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King Canute muses in the South Seas: Why aren't Pacific Islands transitioning to low carbon sea transport futures?

Avnita Goundar[a,*,1], Alison Newell[b,1], Peter Nuttall[a,1], Isabelle Rojon[c,2], Jale Samuwai[d,1]

[a] The University of the South Pacific, School of Marine Studies, Lower Laucala Campus, Suva, Fiji
[b] The University of the South Pacific, Lower Laucala Campus, Suva, Fiji
[c] University Maritime Advisory Services, 14 Upper Woburn Place, WC1H 0NN London, