person; this value has not been constant, e.g. due to the fact that average height of people has changed, due to different amount of physical work etc. (Krausmann 2008, 13, 30). 4) A third of the grain was subtracted before the computation as a possible amount preserved for seed.

[39] For numbers in brackets the conversion 1 *Vierling* = 50.9 litres and 54 litres for oats was used–in accordance with information referring to Villach/Beljak in 1543. According to data from the same year the volume of a *Vierling* in St. Veit an der Glan/Št. Vid ob Glini (59.6 litres, approximately 76 litres for oats), or Klagenfurt/Celovec (71.9 litres, again approximately 76 litres for oats) lay in between the numbers for Villach/Beljak (Vilfan 1954, 73) and the mentioned data for Griffen/Grebinj.

[40] In reality it was surely not entirely used for human consumption as a mare is proven at that farm by the same inventory. The buckwheat was not taken into account as it is not mentioned whether it was in sheaves or not.

[41] The grain harvest on this farm in 1688 was 6 *Vierlings* of oats, 5 *Vierlings* of rye, 5 *Vierlings* of wheat, 1 *Vierling* of barley, 5 *Vierlings* of buckwheat (StiASP, Eb., A., fasc. 40, L. 25, no. 40) and most probably the harvest of oats, rye and wheat, assured for the food of the retired couple (StiASP, Eb., A., fasc. 39, L. 21, no. 15). But it was at least 25 *Vierlings* of oats, 4 *Vierlings* of rye, 9 *Vierlings* of wheat, 4 *Vierlings* of barley in 1693 if it really is the same farm (StiASP, Eb., A., fasc. 41, L. 27, no. 13).

for the quantity of grain stored from the previous years as well as for the following. Setting the data from the inventories of Rogar 1688 and Jamnik 1696 (Fig. 3, nos. 54, 49) into context reveals that at least the harvest of some basic cereals in both years was very bad, but in these cases the whole harvest was by no means lost. Holistic mentioning reveals that 27 *Vierlings* of cereals were harvested at Strevc (Fig. 3, no. 52) in 1676 as compared to only 20 *Vierlings* in 1688, i.e. a quarter less. Additionally, the fact that oats, rye, wheat and even buckwheat and barley were still in field[42] on 16 September 1688 reveals that the ripening of cereals was late that year (StiASP, Eb., A., fasc. 39, L. 21, no. 27; fasc. 40, L. 25, no. 39); in the 1950s spring-sown oats were cut there on 5 September (Meze 1963, 234). The at-first-glance-considerable cereal harvest at Jamnik in 1696 is possibly the consequence of the above-average field acreage of this farm,[43] according to the data from 1665, but yokes as units of area in the 17th century cannot be easily transformed to objective units.[44]

Grain had to be milled, at least mostly, by means of water power. Some **mills** of isolated farms were inoperable a couple of winter months due to ice and snow cover (Struna 1955, 28), operating period of some others was restricted because of insufficient volumetric flow rates of brooks (Melik 1953, 5). It refers e.g. to the mill of Krofič farm in mid-1660s (Fig. 3, no. 48) (StiASP, Eb., B. 4, 689).[45] The analysed inventories contribute to the history of mills in two ways; firstly, they give us a better insight into the territorial distribution of usable mills and its changes in time. Secondly, the values attributed to milling equipment, as well as its rarely explicitly recorded state, enable conclusions about the very different quality and even technical characteristics of mills on, in some cases, neighbouring farms. The density of mills on the territory of isolated farms varied considerably. Whereas there was a mill on every fourth farm, at the very most, in the AU of Luče in the seigneury of Gornji Grad in 1581, as revealed by judicial sources, three quarters of the eight farms of the seigneury of Eberndorf/Dobrla vas in the region of Solčava possessed a mill in 1665. The register from 1542 made for taxation purposes mentions only 3 or 4 grain mills on the isolated farms in the AU of Luče; the land register from the early 17th century just lists 6 grain mills in this entire AU.[46] Despite the fact that the number of preserved inventories of isolated farms in the AU of Luče from the early 17th century is extremely low, the inventory of Ložekar (Fig. 3, no. 11 or 12) from 1610 records a mill not mentioned in the contemporary land register (Zwitter 2014a, 226). The inventory reveals the existence of milling equipment on Strevc farm in 1688 (Fig. 3, no. 52) where it is not mentioned in the description from 1665. On the other hand the mills mentioned on two farms in 1665 were not usable some decades later: Goler's mill lay broken in 1678 and the pair of millstones at Jamnik were entirely worn out and thus rendered useless in 1696 (Fig. 3, nos. 50, 49) (StiASP, Eb., A., fasc. 39, L. 22, no. 35; fasc. 40, L. 25, no. 39; fasc. 42, L. 28, no. 24; Eb., B. 4, 687–89).

The fact that the majority of mills on observed isolated farms were driven by small brooks on steep slopes assures that the form of waterwheel was either overshot or breastshot, but not undershot (Melik 1953, 5). Exceptionally, inventories contribute to the knowledge whether vertical-wheeled or horizontal-wheeled watermills were in use. In the former group a pair of cogwheels transmits the energy from the horizontal axle of the vertical waterwheel to the vertical spindle, driving the millstone above. The latter group is simpler, without gearing. The horizontal waterwheel lies beneath the millstone; they are

[42] »*Ansaath alß waizen, roggen, haiden, vnd habern, vnd gersten, ist noch am feldt stechendter zusamen geschäzt worden.*" It is not clear, whether some of them had been cut and were only drying in fields at that time. But due to the great differences in time between sowing and harvest it could not be the case for all the species.

[43] The fields of Jamnik and Krofič (Fig. 3, nos. 48, 49) occupied 5 yokes as compared to 4 yokes of Macesnik (no. 55), 3.5 yokes of Rogar and Kolar (nos. 54, 51), 3 yokes of Ploder and Goler (nos. 53, 50). For Strevc (no. 52) the information is corrected from 6 to 2 yokes either in order to correct a lapse or to mark a later change (StiASP, Eb., B. 4, 685–89).

[44] The analysis of sources from the same seigneury referring to Jauntal/Podjuna showed that a seventeenth-century yoke was not a constant unit of measurement: the biggest yokes were multiples of the smallest ones. Moreover, numerous yokes measuring close one hectar (representatives of bigger yokes) suggest that tenants tended to hide a part of the land by claiming that the surface in question equalled to less yokes than in reality (Zwitter 2015, 384–97).

[45] »*Hat sein haußmüll mit 1 lauffer aber offt kein wasser*«.

[46] For reasons of incompleteness of the numbers of mills recorded in sources mentioned here but also in other sources see Zwitter 2014a, 225–26.

connected and both move in the same direction. It is much easier to construct, it requires little and easy maintenance, yet it often represents a less efficient way of use of water power. However, the efficiency depends on construction details and brook characteristics. Both forms were in use for centuries (Lucas 2011, 15–17, 30–31, 34–37, 40–41, 61); a mill with horizontal waterwheel was ethnologically documented in the Alpine settlement Srednji Vrh in the Upper Sava Valley (Bogataj 1989, 84). Whereas milling equipment is often only assessed together without listing its components, or just millstones and iron are explicitly noted, there are »*2 par räder mit zäkherl*« in the inventory referring to Rogar farm in 1693 (Fig. 3, no. 54) (StiASP, Eb., A., fasc. 41, L. 27, no. 13). Should we understand it as two pairs of cogwheels, it would make sense to connect them with the also mentioned milling equipment, which would prove that the possibly more effective, yet a more complicated form of use of water power, was characteristic at least for some mills on the isolated farms.

The values attributed to the articles make possible certain conclusions regarding their outlook and quality (Pöttler 2000, 273–74, 278). Milling equipment is recorded in eight inventories of six farms of the seigneury of Eberndorf/Dobrla vas in the region of Solčava; the value ascribed to it differed from 1 fl of the broken mill of Goler in 1678 (Fig. 3, no. 50) or 1.5 fl of Kolar's mill in 1676 (Fig. 3, no. 51) to 5 fl at Rogar in 1693 (Fig. 3, no. 54) or 5.5 fl at Macesnik in 1668 (Fig. 3, no. 55), the last two having been surely good constructions in comparison with those of the neighbouring farms, but still not comparable with the equipment of grain and sawmill of Gubanc farm near Eisenkappel/Železna Kapla (Fig. 3, no. 68), 1706 together assessed to 20 fl (StiASP, Eb., A., fasc. 36, L. 15, no. 204; fasc. 38, L. 19, no. 14; fasc. 39, L. 21, nos. 15 & 17 & L. 22, no. 35; fasc. 40, L. 25, no. 39; fasc. 41, L. 27, no. 13; fasc. 42, L. 28, no. 24; fasc. 44, L. 32, no. 24).

Especially on the common steep grain fields, a combination of natural and human-induced or -accelerated **slope processes** took place. Ploughing following along the contour of the slope is the only possible way of ploughing steep fields as animals cannot draw ploughing implement uphill (Sadar 1953, 107). At the same time it is a slope processes slowing strategy (Winiwarter and Sonnlechner 2001, 23) because the furrows lie rectangularly to the direction of downhill water flow. Still, agriculture contributed an essential part to slope processes, soil used to be heavily exposed especially from the ploughing date up to the time when plants reached the growth stage, severely reducing the effect of rain drops, at the same time binding the soil by the root system. Additionally, soil was relocated downhill during each ploughing. Despite the possibility of upslope soil transport, from several metres up to several tens of metres high accumulations at the foot of the former steep fields (Medved 1961, 146; author's fieldwork minutes, autumn 2009) speak for prevalence, several centuries long, of soil downhill transport. Ploughing, not only hoeing, was commonly practised in the 17th century Upper Savinja valley. 23 of 32[47] inventories of tenants list at least one ploughing implement, or a part of it, and in further 5 inventories it could be a part of the not clearly defined objects assessed together (StiASP, Eb., A., fasc. 35, L. 11, nos. 112 & 115 & L. 12, no. 7 & L. 13, nos. 13 & 76 & L. 14, nos. 141 & 154; fasc. 36, L. 15, no. 204; fasc. 38, L. 19, no. 14; fasc. 39, L. 21, nos. 15 & 17 & L. 22, no. 35 & L. 23, no. 27; fasc. 40, L. 25, nos. 39 & 40; fasc. 41, L. 27, no. 13; fasc. 42, L. 28, no. 24 & L. 29, no. 20; StLA, GB I, 3388–89, Delšak, Dovnik, Prodnik (Jelen), Jerij, Kladnik, Knez, Ložekar, Martek, Rep, Schetteÿ). For the history of erosion it is important if the ploughing implements were ards mainly scratching the soil, or ploughs, turning the soil and thus accelerating its downslope transport more heavily. On steep fields even ards often turned, not only scratched the soil, but its downhill transport was still less accelerated than in the case of ploughs (Orel 1955, 53, 56). Ards and ploughs are listed in the inventories, but Oskar Moser's recommendation of caution while studying the inventories from southern Carinthia fits also to the area observed here. The fact that Slovene language of the assessors used to be translated, as inventories are written in German, could have caused confusion regarding the expressions for ploughing implements (AISN, B. O., box 4, Ard and plough, note of Dr. Moser's pers. comm. to Dr. Kuret, 5/1/1961). The specific construction details of ploughing implements proven before

[47] The inventory of Ploder from 1677 was excluded as it does not reflect the entire situation on the farm at that time–see footnote 97.

the end of the 19th century could cause further problems. At that time ploughing implements on the observed territory were ards, but the coulter was mostly not built in the ard construction so that two sets of animals were needed for ploughing–the first one only drawing the coulter, the second one the ard (Orel 1955, 51–56). The existence of this type of ploughing implements is attested by Kolar inventory from 1630 (Fig. 3, no. 51), listing »*ain arl vnd ain vorschneideisen*« (StiASP, Eb., A., fasc. 35, L. 11, no. 112). On the other hand, it is not certain whether »*1 arl vnd pflueg*« recorded in the inventory of Strevc from 1643 (Fig. 3, no. 52) (StiASP, Eb., A., fasc. 35, L. 13, no. 13) refer to an ard and a plough, they could also only stand for an ard and a coulter.[48]

As one century represents the timeframe observed, soil is a non-renewable resource (Winiwarter and Sonnlechner 2001, 16). Management of steep agricultural land was in some cases in pronounced discordance with the changing environment and unsustainable.[49] Data on damage caused by slope processes culminate at the end of the Late Maunder Minimum; nonetheless there is no reliable evidence that slope processes at that time in fact caused severer difficulties than in the 17th century. Fluvial erosion caused great damage to Rogar farm in the early 18th century (Fig. 3, no. 54), in 1709 at the latest; tenant's annual pecuniary dues and taxes were reduced by 4 fl, until the damage was recovered;[50] this sum, for instance, amounted to almost a fifth of pecuniary dues and taxes of this farm in 1710 (StiASP, Eb., B. 8, 454 & the added sht. s.p.; StiASP, Eb., B. 151, 1029). The reduction lasted at least up to 1715. A considerable extent of fields is most probably proven there by the harvest data in the inventory from 1693. A source from 1711 proves that also the neighbour Ploder (Fig. 3, no. 53) was stricken by fluvial erosion and also his annual pecuniary dues and taxes except for the low tax on meat were temporarily reduced by almost one fifth – to 15 fl (StiASP, Eb., B. 8, 455; StiASP, Eb., B. 151, 1029–31). Between 1714 and 1719 »*wasser gus vnd lähnen*«, landslides[51] and running water, possibly forming gullies, caused extensive damage to Spodnji Jamnik and Zgornji Jamnik above Luče (1 160 m a.s.l.) (Fig. 3, nos. 22, 23) or to undivided Jamnik and a half of Cahovnik farm (Fig. 3, no. 24), whose agricultural land partly lies on the slope beneath; their pecuniary dues and taxes[52] were severely reduced due to this extreme circumstance (NŠAL 20, box 62, Land register 1720, AU of Luče; NŠAL 20, box 63, Land register 1719, AU of Luče; NŠAL 23, box 48, Land register 1714, AU of Luče). A landslide or, less probably, an avalanche[53] caused great damage to Oprešnik isolated farm near Solčava (Fig. 3, no. 38) between 1714 and 1719; peasant's burdens listed in the land register were reduced by approximately one third, to 8 fl. Between 1714 and 1718 landslide(s[54]) or avalanche(s)[55] caused, or at least contributed to the economic collapse of the isolated farm Navršnik (Fig. 3, no. 47). Navršnik's pecuniary dues and taxes were reduced, but still, the neighbour Klemenšek

[48] This kind of mistake was made by Jakob Medved, characterizing the separate coulter as »an implement, similar to an ard« (Medved 1967, 31).

[49] Data on consequences of a severe storm with excessive rainfall in the night 29–30 October 1926, when cereal production was still important in the territory delt with, helps us understand the early modern conditions. According to journalist's note mentioning the damage caused to Bukovnik farm (Fig. 3, no. 62), there occured 11 landslides on the fields (ŽA Luče, Chronicle, year 1926); some fields of this farm were so steep that they were hoed, not ploughed (Meze 1963, 243–44).

[50] »*Gnädiger nachlasß weegen wasser schadens, so ihme seinen grundt hinwekhgerüssen 4 fl /../ so lang biß diser schaden verwachsen wirth*« (StiASP, Eb., B. 8, 454). In the mountainous part of the Vellach/Bela drainage basin (Fig. 3), damage caused by fluvial erosion is attested e.g. in 1708 and again in 1709 (StiASP, Eb., B. 151, 69).

[51] The term »lähn« can also refer to an avalanche (Rohr 2007, 400) but in this case »*wasser gus vnd lähnen*« acted (almost) at the same time. Additionally, a source from the Upper Savinja Valley from 1843 mentions »*erd- und schneelehnen*« (StLA, A. Göth Georg Nachlass, fasc. 39, bundle 792, Beschreibung des Bezirkes Oberburg 1843, 1) thus both meanings are possible.

[52] Arguments for this interpretation, based on archival sources, see in Zwitter 2015, 189–90.

[53] »*Dissen grundt hat der lähn ruiniert*« (NŠAL 20, box 63, Land register 1719, AU of Solčava). Comparison with information from 1896, when a landslide allegedly moved the house of this farmstead (ŽA Nova Štifta, Chronicle of Solčava parish, 145), speaks for a landslide.

[54] The same content is recorded in the land registers from 1719 and 1720, in the former in singular (*lahn*), in the latter in plural form (*lähnen*), but the listing of equal tax reduction does not prove the thesis of one landslide/avalanche followed by another one(s) in the next year; it can also only be a lapse.

[55] It is a fact that avalanches in some winters occurred on steep agricultural fields, e.g. on 17 January 1891 when an avalanche killed two people from the farmstead Ramšak north of Ljubno (Fig. 3, no. 21) who were trying to make the path below steep fields passable (ŽA Ljubno, Chronicle, year 1891).

(Fig. 3, no. 46) bought that farm and started to pay the slightly reduced pecuniary burdens for it in 1718 (NŠAL 20, box 62, Land register 1720 & box 63, Land register 1719; NŠAL 23, box 48, Land register 1714, AU of Solčava). The relatively high extent of fields of the nearby Jamnik farm (Fig. 3, no. 49) in the 17th century was already mentioned. A source from the mid-1740s records great damage caused to them by water[56] (KLA, Theresianische Rektifikationen, fasc. 114/3, Protocoll der neÿ machenten fassion no 15, p. 38). Apart from erosion, along with the less evident raindrop impact, surface wash, throughflow and soil creep forced abandonment or extensification of use of a part of the agricultural land, especially if soil was also drawn down-hill by ploughing. In the cadastral municipality Sv. Duh, covering the western part of the region of Solčava, for a parcel in possession of the tenant Covnik (Fig. 3, no. 43) the Josephinian cadastre from the late 1780s explicitly mentions its former use as field, but it could by then not be used as field any more because the soil had gone too shallow.[57] There are other instances in the same cadastral municipality where similar course of soil history can be presumed, mentioning parts excluded from the field parcels because the soil shallowness would not allow their use as fields. On some fields, for instance, field no. 193, a part of Pastirk farm (Fig. 3, no. 45), the impact of slope processes reached a high degree by the late 18th century as the steepness of the field and at the same time thin soil, negatively affecting the yields, are recorded (AS 1110, Oberburg, CM Hl. Geist, Fassion, esp. nos. 193, 263). Due to the time lag, the Josephinian cadastre cannot reveal the fields abandoned in the 17th century, but it proves that slope processes led to abandonment of some former fields in the area observed in different times of soil history, forcing farmers either to intensify land use on another part of the farm, e.g. forming new permanent fields, or extending the swidden cultivation or, if it was not possible, to reduce the total field extent.

2.3 Non-agricultural sources of income and food revealed by inventories

Hunting represented an additional source of income, food and other animal raw materials. According to Rösener weapons, for instance a halberd or a lance, were present on many farms in Europe in the 18th century. Weapons served herdsmen to defend the herd against attacks of wild beasts or dogs but were also used in peasant quarrels (Rösener 2007, 107, 117). According to data referring to the neighbouring Carniola, many simple men served abroad as soldiers in the 17th century (Valvasor 1689, II, 103) and a sabre at the Robnik farmstead (Fig. 3, no. 61) was labelled as »Turkish« in mid-20th century (SEM, Documentation, Collection of individual researches, B. O., notebook VI/23, 19); per chance not groundlessly.

A part of hunting activities was carried out legally. According to the hunting ordinance from 1539, each of the foresters of the seigneury of Gornji Grad had hunting privileges in the forest under his control (NŠAL 20, box 74, hunting ordinance 1539). Various sources from the 17th century prove that lists of people from isolated farmsteads situated in the AUs of Luče and Solčava, whom hunting represented a source of legal income, were not constant (e.g., NŠAL 20, box 29, account 28 December 1663–28 December 1664; NŠAL 20, box 39, account 1 April 1681–31 March 1682, *Außgab auf allerleÿ wiltbräth oder jagerreht*). E.g., on the list of people paid for their quarry by the administration in Gornji Grad in the year 1681/82 (for instance 0.4 fl for a chamois, 2/3 fl for a wolf fur, 1.5 fl for a deer), there are up to eight last names suggesting that these hunters might have come from isolated farmsteads in the AUs of Solčava and Luče in the seigneury of Gornji Grad.[58] Additionally, the tenant of the seigneury of Eberndorf from Krofič farmstead (Fig. 3, no. 48) is explicitly listed there. 6 chamois, 5 deer, a bear, a wolf, 3 specimens of

[56] »*Disse akher haben von dem wasser grossen schaden geliten.*«

[57] Describing field no. 263: »*Ein acker Dovga Niva* [the name quoted means Long field] /…/ *ist santig kan vermög dine der erden nicht mer angebauth werden.*«

[58] These hunters were: Jernej and Ahac Ložekar (Fig. 3, nos. 11, 12 or 44), Blaž Klemenšek (no. 46), Gregor Knez (no. 36), Martin Strmčnik (no. 31 or 32), Adam Jezernik (no. 17 or 18), Tomaž Rosec (no. 3), and Selišnik (no. 4) [the farmsteads referred to in brackets are good, but not the only possibilities of their provenance]. Apart from other hunters, whose last names do not suggest any links with isolated farmsteads in these two AUs, a certain »*Mertl*« is also listed who might also have come from one of the farms in question.

wild fowl and two unspecified animals were paid to these 9 hunters (NŠAL 20, box 39, account 1 April 1681–31 March 1682, *Außgab auf allerleÿ wiltbräth oder jagerreht*). Ethnological evidence emphasizes the importance of poaching in the Upper Savinja valley (Petek 2007, 96–98)[59], its existence in the region of Solčava in the 16th century is proven by the punishment paid by Prodnik farm in 1553 (Fig. 3, no. 60) (NŠAL 20, box 24, accounts 1553, *Pensabl*). A sabre and a pair of gauntlets were found at Dovnik farmstead in 1607 (Fig. 3, no. 7), an old halberd, a gun and an old sword at one of the two Ložekar farmsteads south of Luče in 1610 (Fig. 3, no. 11 or 12), a hunting gun at Rep in 1620 (Fig. 3, no. 6), a gun at Martek north of Luče in 1632 (Fig. 3, no. 33), a sabre, a lance and a gun at Jerij in 1664 (Fig. 3, no. 15) (StLA, GB I, 3388–89, Dovnik, Jerij, Ložekar, Martek, Rep), a sabre on Rogar farm in the region of Solčava in 1659 (Fig. 3, no. 54),[60] two guns at the nearby Macesnik in 1668 (Fig. 3, no. 55) (StiASP, Eb., A., fasc. 36, L. 15, no. 204; fasc. 38, L. 19, no. 14), a short sword at Ramšak farmstead (Fig. 3, no. 56) or another house in the region of Solčava in 1700 (StLA, GB I, 3388–89, Schetteÿ). Inventories thus prove that possession of weapons, including firearms, was common at least among the well-situated farms in the 17th century Upper Savinja Valley. Among the poor ones other hunting equipment, e.g. snares, not leaving traces in the inventories was probably used. If the statement of the tenants of the seigneury of Eberndorf/Dobrla vas in the region of Solčava from 1795 is correct, their possession of weapons such as pistols, guns and sabres, was encouraged by the territorial court of Gornji Grad for defence against wild beasts (StiASP, Eb., A., fasc. 16, Sulzbach).

Trade in wood was an additional source of income, reaching the region of Solčava at least in the 17th century (Zwitter 2014a, 228). The inventory referring to Rogar farm in 1659 (Fig. 3, no. 54) mentions a charter referring to the forest as a part of that farm. The charter was probably written after 1633 because it is not mentioned in the previous inventory (StiASP, Eb., A., fasc. 35, L. 12, no. 7; fasc. 36, L. 15, no. 204). In the 1610 inventory of Ložekar south from Luče (Fig. 3, no. 11 or 12), an implement for floating (»*ain eisener schwem agkhen*«) is recorded (StLA, GB I, 3388–89, Ložekar). Floating of wood on that section of Lučnica had already been an additional source of income at least before the middle of the 16th century (Zwitter 2014a, 227–28).

There are many other objects possibly not used only to meet the household demands, such as the often present spinning wheels, which in the Central Europe only became frequent in the Early Modern Period (Roth 1979, 398). There were, for instance, four spinning wheels at Rogar in 1659 and three in 1676 and 1688 (Fig. 3, no. 54), three spinning wheels at Strevc in 1688 (Fig. 3, no. 52) and in Ramšak farm (Fig. 3, no. 56) or another house in the region of Solčava in 1700, to mention only the inventories with several spinning wheels (StiASP, Eb., A., fasc. 36, L. 15, no. 204; fasc. 39, L. 21, no. 15; fasc. 40, L. 25, nos. 39 & 40; StLA, GB I, 3388–89, Schetteÿ). A loom is mentioned in Jamnik's inventory from 1630 (Fig. 3, no. 49) (StiASP, Eb., A., fasc. 35, L. 11, no. 62), but in some cases it could be interpreted as a part of immovables.

2.4 Rural credit

Inventories are often the only written legacy of rural credit networks because usually no written contracts were made (Pfister 1994, 1342). Bad harvests, animal diseases, variable prices of agrarian products, changing taxes and family cycle (provision of a dowry, time of successive births resulting in an increased number of family members and calling for additional female workforce; post-mortem due, along with tenant's obligation of paying out the shares of inheritance to the other heirs) played important roles in rural indebtedness. Loans were also related to investment, e.g. to purchases of livestock or building of a new house. For small loans offered in form of postponed payment, interest was usually not paid. The

[59] Also descriptions from late 19th century stressed that many young men from the region of Luče were passionate and audacious hunters and that people from the region of Solčava were audacious chamois hunters (Janisch 1885a, 88; Janisch 1885b, 1042).

[60] It is possible—but highly improbable—also for a gun to be inventoried there because a »*pixen*« is mentioned. The same word was used in three other inventories where the context makes clear that it characterizes a gun: »*ein jeger püxen*«, »*ain püxen sambt der flaschen vnd spaner*«, »*püxen sambt puluer flaschen vnd spaner*« (StLA, GB I, 3388–89, Rep, Ložekar, Martek). The very low value attributed to this object in the inventory of Rogar (only 0.3 fl) suggests that it was a purse.

two basic forms of credit, money-lending and deferred payment can be distinguished only in some cases (Holderness 1976, 99, 107; Pfister 1994, 1354–55; Richter 1986, 134, 140, 145, 149). Credit networks can only be reconstructed partly since often just the first, or only the last names of involved people, or only their kinship relations are listed (Pöttler 2000, 276; Richter 1986, 139). The inventories which do not list any debts do not prove their inexistence (Roth 1979, 409).

The seigneury acted as a major lender since deferred payment of rent was commonplace. The accumulation of arrears from different years was allowed up to a certain degree, not to lead tenants to bankruptcy. The Church, other seigneuries, clergy, tradesmen, artisans, widows and unmarried people, rich farmers and other peasants represent some of the very frequent sources of agrarian credit in the Early Modern Period (Holderness 1976, 101–2, 104–5; Richter 1986, 134–40, 149). Rural credit flows occurred in both directions of the social scale: downwards but also upwards. Servants, for instance, often died in the role of their headship's lender, mostly because they failed to receive full wages they had earned; there were even cases of servants not receiving the wages for more than ten years. The loans up the social scale were mostly not a result of voluntary decisions; they were rather a form of exploitation (Pfister 1994, 1348, 1351–52; Richter 1986, 138).

Indebtedness to different people or institutions prevented the debtors from a too severe dependency on one creditor, which could result, for instance, in usury (Holderness 1976, 104–5; Pfister 1994, 1350). It was a strategy of getting more loans to look for different and distant lenders, who preferably did not know each other, in order to hide one's (over)indebtedness, but it was often a precondition for one to know someone personally to be able to obtain a loan (Pfister 1994, 1348, 1350, 1357). A peasant was often a lender and a borrower at the same time (Holderness 1976, 102). Some rural credits remained unsecured, while others were secured by a surety or by a part of possession pawned (Richter 1986, 141).

The inventory of the tenant from the isolated farmstead Kladnik[61] near Luče (Fig. 3, no. 14) from 1613 (StLA, GB I, 3388–89, Kladnik) reveals how great the **local credit network** of some tenants was. The comparison of this inventory with the land register from 1602 (NŠAL 20, box 4, land register 1602) and the land register originally dated to the same year but completed later[62] (NŠAL 20, box 3, land register 1602?) enabled the identification of the majority of his debtors due to the same first and last names as in this Kladnik's inventory. From the 37 debts listed, the debtors of 21 or 22 of Kladnik's active debts were tenants or previous tenants from the isolated farmsteads,[63] 20 to 21 of them from the same AU of the same seigneury as the lender himself. It means that one sixth to one fifth of all isolated farmsteads from the AU of Luče in the seigneury of Gornji Grad (or the present-day municipality of Luče) were Thomas Kladnik's debtors at the time of his death. Additionally, there were 4 to 6[64] people living in the village of Luče in the same AU and 10[65] more individuals, whose last names correspond to the names of

[61] »*Actum im ambt Leutsch auf der hueben na Kladnikouim*«, the last two words are written in Slovene and mean »on the Kladnik farm« (StLA, GB I, 3388–89, Kladnik, 2nd version; because of very cursory handwriting some of the letters from the quotation could also be read otherwise with no influence on the meaning of the quotation).

[62] There is, for instance, an original minute, not a later insertion, recording the event from 1603. Additionally, the names of some of the tenants are not the same any more as compared to the land register from 1602 so the headship of those farms changed in the meantime (e.g. »*Jacob*« was succeeded by »*Marco*« on one of the two Bezovnik farms above Gornji Grad (Fig. 3, nos. 1, 2). Moreover, some of the farms were divided in the meantime–there was the tenant »*Jurÿ*« on the isolated farm Detmer north of Ljubno in 1602 (Fig. 3, no. 20), but there were tenants »*Jurÿ*« and »*Valenti*« paying together almost the same sum paid 1602 by »*Jürÿ*« alone–1 fl 21 kr in 1602, 1 fl 22 kr in the later source (NŠAL 20, box 4, land register 1602; NŠAL 20, boxes 2–3, land register 1602? [the parts of this land register, to which I'm referring, are divided into two boxes], pp. 121, 135, 832–33)).

[63] According to both aforementioned early 17th century land registers Virgilius Robnik had been the tenant from the Robnik farm (Fig. 3, no. 13), but before1602 a new tenant was installed there. Virgilius Robnik, probably the same person, was in the early 17th century cottager in the village of Luče (NŠAL 20, box 3, pp. 869, 986; box 4, Land register 1602, AU of Luče). It is not clear whether the debt listed in Kladnik's 1613 inventory originated from the time when he was in possession of the isolated farm or from the period when he was a cottager.

[64] Apart from Virgilius Robnik, as the fifth, the history of the sexton Anthony as the sixth person should be studied in closer detail in order to be sure whether he lived in this village or not.

[65] But one of them, Lukas Cire, co-owed the debt with Matheus who was according to the mentioned land registers the tenant from the isolated farm Cire (Fig. 3, no. 10) (NŠAL 20, box 3, p. 902; box 4, AU of Luče).

isolated farmsteads in the mentioned AU, but their first name is not the same as in any of the two land registers. These people were either tenants' relatives living on the same farms, they were tenants installed in a holding after the second land register mentioned was drawn up, or they were not living at the isolated farmsteads corresponding to their last names at all, being, for instance, cottagers in the village of Luče. In two cases the interest rates can be calculated, revealing that they were not universal. The interest rate for the tenant from the isolated farm Obojnik (Fig. 3, no. 30) was 7.5 %[66], whereas for the tenant from the Navršnik farm (Fig. 3, no. 16) it was 3.7 %[67]. In the source referring to the division of this property the interest rate of 6.7 % is recorded for a part of the property attributed to the deceased tenant's daughter.[68] In exceptional cases it can be found out that a loan was secured by a surety or by a part of possession pawned. Urban Dekmar played the role of surety for the tenant from the half Čeligoj farm on the southern slope of Raduha (Fig. 3, nos. 29, 34); the sum in question was relatively low as Čeligoj owed to Kladnik 2 fl at the time of lender's death. For the security of the 26.67 fl, owed by Matevž Trkač, a pair of bulls was pawned. In the case of Kladnik's considerable loan to Virgilius Robnik (20 fl at the time of lender's death) the existence of a written contract (*schuldschein*) is recorded. In the case of the tenant from Petek isolated farmstead (Fig. 3, no. 5) as debtor, the reason for indebtedness is listed–it is the deferred payment of 18.5 fl for a pair of oxen[69], which Petek received from Kladnik. The loan seems to have been interest-free, but it cannot be stated for sure. The sum of the whole list of Kladnik's active debts, very close to 1000 fl[70], would suffice to buy more than 100 oxen similar to those that Petek had bought from Kladnik. The sum of active debts in the source from 1622, referring to the division of the property listed in this inventory, is 844.8 fl; some of the active debts listed 10 years earlier were lost[71] (StLA, GB I, 3388–89, Kladnik). The exceptionality of Kladnik's early 17th century credit activity is obvious, if we compare his active debts with Mravljak's study of 45 inventories referring to farms at the foot of and on the slopes of Pohorje and Kozjak, again a territory of isolated farmsteads, from the period 1635–1695. The highest sum of active debts there was »merely« 288 fl in 1644 (Mravljak 1932, 172–73, 183).

Following the review of the credit activity of an important local lender in the region of Luče, we are going to change the viewpoint and focus on a sample of eight almost territorially adhering isolated farms with several inventories preserved from the 17th century–the high farms of the seigneury of Eberndorf/ Dobrla vas in the region of Solčava.

The numbers of people and institutions as tenant's lenders were very diverse; the same goes for the extent of **debts to the seigneury**. The situation of Kolar in 1630 (Fig. 3, no. 51) represents an extreme position. The tenant's debts exceeded the sum of the inventoried possession. When he was on his death-bed, he was indebted to ten people and the local Church of Holy Spirit (Fig. 3), but the seigneury did not act as lender at all. Whereas the majority of the inventories prove indebtedness to more than one person or institution, seigneury and the others, in four of five cases of tenants displaced from holding the seigneury is recorded as their only lender. One could doubt whether the lists of debts recorded in these cases are complete, but even according to Rogar's inventory from 1688 (Fig. 3, no. 54), the fifth case of displacement from holding, listing also indebtedness to other people and church, the debt to the seigneury

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66 »*Pangraz Oboinigkh bleibt schuldig 20 ducatten* [1.33 fl each] *vnd von ein jahr interesse 2 fl*« (StLA, GB I, 3388–89, *Verzaichnuß der jenigen schulden* …, 4 December 1613). 28.6 fl/26.6 fl = 1.075.

67 »*Rupreht Nauerschnigkh bleibt schuldig 20 fl vnd von fünff jahren auf dato daß intereße 4 fl*« (StLA, GB I, 3388–89, *Verzaichnuß der jenigen schulden* …, 4 December 1613). $\sqrt[5]{(24\ fl/20\ fl)} = 1.037$.

68 »*... vnd so lang sie bei ime liegen werden mit 4 kr von ein fl jerlichen zu verzinßen schuldig*« (StLA, GB I, 3388–89, Kladnik, 29/1/1622). 64 kr/60 kr = 1.067. Because of the very cursory handwriting some of the letters from the quotation could also be read otherwise with no influence on the meaning of the quotation.

69 The source suggests that it is their whole cost: »*ein par oxen dem Sÿmon Pettek pro 14 d*[ucatten] [80 kr each; 60 kr = 1 fl] *in münz 11 kr weniger verkhaufft worden, die er Pettekh noch zubezallen schuldig verbleibt*« (StLA, GB I, 3388–89, Kladnik).

70 There are in comparison with the whole sum small differences between the preserved versions of the inventory. But in one of the versions 14.67 fl are listed twice–at the debtor Osojnik as well as at Miklavc, who in the end had to settle this debt.

71 Mentioned most clearly for 33.33 fl owed by the tenant from Osojnik isolated farm (Fig. 3, no. 19) in the early 17th century, who according to the inventory: »*ist gestorben vnd hatt nichts verlassen*«–died without having left anything. This is one of the debts not listed in 1622 (StLA, GB I, 3388–89, Kladnik).

represented 80 % of all debts, not taking into account the costs of inventory. It was **not a fixed sum of the debts at which the tenant was displaced from holding**. The comparison of the inventories with land registers from 1678 and 1696 shows that in the case of Kolar in 1676 (Fig. 3, no. 51) his debts to the seigneury amounted to 96.1 fl, i.e. more than twelve times the majority of his annual pecuniary dues and taxes. In the case of Strevc in the same year (Fig. 3, no. 52), the indebtedness of 76.7 fl, i.e. 9.5 times the majority of his annual pecuniary dues and taxes, and at the same farm in 1688 even the indebtedness of 30.2 fl, i.e. less than four times the majority of his annual pecuniary dues and taxes caused displacement from holding (StiASP, Eb., A., fasc. 35, L. 11, no. 112; fasc. 39, L. 21, nos. 14 & 17; fasc. 40, L. 24, no. 1 & L. 25, nos. 39 & 40; StiASP, Eb., B. 7, pp. 199, 201; B. 63, fol. 463, 467). A part of the herds of the observed tenants, with the exception of Macesnik, grazed on the alpine pastures of the seigneury of Hagenegg north of their farms (StiASP, Eb., B. 4, 689). The annual due for it caused Rogar's (Fig. 3, no. 54) debt to that seigneury which is proven by the 1633 inventory (StiASP, Eb., A., fasc. 35, L. 12, no. 7).

In some cases a part of the tenant's **arrears** was **lost for the seigneury**, e.g. at Kolar in 1676 (Fig. 3, no. 51). The displaced tenant's possession was assessed to 29.9 fl, his debts to the seigneury amounted to 96.1 fl. It says in the inventory that 66.2 fl were lost for the seigneury. The whole possession of the displaced, listed in the inventory—livestock, grain and implements—was left on the farm and lent to the new tenant, stepson of the displaced one. He was, namely, obliged to pay the installation due (7.3 fl) and also the 30 fl[72] for the possession from the inventory (StiASP, Eb., A., fasc. 39, L. 21, no. 17). The debts of tenant Jamnik (Fig. 3, no. 49), who died in 1696, exceeded the balance of the possession inventoried. The sons, one of them married, did not succeed him due to poverty and lack of sanity. The seigneury made sure to receive the sum owed and at the same time prevented the farm from lying desolated as »*Andree Rueprecht*«, burgher of the market-town of Eisenkappel/Železna Kapla, paid the installation due of 20 fl, the post mortem due of 8 fl, the majority of the sum of rent, dues, tax and respective arrears (22.5 fl) in 1696 and obliged himself to pay off the remaining old arrears (9.4 fl), as well as to present an appropriate new tenant in the next three years (StiASP, Eb., A., fasc. 42, L. 28, nr. 24; StiASP, Eb., B. 63, 461; B. 155, 331).

Debts to the nearby church of Holy Spirit (Fig. 3) are often recorded. The highest among them were much lower than the highest debts to the seigneury. In the inventory of Rogar from 1676 and Jamnik from 1696 (Fig. 3, nos. 49, 54) the reason for indebtedness is listed–it was a loan, in the latter case it is clearly mentioned that interests were also included[73] (StiASP, Eb., A., fasc. 39, L. 21, no. 15; fasc. 42, L. 28, no. 24). Another possible reason for indebtedness to Church was related to livestock belonging to Church but kept on farms. For instance, in the year 1652 74 cows and 604 sheep belonged to the parish church in Solčava (Fig. 3), according to the data from the same year this parish church and the filial Church of Holy Spirit collected an annual due of 0.1 fl yearly for each cow and 0.03 fl for each sheep from farmers who were keeping their livestock (Zwitter 2014a, 212). Additionally, a part of the herd belonging to Church could be paid off instead of remaining on the farm or being returned. Seven sheep of the Church of Holy Spirit and two sheep of the parish church would in such case cause a debt of 6 fl at Jamnik farm in 1696 (Fig. 3, no. 49) (StiASP, Eb., A., fasc. 42, L. 28, no. 24). Of course, debts to churches could also be arrears for religious services.

Some **remote creditors** played important roles. In 1620s such a role was played by »*Enzÿ Predounigg*« or »*Vinsenz Predounikh*«, the tenant of the seigneury of Bleiburg/Pliberk, living in (the vicinity of) Mežica in Carinthia[74] (StiASP, Eb., A., fasc. 35, L. 11, nos. 62 & 112 & 115). It is at least a good possibility that he was one of the household members from the about 30-kilometre-distant isolated farmstead Predolnik in Plat near Mežica (Fig. 3, no. 64), which according to the data from 1788 really

[72] Instead of 29.9 fl (Ž. Z.).

[73] Among the tenants' debts: »*Der khürchen H. Geist dargelichenes.....7 fl*« (Rogar), »*Der kürchen deß H. Geists am darlechen vnd zünß 15 fl*« (Jamnik).

[74] Jamnik's inventory: »*Dem Enzÿ Predounigg auff Pleÿburg gehorigen vndterthan 10 fl*«; Kolar's inventory »*dem Vinsenzen Predounikh zu Miss 9 fl*«.

belonged to the seigneury of Bleiburg/Pliberk (AS 1111, Bleiburg, CM Plat). His role of a lender is proven by both inventories from 1630 referring to Jamnik and Kolar farms (Fig. 3, nos. 49, 51), so at least the strong influence of kinship relations can probably be excluded. The debts amounted to 9 fl and 10 fl. In the late 17th century the tenant from the isolated farmstead Gubanc near Eisenkappel/Železna Kapla (Fig. 3, no. 68), subject of the seigneury of Eberndorf/Dobrla vas, who was at the time of his death in 1706 additionally in possession of a free holding, played a role of an important lender (StiASP, Eb., A., fasc. 44, L. 32, no. 24). Unlike Kladnik's debtors, the majority of whom lived in the same AU of the same seigneury as the lender, the credit network of Gubanc extended much further, its south-eastern edge is particularly important for us. Gubanc's loan enabled Rogar (Fig. 3, no. 54) to pay the majority of the rent in 1687[75] (StiASP, Eb., A., fasc. 40, L. 25, no. 40). A loan to Krofič (Fig. 3, no. 48) in the region of Solčava[76] is also recorded. Even a burgher of the market-town of Ljubno ob Savinji (Fig. 3), subject of the seigneury of Gornji Grad[77], is mentioned as a considerable debtor of Gubanc, owing him 50 fl in 1706. Lying near the important road along the Vellach/Bela valley to the pass Jezerski vrh/Seebergsattel, the inventory of Gubanc from 1706 reveals the influence of this traffic connection for credit activity[78] (StiASP, Eb., A., fasc. 44, L. 32, no. 24).

There were also important connections with individuals from Wackendorf/Večna vas near Bleiburg/Pliberk and Buchbrunn/Bukovje near Eberndorf/Dobrla vas in the late 17th century. From the livestock bred on Kolar farm in 1676 (Fig. 3, no. 51) two young oxen belonged to »*Khoreschnig zu Puchprun*«[79] and two sheep to »*Schonne zu Wackhendorff*«[80]; the latter was also possessor of two sheep bred at Strevc (Fig. 3, no. 52) that same year. When the old Jamnik died in 1696 (Fig. 3, no. 49), he also owed considerable debts to two persons with these two names of homesteads–7 fl to »*Schanne*« and 4 fl to »*Koreschnigg*« (StiASP, Eb., A., fasc. 39, L. 21, nos. 14 & 17; fasc. 42, L. 28, no. 24).

Some farmers owed considerable amounts to **craftsmen or merchants**, revealing their gravitation to Eisenkappel/Železna Kapla as well as the existence of works which farmers did not carry out themselves. In 1620s the cooperation with butcher Krälnig, burgher of the market-town of Eisenkappel/Železna Kapla, is revealed by Kolar's and Jamnik's inventories from 1630 (Fig. 3, nos. 51, 49); the former owed him 19.3 fl, the latter 7 fl (StiASP, Eb., A., fasc. 35, L. 11, nos. 62 & 112). There is a debt of 11.2 fl to a dyer[81] from the same market-town recorded in Goler's inventory from 1698 (Fig. 3, no. 50), 11 fl in the inventory referring to Ramšak farm (Fig. 3, no. 56) and another house in the region of Solčava in 1700 (StiASP, Eb., A., fasc. 42, L. 29, no. 20; StLA, GB I, 3388–89, Schetteÿ) and a much smaller debt of 0.5 fl to a dyer from the same market-town in Rogar's inventory from 1659 (Fig. 3, no. 54) (StiASP, Eb., A., fasc. 36, L. 15, no. 204). The inventory of the poor Goler from 1678 (Fig. 3, no. 50) lists the debt to a carpenter amounting to 6.25 fl, related to the erection of a new house, which was clearly not built (exclusively) by the household members and their neighbours. 6 fl of this debt had to be paid later by the next tenant (StiASP, Eb., A., fasc. 39, L. 22, no. 35); it was at least not exceptional for isolated farms in the Upper Savinja valley at that time that their farmsteads consisted of a group of buildings and the inventory of Ložekar from 1610 (Fig. 3, no. 11 or 12) reveals that roofs of the house and granary were in a bad condition (Zwitter 2014a, 227). The tenant of Rogar farm (Fig. 3, no. 54) owed 4 fl for salt to Kazl from Eisenkappel/Železna Kapla in 1688, also Rogar's inventory from 1633 provides evidence of deferred payment for salt (0.67 fl) (StiASP, Eb., A., fasc. 35, L. 12, no. 7; fasc. 40, L. 25, no. 40). A debt to the blacksmith in Eisenkappel/Železna Kapla (0.7 fl) is listed in Goler's inventory from 1678 (Fig. 3, no. 50) (StiASP, Eb., A., fasc. 39, L. 22, no. 35). Small debts to a weaver and tailor in the inventory of the

[75] Among Rogar's debts in 1688: »*Dem Gubänz in der Capl dargelichnes zur 1687. stüfft 10* [fl]«.

[76] »*Khrofitsch* [in the 2nd version *Krophiz*] *in Sulzbach*«.

[77] »*Schollar* [in the 2nd version »*Solar*«, in the 3rd version »*Sollär*«] *zu Lauffen in Vndter Steÿer ein burger nach Oberburg geherig*«.

[78] There was »*Poduerschnigg in Seelandt* [or »*in Seeländer pfarr*«]« – from Jezersko (close to the mentioned pass Jezerski vrh/Seebergsattel) among the debtors.

[79] It really is a name of homestead in Buchbrunn/Bukovje (Kulterer 1965, 362).

[80] And this really is a name of homestead in Wackendorf/Večna vas (Kotnik 1999, 151).

[81] Provided that »*ferber*« is understood as an occupation, not only as last name.

poor Jamnik from 1696 (Fig. 3, no. 49) prove that not all textile and clothes were home-made (StiASP, Eb., A., fasc. 42, L. 28, no. 24).

The **debts to the local priest**[82] were, for instance, a consequence of arrears for tithe and for the due to priest–there is a debt of 1 fl for tithe in Goler's inventory from 1678 (Fig. 3, no. 50), 5 fl for the undelivered tithe and the due to priest in Jamnik's inventory from 1696 (Fig. 3, no. 49) (StiASP, Eb., A., fasc. 39, L. 22, no. 35; fasc. 42, L. 28, no. 24). The observed tenants were also debtors of **a number of other locals**. Beside the spatial closeness also kinship relations played an important role. Among the cases where lending is the explicitly mentioned cause for indebtedness, the case from Jamnik's inventory from 1696 draws special attention, revealing the riskiness of rural credits and the important role which seigneury could play in such cases. The daughter-in-law lent 22 fl in cash to her father-in-law, the tenant from Jamnik farm in a difficult economic situation.[83] According to the contemporary calculation the debts exceeded the sum of the whole inventoried possession for 35.25 fl. Thus the debts were divided into those of priority and others. All the debts to the seigneury, seigneurial officials, churches and priest belonged to the former group, while others belonged to the latter. After the debts of priority were subtracted, only 14.5 fl, i.e. 17 % of the whole inventoried possession, remained. As long as it did not threaten the rights of the privileged group of creditors, the seigneury paid regard to the fact that the daughter-in-law lent her money, moreover, she was doing unpaid housework for more than 10 years, and that two sons of the deceased, one about 40, the other about 50 years old, were up to their father's death working on the farm as farmhands and none of the three mentioned persons received any payment for it. Thus the whole remaining 14.5 fl entirely fell to the mentioned three relatives' share, which still means that the daughter-in-law lost the majority of her loan. The remaining seven creditors lost everything that Jamnik owed them, together a total of 27.7 fl (StiASP, Eb., A., fasc. 42, L. 28, no. 24).

Masters often **owed money or objects to** their **servants**–farmhands, maids or herders. There are 16 such cases mentioned in 5 of the 23 inventories (StiASP, Eb., A., fasc. 35, L. 13, no. 76; fasc. 38, L. 19, no. 14; fasc. 41, L. 27, no. 13; fasc. 42, L. 28, no. 24 & L. 29, no. 20–21). In half of the cases with debt amount recorded, the debt ranged from 1.2 to 2 fl. It was frequently the deferred payment for their work. The highest debts to servants were 4 fl (in 1649) and 5.73 fl (in 1698); as we are told that these referred to deferred payment (StiASP, Eb., A., fasc. 35, L. 13, no. 76; fasc. 42, L. 29, no. 20), those servants had not been given their wages for years. Similarly, it is explicitly mentioned at Rogar in 1693 (Fig. 3, no. 54) that the debt to the farmhand referred to his work on the farm in the previous year (StiASP, Eb., A., fasc. 41, L. 27, no. 13). Still, the farmhand whose master's debt was the highest was additionally rewarded as the master assured him a bequest of 4 fl (StiASP, Eb., A., fasc. 42, L. 29, no. 20–21). However, in some cases servants served also as real money lenders. 3 fl were owed to the maid[84] on Jamnik farm in 1696 (Fig. 3, no. 49) for covering the cost of her master's funeral. Her loan was secured by a heifer pawned to her (StiASP, Eb., A., fasc. 42, L. 28, no. 24).

According to ethnological data usual forms of help among farmers, e.g. neighbours, were most often not expected to be returned until assistance was required by the farm which had offered it before (Makarovič 1979, esp. 7–8, 77, 84, 121). The lists of debts and active debts in the inventories prove that it was not always the case in the 17th century, however, a part of informal help among the farmers is most probably missed in this type of sources as the farms to which this form of help was offered did not owe anybody anything except for future willingness to help in a similar or in a diverse manner.

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[82] The debts to church do not seem to be in all cases clearly distinguished from debts to the priest. Whereas the tithe really belonged to the priest as he was one of the tithe leaseholders there (NŠAL 20, box 3, 1307), the situation with Rogar's debt to the priest for 6 sheep in 1633 is less clear (StiASP, Eb., A., fasc. 35, L. 12, no. 7).

[83] »*Der Eva Jämbniggin an par dargelichnem geldt.....22 fl*«, »*von ihrem eigenen zuebringen der 22 fl, weliche sÿe ihme vattern* [i.e. father-in-law] *in seiner hochen noth dargelichen*«.

[84] Here name is not given and the possibility that it was the master's daughter-in-law cannot be entirely excluded.

2.5 The changing rural wealth

The land register of the seigneury of Eberndorf/Dobrla vas contains a minute referring to the farm Goler (Fig. 3, no. 50): »*1699. Ligt dise hueben lähr auß mangl geldt vnnd leüth, die wißmätter aber, sein in bestandt verlassen worden, den Stüffter daselbst pro 7 fl*«, meaning that the farmstead lay abandoned in the year 1699 due to lack of money and people, the meadows were let to one (possibly two or three)[85] of the neighbouring farms from the seigneury of Gornji Grad, lying north of the village of Solčava, named in the early modern sources as Štiftar (Fig. 3, no. 57–59) (StiASP, Eb., B. 63, fol. 462).[86] But the inventory referring to the same farm in 1698 reveals high bequests to the parish church in Solčava, the Church of Holy Spirit near the Goler farm, the Church of St. Leonard on the other side of the mountain ridge on the way to Eisenkappel/Železna Kapla (Fig. 3)–together 61 fl, accompanied by additional 8 fl bequeathed for food and drink at the funeral and a heifer estimated to 5 fl to be slaughtered and distributed to the poor. The mentioned bequests accounted for 40 % of the whole inventoried possession (StiASP, Eb., A., fasc. 42, L. 29, nos. 20–21). His charity in form of gifts to the poor was shown publically. Bequests to churches were in the 17th century commonplace (Verginella 1996, 7, 95, 161, 166–68, 194–95), but the sum bequeathed by Goler (Fig. 3, no. 50) is entirely exceptional in comparison with other 17th century inventories of the tenants of the seigneury of Eberndorf/Dobrla vas in the region of Solčava, where the wealthy Macesnik (Fig. 3, no. 55) in 1668 only bequeathed 3 fl to the parish church and 9 fl for the masses (StiASP, Eb., A., fasc. 38, L. 19, no. 14). The inventory clearly reveals that conclusions about the environmental impact of the successive bad harvests on the economic situation of Goler farm (Fig. 3, no. 50) based only on the land register minute would be wrong.

2.5.1 General critical remarks on 17th century peasant inventories as sources for tenants' assets

Data on rural wealth, documented in inventories, are of considerable relative importance because the values attributed to the articles inventoried are often underestimations as compared to the market prices (Pöttler 2000, 273–74, 277–78). Cereals and livestock products, strongly affected by environmental conditions, often represented a great proportion of the value of the whole estimated tenant's property. Notwithstanding the fact that some items of low general importance, e.g. a clothesline, can be mentioned, probate inventories are far from being exhaustive (Baulant 1975, 506, 510–11, 517). The absence of a part of the property can be a sum of various factors. Inventory instructions differed between seigneuries and could change in time (Gadd 1980, 233; Pöttler 2000, 267; Pöttler 2002, 254). If other people removed something declaring that it belonged to them, e.g. a widow the linen made from thread she had spun herself, such an article could also not be listed in the deceased's inventory. A part of the property could have been hidden before the possession was inventoried, but it was not unlikely for such a crime to be revealed by other household members, neighbours, etc. Additionally, some mistakes were made through carelessness of persons in charge of the inventory procedure; if a large number of inventories is investigated, errors of this type cancel themselves out due to their normal distribution (Baulant 1975, 507; Borscheid 1980, 92–93; Overton 1980, 207; Pöttler 2000, 277; Roth 1979, 405). In the region of Meaux in France about 1700 and in the middle of the 18th century, for instance, the provisions of cereals, fodder, wine, wood, yarn and linen seem to have been documented precisely–unlike apples, cabbage, nuts, etc. listed with varying degree of exhaustiveness. Although cows were reared by half of the households analysed there, milk or butter are not listed in any of the inventories, whereas cheese is only documented exceptionally, the same applies to eggs, although poultry was commonly reared. There is no honey or wax

[85] The definite article »*den*« speaks for plural, whereas the verb form »*zahlt*«, referring to the due for these meadows, proves that it is one person unless it is just a part of the phrase not adjusted to the real situation.

[86] The three farms formed a hamlet up to the arson during World War II. Only one of them is known as Štiftar now, the house names of the other two later relocated houses were only known as Martinc and Majdač in the mid-20th century (for the 20th century data Meze 1963, 267–68; historical data according to my study of early modern land registers, e.g. NŠAL 23, box 48, book 39, AU of Solčava).

in the inventories of beekeepers and dogs are only mentioned exceptionally (Baulant 1975, 506–7). A part of the property in some cases remained unassessed, being bequeathed to heir(s) (Pöttler 2000, 276). For objects which could be interpreted as part of the fixed property, e.g. tables or banks, it was possible not to be listed at all (Garrard 1980, 63; Roth 1979, 404; Pöttler 2000, 266–67; Pöttler 2002, 265). Possible existence of displaced money or livestock could strongly affect the total property assessment (Roth 1979, 397). The numbers of articles given as twelve or its multiples should be addressed with caution; namely, twelve is a synonym for a dozen, which could be used either exactly or as an approximation (Pöttler 2000, 279). Consequently, researchers must organize the data at the beginning of the analysis in order to find out the strong and weak points of the particular sample of inventories (Baulant 1975, 516). It is thus obvious that it is not an appropriate way of analysis to compare the balances given in inventories themselves. The fact that balances given are often false makes things even worse. The adjusted balances, including only the comparable contents of inventories, should be calculated (Garrard 1980, 64).

2.5.2 The changing assets of tenats from isolated farmsteads in the 17th century Upper Savinja Valley

Fig. 5 presents modified balances of assets. It reveals the capability of tenants to pay off the debts with main agricultural products–cereals and livestock.[87] The great majority of the analysed inventories are probate inventories, thus listing also the debts related to the tenant's

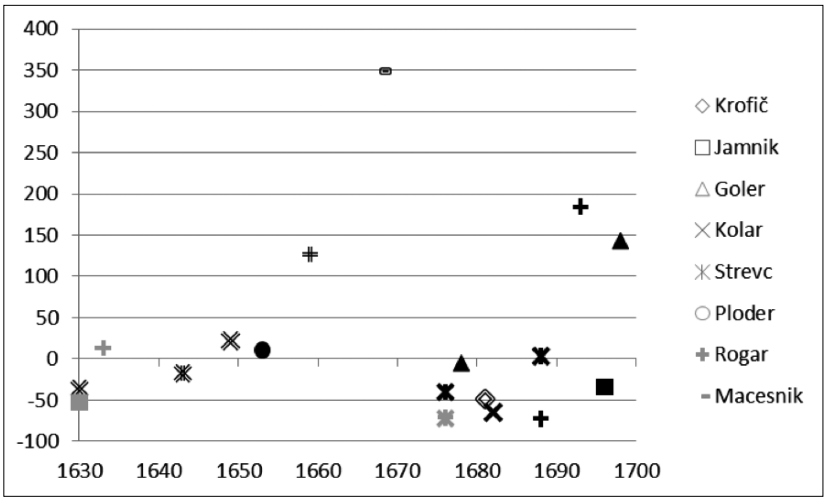

Figure 5: *Sums (in fl) of estimated values of livestock, cereals and active debts, the debts subtracted for eight farms of the seignuery of Eberndorf/Dobrla vas in the region of Solčava according to the inventories from 1630–1698. Timeframe is given with years on abscissa. Data from inventories from 1 August to 30 November are black, those from 1 February to 31 May grey. The double black line stands for the inventories from both remaining periods.*[1]

Sources: StiASP, Eb., A., fasc. 35, L. 11, nos. 62 & 112 & 115 & L. 12, no. 7 & L. 13, nos. 13 & 76 & L. 14, no. 141; fasc. 36, L. 15, no. 204; fasc. 38, L. 19, no. 14; fasc. 39, L. 21, nos. 15 & 17 & 27 & L. 22, no. 35 & L. 23, no. 27; fasc. 40, L. 24, no. 1 & L. 25, nos. 39 & 40; fasc. 41, L. 27, no. 13; fasc. 42, L. 28, no. 24 & L. 29, no. 20.

[1] 1) The overlapping grey marks in 1676 represent the data for Rogar and Kolar (Fig. 3, nos. 51, 54). 2) The exact value for Jamnik in 1630 (Fig. 3, no. 49) would lie even a bit lower, but it is impossible to calculate it because only the value of the majority of livestock owed by the deceased to the siblings is given. 3) The value for Kolar in 1630 is almost precise–the assessment of a heifer is missing, but most probably also the debt for two sheep, so these two small sums almost cancel themselves out. 4) The value for Goler in 1698 (Fig. 3, no. 50) is too low (e.g. cereals were bequeathed to the widow and thus remained unestimated). 5) Four of the 23 inventories are not included in Fig. 5: the inventory of Krofič from 1654 (Fig. 3, no. 48) is only a summary inventory not enabling such calculations; the inventory of Goler from 1672 (Fig. 3, no. 50) is not fully-fledged; the inventory of Simon Ploder from 1677 refers to the tenant who resigned in 1674 (see footnote 97), additionally, it seems that even as far as Simon is concerned it is not a fully-fledged inventory; there are two unequal inventories referring to Strevc farm in 1676 (Fig. 3, no. 52); only the one including the 1676 cereal harvest data is included in Fig. 5.

[87] As mentioned, values of cereals and livestock are probably underestimated. All the species, with the exception of bees, for which it is not always clear whether the hives were populated or empty, are included in Fig. 5.

death, for instance expenses for the funeral, the post mortem due, the expenses for the survey of the possession and costs for writing down the inventory. These debts, along with the deceased's bequests, are not included in Fig. 5 in order to obtain an insight into potentially real situations on the observed farms.[88] The conditions on the farm, namely, changed tremendously shortly afterwards. The future tenant had to pay installation due and changes concerning society, environment and economy affected conditions of the farm.

The inventories are classified in three groups in Fig. 5. Those from August to November present data from the time of cereal harvest, the second half of pasturing season and the very beginning of the barn-feeding period. At that time animals were best fed in the whole year and, at least in the first months, the selling of a part of the herd before the beginning of barn-feeding period had not taken place yet. Also cereal stocks were the best in the whole year unless the influence of trade caused a deviation. Thus the

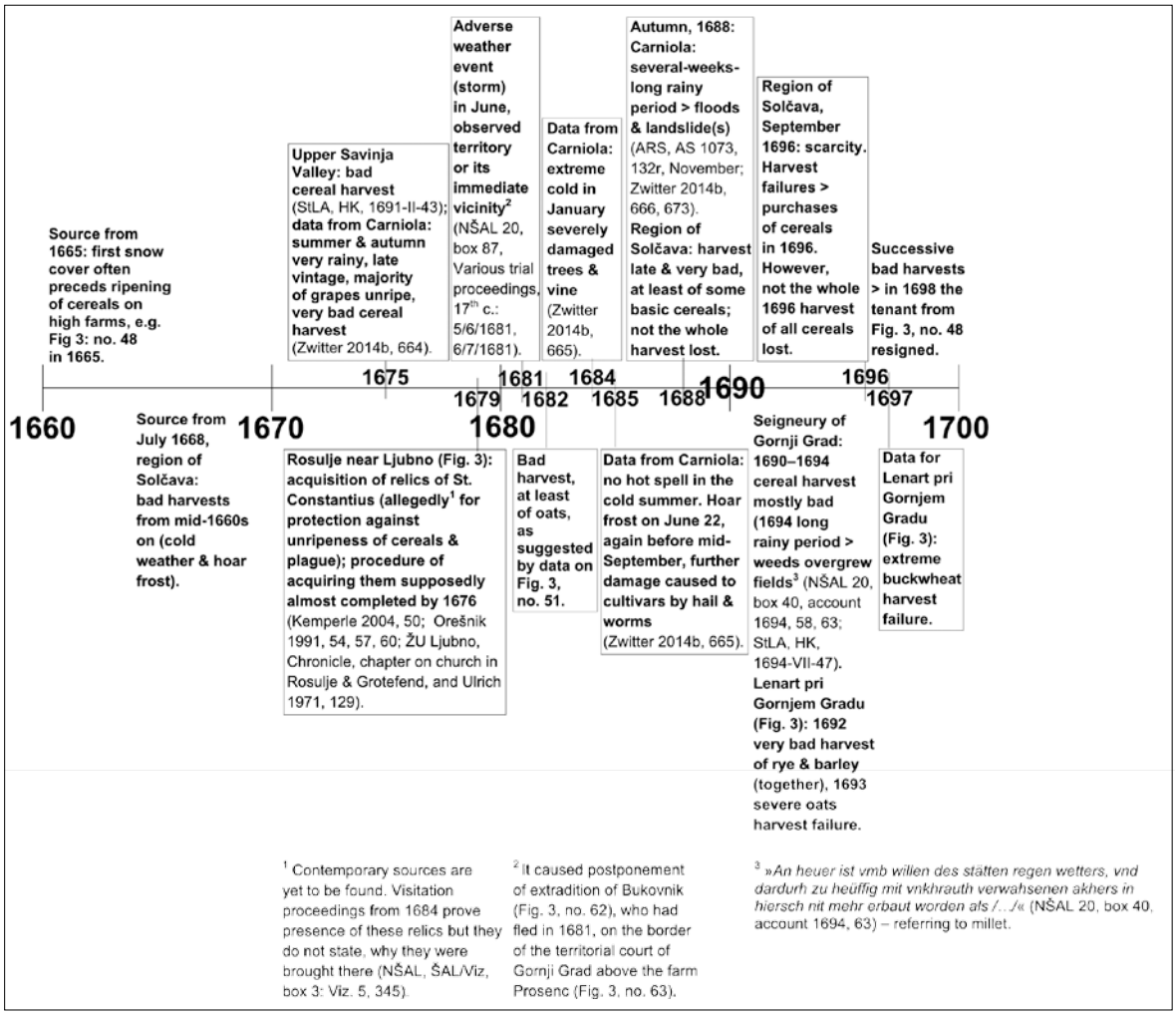

Figure 6: *Timeline of collected data on weather and climate in the observed territory and its immediate vicinity, as well as on their adverse imacts on agriculture (1660–1700).*[1]

[1] Sources are cited if they are not given elsewhere in this article.

[88] For the same reason, 4.6 fl owed by Rogar (Fig. 3, no. 54) to Mr Sebastian Ruprecht from Eisenkappel/Železna Kapla in 1659 were not subtracted from the balance. Namely, in the case of Macesnik's (Fig. 3, no. 55) debt to the same man in 1668, inventory reveals that these expense was a consequence of the survey of the possession (StiASP, Eb., A., fasc. 36, L. 15, no. 204; fasc. 38, L. 19, no. 14).

black symbols in Fig. 5 would lie lower in a less favourable part of the year. The situation in the time of inventories from February until May was just the opposite. It is the concluding part of the barn-feeding season (with the scarcest milk production on average as well as lowest weights of livestock) and the beginning of the pasturing season, additionally, no or hardly any edible plants could be collected outside. The grey symbols would lie much higher in the harvest time.

Fig. 5 shows different impacts of changing environmental, economic and social conditions on different farms in different parts of the observed seven decades of the 17th century. The **culmination of farms uncapable of paying off the debts with main agricultural products in the late Maunder minimum** is evident (Fig. 6). Quantities of tithe collected in Lenart pri Gornjem Gradu (Fig. 3) in 1692–1694[89] and 1696–1697 prove that harvests of all cereal species were not equally affected. The lowest volume of oats was harvested in 1693, whereas quantities of tithe collected in 1696 and 1697, i.e. the best ones among discussed years, were for a half higher. Extreme buckwheat harvest failure of 1697 represented only one ninth of the crop of 1692, when tithe in buckwheat was the highest in these years. Rye and barley were documented together; their worst harvest in 1692 amounted to less that a half of the volume in 1694 or 1696. Fluctuations of wheat harvest were not so pronounced in discussed years (NŠAL 20, box 40, account 1 January 1692–31 December 1693, 85–86, 92–93, 98–99, 102; account 1 January 1694–31 December 1694, 54, 60, 71; account 1695/96 [and 1697], chapters on collected wheat, rye, oats and buckwheat in 1696 and 1697).

In September 1696 the scarcity, especially of cereals, is mentioned in the visitation record from the parish of Solčava as a common feature (NŠAL, KAL, fasc. 166, U 2–3). The tenant Krofič (Fig. 3, no. 48) resigned in 1698 because of the successive bad harvests[90] (StiASP, Eb., B. 63, 466). According to the statement of the sexton from the parish of Solčava from 1699, the reason for his inability to collect all the dues he would have been entitled to, was that at that time a lot of farms lay abandoned: »*Collectura importaret 10 staria, si omnes solverent ast quia nunc multi fundi sunt vacui, non obtinetur tota*« (NŠAL, KAL, fasc. 82, U 5 (2nd unit with the same number), 21 May 1699; underlined by Ž. Z.). The register of arrears from 1699–1701 proves that the statement is partly exaggerated but by no means unfounded. This register confirms the existence of at least five abandoned isolated farms among about forty in the AU of Solčava in the seigneury of Gornji Grad, four of them are listed with names of homesteads: Pastirk (Fig. 3, no. 45), Navršnik (Fig. 3, no. 47), Ručnik (Fig. 3, no. 42), and Lamprečnik (Fig. 3, no. 41)[91] (NŠAL 20, box 4, register 1699–1701), the fifth one lay at the entrance to the Logarska Valley (Zwitter 2015, 206).

On the other hand, there was an attempt to repopulate the abandoned high isolated farmstead Rep in Koprivna in 1692 (Fig. 3, no. 65) after almost 13 years but it failed due to harvest failure of 1692[92]; nonetheless, a new tenant was successfully installed there in 1693 (KLA, AHS, A 2450, shts. 41, 57; KLA, AHS, A 2451, shts. 95, 114–15).[93] The same phenomenon – **re-population of former farms** in high altitudes at the time of frequent harvest failures can be observed on the northern side of the ridge dividing the Savinja and the Vellach/Bela drainage basins. At least two among the few high isolated farms situated there had been used as alpine pastures and temporary settlements (Rjavčnik from 1670 on; Zgornji Tomažič at least from 1673 on) but were both permanently populated again in 1694 (Fig. 3, nos. 66, 67). In the case of Rjavčnik the reason is stated – extensified land use and the related lower tenants' dues were

[89] Regarding buckwheat no data is available for 1694.

[90] »*… wegen der solangen müßgerattenen jahren*«.

[91] The mean of annual precipitation rises from east to west in the region of Solčava, at Ručnik and Lamprečnik, which were abandoned at that time, it exceeds the mean annual precipitation of Macesnik (Fig. 3, no. 55) by at least 100 mm (Environmental Atlas…). Less favourable conditions for growth of cultivars at Lamprečnik than at Krofič were also proven by my fieldwork on 26/9/2009–blackberries (*Rubus sp.*) were ripe at Krofič (where according to the note from 1665 snow often covered unripe cereals) but still red at Lamprečnik.

[92] Harsh winter 1691/92 that caused a complete harvest failure of autumn-sown wheat in the low hills east of Celje in southern Styria (NŠAL 20, box 40, account 1693, 60; location of Slom according to Gestrin 1952/53, map s.p.) was thus not the only adverse weather impact on cultivars in this year; it is not credible that on the altitude of the Rep farm winter-sown cereals played an important role.

[93] For more details see Zwitter 2015, 205–6.

harmful to the seigneury (StiASP, Eb., B. 151, 75, 78). In June the same year, 1694, the seigneury of Gornji Grad ordered its high official (*Anwalt*) to do his best to collect tenants' arrears from the previous two years of harvest failures in order to prevent a further accumulation of arrears in the future. The official promised to consider it with respect to the ensuing harvest and to follow it if only possible (NŠAL 20, box 40, imperfections in the *Anwalt*'s account, 1692/94, § 37 and *Anwalt*'s response).

Successive bad harvests did not cause severe economic difficulties to all the farms, which is partly due to their different quality (Table 5).

Table 5: *Quality classes of the farms of the seigneury of Eberndorf/Dobrla vas in the region of Solčava as recorded by the land register from 1678*

Farm (no. on Fig. 3)	Macesnik (55)	Krofič (48)	Jamnik (49)	Rogar (54)	Goler (50)	Kolar (51)	Strevc (52)	Ploder (53)
Quality (class)	1st	2nd	2nd	2nd	3rd	3rd	3rd	3rd

Source: StiASP, Eb., B. 7, 199–201. 1st class = *bona*, 2nd class = *mediocris*, 3rd class = *exigua*.

The inventory of Macesnik from 1668 makes clear that the preceding accumulated bad harvests in the mid-1660s did not have evident consequences for this first-class farm. Namely, on 27 July 1668 the priest of Solčava mentioned bad harvests, caused partly by cold weather (*frigus*) during those phenophases when cereals could not tolerate it and thus killing (*necare*) the plants, partly by hoar frost (*pruina*) since he was in charge of that parish (NŠAL, KAL, fasc. 43, U 25, visitation proceedings, parish of Solčava, 1668), i.e. from the mid-1660s (NŠAL, KAL, fasc. 43, U 26, visitation proceedings, Solčava, 1669). The emergence of snow cover before the cereals ripened is also recorded for Krofič farm in 1665 (Fig. 3, no. 48) (StiASP, Eb., B. 4, 689). In Fig. 5 the value of Macesnik is by far the greatest of all. Additionally, it is the only one among the analysed inventories of tenants belonging to the seigneury of Eberndorf/Dobrla vas, listing also cash–no less than another 435.33 fl (StiASP, Eb., A., fasc. 38, L. 19, no. 14)! The picture of the more numerous second- and third-class farms is less uniform. While the possession of the tenants at Kolar was never considerable (Fig. 3, no. 51), the tenant of the also third-class Goler farm (Fig. 3, no. 50) was poor in 1678, but his successor was well off in 1698–in the time of bad harvests. Thus also the social component played an important role. It is most clearly demonstrated by Rogar farm (Fig. 3, no. 54) in Fig. 5, where the tremendous change from negative values to almost 200 fl took place in only five years, if it refers to the same farm.[94]

The **dowry** represented on the one hand an important economic basis and a burden on the other. The dowry of the wife of the in 1653 deceased tenant from Ploder farm (Fig. 3, no. 53) amounted to 1 cow, 1 heifer, 2 calves, 6 sheep and 1 pig (StiASP, Eb., A., fasc. 35, L. 14, no. 141). Considerable dowries and husband's contribution to the wife prevented the very poor from marrying, which limited the number of starving people. It says in the 1688 inventory of the tenant from Strevc farm (Fig. 3, no. 52), that none of his sons married due to his poverty (StiASP, Eb., A., fasc. 40, L. 25, no. 39). The dowry provided to the daughter by the tenant from Jamnik farm, who died in 1696 (Fig. 3, no. 49), amounted to 36.7 fl–the same man borrowed at an unknown time 22 fl from the dowry of his daughter-in-law, but was unable to repay the sum in question (StiASP, Eb., A., fasc. 42, L. 28, no. 24). The economic part of the wedding agreement was not always respected. The widow of the strongly indebted tenant from Jamnik farm (Fig. 3, no. 49), who had died in 1630, maintained that according to the nuptial agreement, she was to be given 19 fl. Since she failed to prove it, either by means of a nuptial agreement or witnesses, only 4.3 fl, i.e. the sum equal to the share of each of inheriting children, were attributed to her. Quite contrary to the widow of the tenant Kolar (Fig. 3, no. 51), who also was not in the possession of a nuptial contract at the time of her husband's death in 1649; she lost a part of the property, but nevertheless the possession attributed to her still exceeded the shares of children–the tenant's debts according to this inventory did not exceed the sum of the possession. According to the nuptial contract, the widow of the in 1659 deceased tenant from

[94] See footnote 3.

Rogar farm (Fig. 3, no. 54) should have been attributed 50 fl. The in 1676 retired tenant of Rogar farm still owed her as the mother of his wife's half-brother 17 fl and she was only attributed a part of it in 1676 (StASP, Eb., A., fasc. 35, L. 11, no. 115 & L. 13, no. 76; fasc. 36, L. 15, no. 204; fasc. 39, L. 21, no. 15).

The number of heirs and the value attributed to the inventoried possession subtracted by the sum of debts were the basic factors influencing the amount of the **shares of inheritance**. Additionally, in some cases the division was severely influenced by a wedding contract and bequests. In case of the wealthy Macesnik in 1668 (Fig. 3, no. 55) the largest two of his bequests amounted to 200 fl to the youngest son, who was installed in holding after his father's death, and 100 fl to one of his daughters. After the subtraction of the debts (among them a mare for post-mortem due), and all the items from the will, according to the inventory, an equal share of 42.5 fl was assigned to each of the seven listed inheriting children and his widow. With help of the seigneury the youngest son made an agreement with the coheirs to get their shares paid step by step in the next four years with the exception of the married brother Anthony, who was to get his share that same year (StiASP, Eb., A., fasc. 38, L. 19, no. 14). The whole shares of inheritance were not paid out in all cases. The inventory referring to Jamnik farm in 1630 (Fig. 3, no. 49) reveals that the tenant seven years after his father's death still owed his two brothers and sister huge parts of shares of parental inheritance. The whole shares of inheritance would have represented for each of the two brothers 20 fl, 2 big oxen, 2 bulls, 2 cows, 1 heifer, 10 sheep and 4 goats, for the sister 30 fl and an equal herd of animals as for each of the brothers. But the possession from their brother's inventory did not enable the payment in its entirety; therefore it was only paid out partly. Furthermore, the future tenant was requested to allow the two uncles (i.e. deceased's brothers) to keep a pair of oxen using his fodder. The uncles were then to sell those oxen in order to obtain another part of the shares of parental inheritance. The remaining part of the shares of inheritance of the deceased's siblings was lost[95] (StASP, Eb., A., fasc. 35, L. 11, no. 115; B. 151, 1021–22). The in 1676 retired tenant from the Rogar farm (Fig. 3, no. 54) after 17 years still owed his wife's half-brother the whole share of inheritance (55.8 fl). The latter was only attributed less than two fifths of it in 1676, the remaining part of his share of inheritance was to be paid by the tenant retired in 1676, not the one installed there in the same year. It is not certain whether it was paid out later on or not at all (StiASP, Eb., A., fasc. 36, L. 15, no. 204; fasc. 39, L. 21, no. 15).

Some changes of tenants from those **farms whose master changed frequently**, especially Kolar and Ploder from 1660s on, present a further evidence that these **farms did not enable producers to subsist there**. In the last seven decades of the 17th century, tenants on Kolar farm (Fig. 3, no. 51) changed in 1630, 1649, 1668, 1676 after the displacement of the tenant, however, the new one was again displaced in 1682,[96] then there was no tenant present on the farm until 1684, but the 1684 installed tenant resigned in 1688 due to poverty and a new tenant was installed, in 1698 following the tenant's flight from the farm, and again in 1700 when the tenant, who had left the nearby Krofič farm in 1698/99 (Fig. 3, no. 48) because of bad harvests, was installed on Kolar farm. In the last mentioned case, seigneurial official noted to the land register that this tenant owed to the seigneury 78.8 fl from the time when he had been master of Krofič farm and that when his economic situation on Kolar farm would improve, he would have to settle this debt. In the second half of the century the tenants on Ploder farm (Fig. 3, no. 53) changed in 1653, due to great indebtedness in 1665, but the new tenant fled in 1670 (i.e. after successive bad harvests), in 1674,[97] after the flight of the then-current tenant in 1685, because of an injured leg in 1687, the newly installed tenant resigned in 1689. On the other hand, no change of the tenant occurred at excellent

[95] »*... daß überig aber alles, waß diese dreÿ geschwistrigten ihres vätter- vnd mütterlichen erbseits zu praetendirn gehabt alles aberkhe[n]dt worden vnd ferrer diss orts, alß waß die a[n]gedeiten posten sein, nichts zuesuchen haben sollen.*«

[96] In the previous spring (1681) heavily indebted tenant from Bukovnik farm (Fig. 3, no. 62: more than 1320 m a.s.l.), subservient to the seigneury of Gornji Grad, fled. It was thus another unsuccessful attempt to populate a high alpine farmstead which was according to data from 1673 unpopulated and used by Robnik farm (Fig. 3, no. 61) as alpine pasture (Zwitter 2015, 209–10). Livestock disease could have contributed to it since scabies are mentioned in his barn in a source from 1680 (Zwitter 2014a, 215).

[97] There is also the inventory »*Simon Ploders auß dem ambt Sulzpach, welicher sich von selbsten von der hueben begeben /…/*« dated »*Den 13. Julÿ 1677*« (StiASP, Eb., A., fasc. 39, L. 21, no. 43). The chronological order of tenants from this farm reveals that there was no change of the tenant in 1677. Simon namely ceded the headship position to his son in 1674 (StiASP, Eb., B. 151, 1031), thus it is the inventory of a former tenant.

Macesnik farm from 1618 to mid-1660s, when a new tenant was installed in holding; he led this farm until 1715! From 1648 to 1696, even the tenant on the second class farm Jamnik did not change (Fig. 3, nos. 49, 55) (StiASP, Eb., A., fasc. 35, L. 11, no. 112 & L. 13, no. 76 & L. 14, no. 141; fasc. 38, L. 19, no. 14; fasc. 39, L. 21, no. 17; fasc. 40, L. 24, no. 1; fasc. 42, L. 28, no. 24; StiASP, Eb., B. 63, 463, 466; B. 151, 1023, 1026–27, 1031, 1036–37; B. 154, column 22–21).

Displacement of a tenant from holding was a rare occasion in Carinthian context; it was practised when a seigneury rendered the situation as without resource. Following the study of history of several hundreds of farms in various parts of Carinthia, Karl Dinklage only listed one such case, and even there a relative, i.e. the displaced tenant's sister-in-law, was installed in holding; Dinklage sporadically came across other such examples on other farms (Dinklage 1966, 124–25). If we only concentrate on the explicit mentionings of displaced tenants in the inventories of the isolated farms of the seigneury of Eberndorf/Dobrla vas in the region of Solčava, five such cases can be proven, Strevc and Kolar in 1676, again Kolar in 1682, Strevc and Rogar in 1688 (Fig. 3, nos. 51, 52, 54). In accordance with results on frequency of changes of masters, also these tenants came from bad farms and in one case from a middle-class farm (Tab. 5). They are all connected with indebtedness to the seigneury. In both cases from 1676 it is clear that a relative was installed in a holding then–a son and a stepson. In the case of Kolar in 1682 the farm, as previously stated, lay abandoned until 1684. In this case, as well as in the cases of Strevc and Rogar in 1688, whose children did not succeed him, as they remained unmarried due to poverty, it is not clear from the analysed inventories whether the new tenant was a relative of the displaced one at all (StiASP, Eb., A., fasc. 39, L. 21, nos. 14 & 17; fasc. 40, L. 24, no. 1 & L. 25, nos. 39, 40).

The fate of a family which ceased to be in charge of a farm could be diverse. On Goler farm (Fig. 3, no. 50) following the death of a tenant whose debts exceeded the sum of the inventoried possession, the new tenant was obliged to offer food pension to the widow and children for seven years according to the inventory from 1678; their further fate was not foreseen (StiASP, Eb., A., fasc. 39, L. 22, nr. 35). It was different in the case of Rogar farm in 1676 (Fig. 3, no. 54). The tenant Matthias, whose inventory balance was also negative, resigned due to poverty and physical weakness. The new tenant Simon, his son-in-law, was required to offer his parents-in-law food pension during the course of his entire lifetime (StiASP, Eb., A., fasc. 39, L. 21, no. 15). However, in 1688 Simon, whose debts again exceeded the sum of the inventoried possession, was displaced. One of the possibilities is that the farmhand Matthias, named in the Rogar inventory from 1693, was the former tenant still living on the farm after Simon's displacement (StiASP, Eb., A., fasc. 41, L. 27, no. 13). Simon himself migrated to the neighbouring Ploder farm (Fig. 3, no. 53) where he was tenant from 1689 on (StiASP, Eb., B. 155, p. 143).

Material culture of isolated farmsteads in the Upper Savinja Valley in the 17th century was very diverse. Whereas it was noted that Petek farmstead (Fig. 3, no. 5) was a great building in 1601 and the wooden ceiling at Rep (Fig. 3, no. 6) was decorated in the 17th century, the floor in house of a low quality farmstead in Planina north of Ljubno (Fig. 3) was not even levelled in the late 19th century (Zwitter 2014a, 227). Urban Schetteÿ, subject of the seigneury of Gornji Grad, was in possession of Ramšak isolated farm (Fig. 3, no. 56) and another house in the region of Solčava. The inventory of the couple Schetteÿ from 1700 reveals exceptional luxury in the late 17th century. At least one of the household members was not only literate, but possibly even in command of foreign languages. The six listed books were written in Latin, German, French and Slovene; their contents were either religious or they were handbooks on learning how to read.[98] From the description of the jewellery–the luxury of some women's garments is also obvious–only the most luxurious articles shall be presented. There was a silver belt made of old coins, a gold ring and three gilded silver rings with (precious?) stones, at least eight garments were decorated with black or white lace–once even Lyon lace is mentioned[99]–and silk[100] was present in the wardrobe,

[98] Many thanks to Dr Anja Dular for the explanation what »*plateltaff*« is, and for the opinion that the objective of the French booklet characterised in the inventory as »*Tibl Ala Jeunessa*« was probably similar.

[99] In France, lace at that time belonged to new patterns of dress (Fairchilds and Forrester 1994, 63).

[100] In Tuscany, silk spread among opulent peasants mostly from the middle of the 18th century on (Malanima 1994, 120–21), but

which, for instance, in Tuscany spread among opulent peasants mostly from the middle of the 18th century onwards (Malanima 1994, 120–21). Four tables, 13 pitchers, 25 earthen bowls, 7 majolicas, a dessert bowl and provisions of wine could speak either for an inn or could be related with the luxurious lifestyle of the couple. The equipment for drawing wood could be a scarce legacy of economic reasons for such opulent people to buy that isolated farm (StLA, GB I, 3388–89, Schetteÿ); trade in wood down the stream of the river Savinja began to bloom in the region of Solčava at least in the late 17th century (Zwitter 2014a, 228).

2.6 Demographic conditions

Registers of baptism, marriage and death, along with the extensive statuses animarum, are not known to be preserved for the parishes of Solčava and Luče for the timeframe observed.[101] Still, some of the visitation proceedings, summary statuses animarum and some of the probate inventories contain demographic data–including the visitation from as early as 1614. The church sources provide a basic insight into the age structure, separately listing *communicantes,* which usually refers to people of more than twelve years of age, and children younger than that (Zwitter 1970, 34), though exceptions with regard to the age were possible in individual cases (Lilijana Žnidaršič Golec, pers. comm.).

The long-lasting notion that the Alpine population in general was characterized by the slow-paced rise in the 18th century which was followed by an accelerated population growth in the first half of the 19th century is an extrapolation of some studies referring to the Western Alps, which do not represent the state of the art any longer. The population of the Alpine parts of the present-day Austria grew from 1 395 000 to 2 122 000 between 1700 and 1850, and thus increased by more than 50 %. However, the

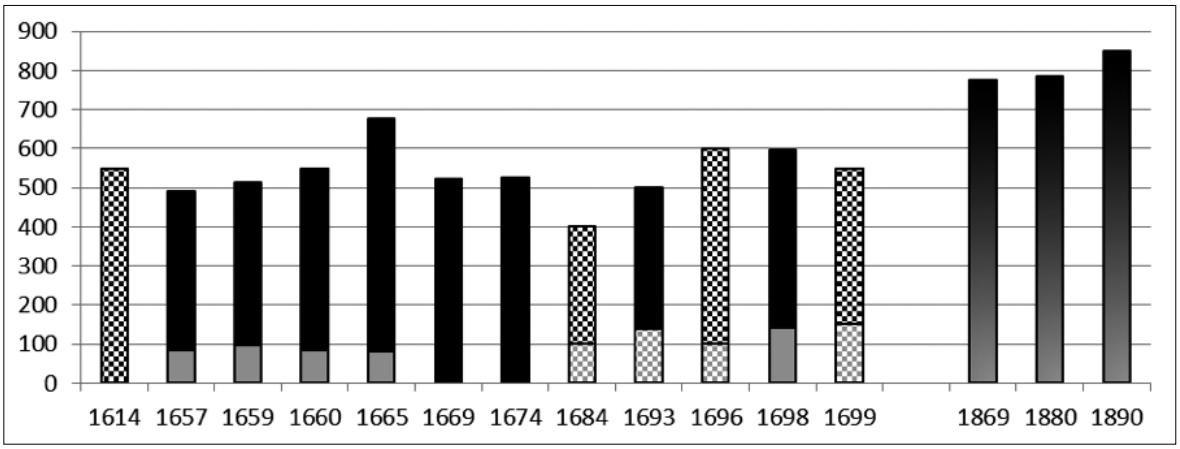

Figure 7[1]: *Population of the Solčava parish in the 17th and the late 19th century.*

Sources: NŠAL, KAL, fasc. 43, U 22; fasc. 43, U 26; fasc. 43, U 29; fasc. 51, U 3; fasc. 58, U 17; fasc. 59, U 28; fasc. 82, U 5 (2nd unit with the same number); fasc. 82, U 16; fasc. 149, U 2; fasc. 166, U 2–3; NŠAL, ŠAL/Viz, box 2: Viz. 2, Styria & Carinthia, 159; box 3: Viz. 5, 356; Orts-Repertorium 1872, 22; Special-Orts-Repertorium 1883, 35; Special-Orts-Repertorium 1893, 57.

[1] The data on *communicantes* are presented black, those on younger people grey. The single-coloured parts of columns stand for data given as accurate. The chequered column parts represent data given as approximations. The information collected by the reliable late 19th century censuses is only added for comparative purpose. The source of information representing the year 1659 on the figure is not dated (NŠAL, KAL, fasc. 59, U 28); its datation is based on the uniform datation of the previous and the following sources, the same for 1657.

the social background of the Schetteÿ couple should be known in order to make more reliable comparisons.

[101] In 1880s a register of death in the parish of Luče starting in 1698 was still preserved, other documented registers of baptism, marriage and death referring to both parishes did not begin before the 18th century at that time already (Janisch 1885a, 88; Janisch 1885b, 1041).

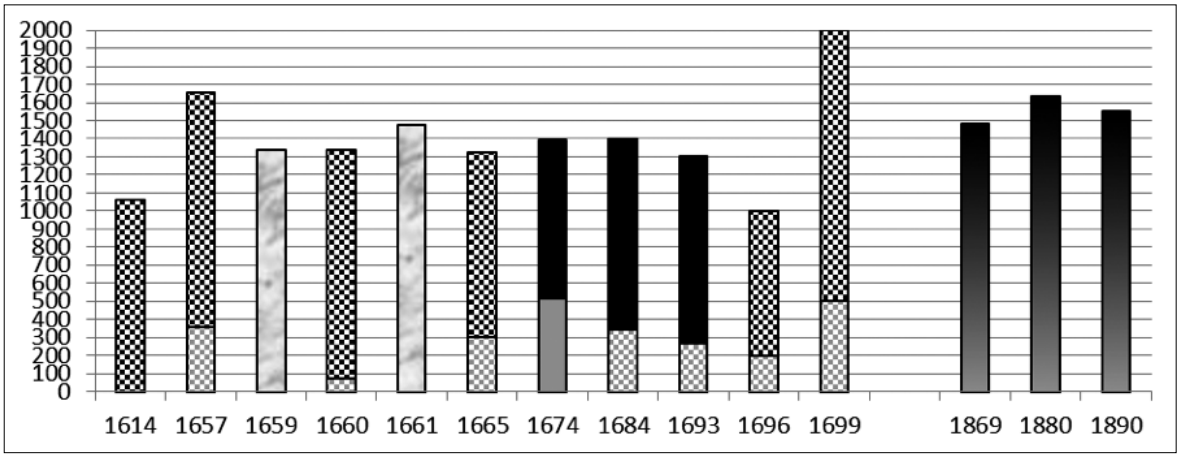

Figure 8[1]: *Population of the Luče parish in the 17th and the late 19th century.*

Sources: NŠAL, KAL, fasc. 43, U 22; fasc. 43, U 29; fasc. 51, U 3; fasc. 58, U 17; fasc. 59, U 28; fasc. 82, U 5 (2nd unit with the same number); fasc. 82, U 16; fasc. 166, U 2–3; NŠAL, ŠAL/Viz, box 2: Viz. 2, Styria & Carinthia, 169; box 3: Viz. 5, 351; Orts-Repertorium 1872, 21; Special-Orts-Repertorium 1883, 33; Special-Orts-Repertorium 1893, 55.

[1] For the meaning of the colours see the note below the Figure 7. For the datation of the information represented on the Figure 8 as from the years 1659 and 1660 see the note below Figure 7. For the marbled columns see the footnote 102.

analysis at a regional scale showed that population growth in Salzburg or Tyrol was insignificant and also for the Alpine parts of Styria, using the population of 1700 (155 400) as a base indexed to 100, the 1850 population (186 456) was only 120. Demographic increase in the mountainous parts was much slower than in the lowlands (Viazzo 1989, 187–89, 193–98).

The term »*baptizati*« in some summary statuses animarum refers not only to children baptised in the year in question, but to all the children too young to attend religious education. This is why, for instance, in the parish of Luče the number of »*baptizati*« (39) was even greater than the number of »*non confitentes*« (34) in 1660 (NŠAL, KAL, fasc. 58, U 17). In the visitation proceedings and in the summary status animarum from 1698, the number of »*non communicantes*« refers not only to children able to attend religious education, but also to younger children. The summary status animarum from 1660 lists 21 »*baptizati*« and 62 »*non communicantes*« beside 464 »*communicantes*« in the parish of Solčava. The visitation proceedings from 1661 present the same data, but 83 »*non communicantes*« are mentioned–the sum of those attending religious education as well as children younger than them (NŠAL, KAL, fasc. 58, U 17; NŠAL, ŠAL/Viz, box 2: Viz. 2, Styria & Carinthia, 159).[102]

Statuses animarum list *de jure* population, which includes permanent immigrants along with temporarily absent locals (Viazzo 1989, 161). **Three basic conclusions regarding the demographic history of the Upper Savinja Valley** can be drawn from Figs. 7 and 8. Firstly, the demographic data collected from the summary church statistics which are given as rough estimates in the visitation records or summary statuses animarum do not even provide a basic insight into the past reality, which is clearly demonstrated by the data from the parish of Luče referring to the years 1696 and 1699–the population surely did not double in only three years. Secondly, beside the rough approximations, a number of data are given as exact–in many cases not even rounded to ten. Although they should not be interpreted as entirely reliable, it is possible to draw the conclusion that the average population number in the parishes of Luče and

[102] The data for the parish of Luče are reported in a similar way: 39 »*baptizati*« and 34 »*non communicantes*« in 1660 but 73 »*non communicantes*« in the proceedings from 1661. Additionally, 1336 »*communicantes*« are mentioned, but the number of all souls is not their sum, it is 1475; the number 1336 is possibly only a copied number of all souls from 1660, the same number was already given as approximation in 1659 (NŠAL, KAL, fasc. 58, U 17; fasc. 59, U 28; NŠAL, ŠAL/Viz, box 2: Viz. 2, Styria & Carinthia, 169).

Solčava in the 17th century represented at least two thirds of that of the second half of the 19th century, but possibly it was even closer to it–especially in the parish of Luče, however, the data from that parish are less reliable. The third conclusion suggested, especially by the data for the parish of Solčava from 1698, is that the repeated bad harvests of the 1690s did not cause a demographic catastrophe. Using the population of 1698 as a base indexed to 100, the 1869 population for the parish of Solčava was only 130, as suggested by the status animarum.

In general, some probate inventories contain demographic data, e.g. the approximate age of people, names of grown-up children and servants; unfortunately, they usually do not tell us how many of those persons mentioned cohabitated in the same household at the same time. It is possible that only some of the servants were listed–those who had not received the wages yet, or those who had been bequeathed by the deceased (Borscheid 1980, 94; Lischke 1991, 65; Pöttler 2000, 267; Roth 1979, 404). In some cases social mobility (Garrad 1980, 60) as well as migrations can also be traced.

Inventories include important further demographic data from the 17th century Upper Savinja Valley. The minute from the land register referring to Goler farm in 1699 (Fig. 3, no. 50), mentioning the lack of people as quoted in chapter 2.5, at first glance seems to be in discordance with the late 1690s demographic situation in the parish of Solčava. However, the preserved probate inventory referring to the same farm in 1698 enables us to understand the minute correctly. The tenant, who died in 1698, did not have children who outlived him (StiASP, Eb., A., fasc. 42, L. 29, no. 20–21), so it is lack of successors not a general demographical crisis in the region of Solčava that the land register refers to.

The mean rate of population growth between the end of the 17th and the middle of the 19th century at the micro level corresponded with the general trend in the Alpine parts of Austria, probably even Styria. Between the 17th and the middle of the 19th century great changes took place in agriculture, the most pronounced of them being the introduction of potato. The major cause for their weak influence on population numbers on the territory observed was the impartible inheritance of isolated farms as discovered for the nearby Austrian countryside (Viazzo 1989, 189, 191–92, 221). Potato was rooted in the local diet and eaten alongside cereals, diary products and some vegetables several decades before 1869, as proven by the list of the most frequent peasant meals on working days in the parish of Luče from 1846. It was namely farinaceous food, e.g. a kind of porridge (*Sterz*), oat bread with mealy soup, turnips and milk the usual breakfast; the ingredients of lunch are not listed, rye bread with whey or cheese used to be most commonly eaten in the afternoon, whereas potato prepared in various ways was the most important part of dinner[103] (ŽA Luče, Chronicle, 44). Regarding the 19th century population pressure we should be aware that 3.3 times as much calories for human consumption are yielded on a given acreage growing potato instead of rye, potato is also more weather resistant (Netting 1981, 161–63, 250), its yields are considerable even where cereals cannot ripen (Vasey 1992, 170), a hailstorm shortly before the harvest does not cause any damage to the tubers (Pfister 1984, 108). However, at the same time the chronicle proves that potato only partially replaced the role of cereals, so its demographic effect must have been moderate in comparison to some other Alpine areas (cf. Viazzo 1989, 213–14, 274).

Only some of the inventories contain relevant demographic data. There were seven or eight[104] children still alive when their father, the tenant Macesnik, died in 1660s (Fig. 3, no. 55). Additionally, a maid and two farmhands are mentioned because their work had not been paid yet. Although the total number of servants living in this household each year, the number of children still living at home[105] along with the number of those who had died before their father, are not reported, it is the evidence of a household with more than ten members during a long period (StiASP, Eb., A., fasc. 38, L. 19, no. 14). The inventory referring to Goler farm in 1698 (Fig. 3, no. 50) provides a partial insight into the household with a considerable

[103] »*... abends wieder 3 bis 4 Speisen, wobei Erdäpfel die Hauptrolle spielen, die auf allerlei Art zubereitet werden*« (ŽA Luče, Chronicle, 44).

[104] Seven of them are listed with their names in the inventory, but there is also the eighth sibling recorded in the seigneurial minutes, referring to the same case (StiASP, Eb., B. 154, column 22).

[105] The data from the Austrian Alps show that a considerable part of children often left home only after several decades (Viazzo 1989, 256).

number of members, although the couple in charge of the farm did not have children, at least not children alive at the time of father's death. Five servants are listed, as they had not received their wages before the master's death. Their different functions (a farmhand, a maid, a shepherd, an inferior herdsman and a female herder) suggest the cohabitation of at least the majority of them on this farm, together with the master and his wife (StiASP, Eb., A., fasc. 42, L. 29, no. 20–21).

The probate inventory of Jamnik from 1696 (Fig. 3, no. 49) proves that there was a certain percentage of stem families and that the marriage did not coincide with succession to headship. Apart from the father, who died in 1696 and was on the headship position until his death, several other members of his family lived on the farm: his older married son, about 50 years old, his son's wife, his younger son of about 40 years of age; they were most probably accompanied by at least one maid (StiASP, Eb., A., fasc. 42, L. 28, no. 24). It is in discordance with findings from Metnitz in Carinthia in the middle of the 18th century, where marriage depended on headship position, thus taking place after father's death or retirement (Viazzo 1989, 254–55). The labour requirements due to individually managed alps, exploitation of varied types of agricultural land, including the dispersed patches under swidden cultivation (cf. Viazzo 1989, 227–28, 246–47, 253, 255; Zwitter 2014a, 221–23), and presence of logging, requiring sufficient manpower even in winter time, were some of the reasons for the existence of the complex household structure.

When a tenant migrated to another farm and was installed as tenant there, the name of the homestead became his last name (Mravljak 1932, 174), which in our case reveals the existence of migrations across the border of the seigneury. There is a note from 1679 in the inventory of Goler (Fig. 3, no. 50), that »*Jurÿ Hündtzman*« was installed as new tenant there. In his probate inventory from 1698, his last name was, of course, Goler, but his nephews' stepfather's last name is recorded as »*Hintzmann*«, »*Hüzmanikh*«, »*Hizmanigg*« (StiASP, Eb., A., fasc. 39, L. 22, nr. 35; fasc. 42, L. 29, no. 20), thus the deceased tenant of the Goler farm came from the nearby Icmanik farmstead (Fig. 3, no. 39) or was a cottager in Solčava; in the former, but probably also in the latter case, he had been a subject of the seigneury of Gornji Grad (NŠAL 23, box 48, book 39, AU Sulzbach). Spatial and social mobility is proven by the inventory from 1654, mentioning »*Mickhlau Khrofitsch*«, burgher of the market-town of Eisenkappel/Železna Kapla among the heirs of the possession of the tenant from Krofič farm (Fig. 3, no. 48) in the region of Solčava (StiASP, Eb., A., fasc. 35, L. 14, no. 154).

3. CONCLUSIONS

Investigation of tenants' inventories examined in the context of further sources from the 17th century revealed that those isolated farms in the western part of Eastern Karawanks and central Kamnik-Savinja Alps, which were of sufficient quality—despite their distance from important roads—in general enabled the numerous household members at least subsistence even in the case of successive harvest failures, e.g. in the late 17th century, unless severe economic difficulties were caused by societal challenges. Contrary to this result, many among the families from middle and low quality isolated farms did not find an acceptable way of life there: due to low cereal stocks they were more affected by harvest failures, tenants were deeply indebted, masters changed frequently, some of them were displaced from holdings, some farms were temporarily abandoned. However, some abandoned farms were re-populated despite harvest failures.

Economy of farms was partly based on livestock rearing and agricultural production. Spring-sown cereals prevailed at least on the highest farms; oats were the most important among them thus local agriculture strongly relied on one ecologically undemanding crop, nonetheless, its bad harvest was not unlikely. After the harvest stacks of cereals were left in field to dry meaning that the period of only to a small degree controlled exposure of harvest to weather and animal pests ended only weeks after harvest. Tremendous differences in quantities of cereal stocks, attested by inventories, did not depend only on local environmental and societal conditions but also on further socio-economic factors, such as local and regional cereal trade or lending. Economy of isolated farms was also influenced by initiative of individuals to gain food and raw materials from non-agricultural activities, such as hunting, poaching or trade in

timber. In an environmentally or socially caused difficult economic situation, rural credits were a possible way to cover the lack of resources; apart from local lenders, credit networks acted over distances in some cases tens of kilometres long. But only some of the farmers in economic difficulties were indebted to several lenders. Some of the tenants from the isolated farmsteads were important lenders; credit activity was a risky source of their income.[106]

In case of a natural disaster, e.g. a landslide or successive bad harvests, measures taken by seigneuries were not uniform. On the one hand, they helped their tenants, on the other hand, there was a tendency not to collect lower dues and taxes as they would have if there had been no natural disaster.

Agrarian overexploitation of natural resources, especially ploughing of too steep slopes, resulted in permanent loss of soil due to long-lasting slope processes, but in some cases even in landslides, possibly also avalanches; the same applies to agricultural use of land close to torrents. The trend of exceeding environmental carrying capacity through rearing of too extensive herds was not a common feature, but feed requirements of livestock reared on at least few farms were according to contemporary data in best case hardly met in a sustainable way.

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List of abbreviations:

AU	administrative unit
fasc.	fascicle
L.	liber, libri
no., nos.	number, numbers
U	unit, units

Note: for the abbreviated names of institutions preserving the archival sources as well as the abbreviations concerning the archival collections see chapter 4.1.

4. SOURCES AND LITERATURE CITED

4.1 Archival sources

1. AISN (= Arhiv Inštituta za slovensko narodopisje, SAZU = Archives of the Institute of Slovenian Ethnology, Slovenian Academy of Sciences and Arts): B. O. (= Boris Orel), box 4.
2. Arhiv Republike Slovenije (= Archives of the Republic of Slovenia): AS 177, Franciscejski kataster za Štajersko [Franciscean Cadastre for Styria], C 101, CM (= cadastral municipality) Sv. Duh pri Solčavi.
3. ARS, AS 1073, Collection of handwritings, 132r.
4. ARS, AS 1110, Jožefinski kataster za Štajersko [Josephinian Cadastre for Styria], Oberburg, CM Hl. Geist.
5. ARS, AS 1111, Jožefinski kataster za Koroško [Josephinian Cadastre for Carinthia], CM Plat.
6. KLA (Kärntner Landesarchiv = Carinthian Provincial Archives, Austria): AHS (= Alte Handschriftenreihe): A 2450, A 2451.
7. KLA Theresianische Rektifikationen, Unterer Kreis: fasc. 114/3.
8. NŠAL (Nadškofijski arhiv Ljubljana = Archdiocesan Archives in Ljubljana, Slovenia): KAL (Kapiteljski arhiv Ljubljana = Archives of the Ljubljana Cathedral Chapter): fasc. 43, 51, 58, 59, 82, 149, and 166.
9. NŠAL 20, Gornji Grad A [= part of the seigneurial archives of Gornji Grad]: boxes 2, 3, 4, 24, 29, 39, 40, 62, 63, 68, 74, 87, 97.
10. NŠAL 23, Gornji Grad M [= part of the seigneurial archives of Gornji Grad]: box 48.
11. NŠAL, ŠAL/Viz. (Škofijski arhiv Ljubljana, Vizitacije = Diocesan archives, Visitation documents): boxes 2, and 3.
12. SEM (Slovenski etnografski muzej = Slovene ethnographic museum, Slovenia): Documentation, Collection of individual researches, B. O. (= Boris Orel), notebook VI/23.
13. StiASP (Stiftsarchiv St. Paul im Lavanttal = Monasterial arhives of St. Paul's abbey in the Lavanttal, Austria): Eb., A. (= Eberndorf, Akten), fasc. 16, 35, 36, 38, 39, 40, 41, 42, 44, 45.

[106] Additional important aspects influencing subsistence possibilities were changing taxes and dues but the analysed inventories are not a proper type of source to investigate it.

14. StiASP Eb., B. (= Eberndorf, Bücher) 4, 7, 8, 63, 151, 154, 155, 183.
15. StLA (Steiermärkisches Landesarchiv = Styrian provincial archives, Austria): A. Göth Georg Nachlass, fasc. 39, bundle 792.
16. StLA GB I (= Grundbuch I): 3382; 3388–3389, Herrschaft Oberburg.
17. StLA HK (= Archiv der Innerösterreichischen Hofkammer): 1691-II-43, 1694-VII-47.
18. ZAC (Zgodovinski arhiv Celje = Historical archives Celje, Slovenia): ZAC 536, Gospoščina Gornji Grad [= part of the seigneurial archives of Gornji Grad], box 84.
19. ŽA Ljubno (Župnijski arhiv Ljubno ob Savinji = Parish archives at Ljubno ob Savinji): Chronicle of the parish.
20. ŽA Luče (Župnijski arhiv Luče ob Savinji = Parish archives at Luče ob Savinji): Chronicle of the parish.
21. ŽA Nova Štifta (Župnijski arhiv Nova Štifta = Parish archives at Nova Štifta): Chronicle of the Solčava parish.

4.2 Published sources

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POVZETEK

Pisni viri, predvsem podložniški inventarji, predstavljeni v kontekstu nadaljnjih dokumentov iz arhivov zemljiških gospostev, državne in cerkvene uprave, dokazujejo, da okoljske, gospodarske in družbene spremembe v dinamičnem 17. stoletju na gorske kmetije zahodnega dela Vzhodnih Karavank in osrednjega dela Kamniško-Savinjskih Alp niso vplivale enotno. Predstavil sem priložnosti in pasti pri tovrstni analizi podložniških inventarjev. Metoda za ugotavljanje živinorejskih okoljskih obremenitev v 17. stoletju temelji na primerjavi podložniških inventarjev in opisov kmetij. Njeni bistveni sestavini sta mase domačih živali v 17. stoletju in razmerje potreb različnih živalskih vrst po krmi glede na podatke gospoščinskih obračunov in vizitacijskega zapisnika. analiza žitne pridelave se osredotoča na žitne vrste, količino lokalno pridelanega zrnja in žitne zaloge. Z žitom so tudi trgovali in si ga izposojali. Inventirana orala in podatki o škodi, ki so jo povzročili pobočni procesi, dokazujejo netrajnostno rabo nekaterih njiv. Podložnikom, ki so zaradi okoljskih ali družbenih razlogov zašli v gospodarske težave, so upniki v številnih primerih zagotovili potrebna sredstva oziroma dopuščali plačilne zaostanke, vendar pa so se obseg in značilnosti zadolženosti podložnikov močno razlikovali. Z grafa, ki prikazuje vsote vrednosti, pripisanih živini in žitu, ter premoženja, posojenega drugim, od česar so odšteti dolgovi, je očiten okoljski vpliv slabih letin poznega Maunderjevega minimuma, vendar pa pozitivne in negativne bilance različnih kmetij niso razporejene enotno. K temu so prispevali še drugi dejavniki, npr. obseg in kakovost kmetijskih zemljišč, neagrarni viri dohodka, dote in dedni deleži. Podatki o številu prebivalstva dokazujejo, da je na obravnavanem območju celo v poznem 17. stoletju živelo v primerjavi z 19. stoletjem znatno število ljudi.

SAŽETAK

Arhivski izvori, uglavnom ostavinski inventari kmetova, predstavljeni u kontekstu drugih dokumenata iz arhiva vlastelinstava, državnih i crkvenih vlasti, dokazuju da ekološke, ekonomske i društvene promjene u dinamičnom 17. stoljeću nisu pojednako utjecale na planinska osamljena gospodarstva u zapadnom dijelu istočnih Karavanki te u središnjim Kamniško-Savinjskim Alpama. Predstavljene su mogućnosti, ali i zamke, ovakve vrste analize osobnih ostavinskih inventara kmetova. Metoda za procjenu opterećenja okoliša stočarstva 17. stoljeća temelji se na usporedbi osobnih ostavinskih inventara kmetova s opisima seljačkih imanja. Temeljne komponente uključuju podatke o težini stoke i o omjeru između potrebam različitih životinjskih vrsta po stočnoj hrani, dobivene iz obračuna vlastelinstva i crkvenog vizitacijskog zapisnika. Analizirana je proizvodnja žitarica s posebnim naglaskom na raznolikosti vrsta, količina lokalno proizvedenog zrnja i zaliha žitarica. Dolazilo je i do trgovine i posudbe žitarica. Popisana orna oruđa i podaci o šteti nastaloj procesima pomjeranja zemlje dokazale su neodrživost korištenja nekih polja. U slučaju ekološki ili socijalno uzrokovanih gospodarskih teškoća su vjerovnici kmetovima u mnogim slučajevima osiguravali potrebna sredstva ili pak dopuštali platne zaostatke, no razmjeri i karakteristike zaduženosti kmetova uvelike su se razlikovali. Na grafu koji prikazuje svotu ocijenjenih vrijednosti stoke i žitarica te imovine posuđene drugim osobama, od koje su oduzeti dugovi, može se primijetiti okolišni utjecaj loših lijetina kasnog Maunderovog minimuma. No, drugi čimbenici, kao npr. razmjeri i kvaliteta poljoprivrednog zemljišta, neagrarni izvori prihoda, mirazi i nasljedstva, proizveli su neravnomjernu raspodjelu pozitivnih i negativnih bilanci različitih seljačkih imanja. Statistika stanovništva dokazuje da je, u usporedbi s 19. stoljećem, u regiji živjeo značajan broj stanovništva, čak i krajem 17. stoljeća.

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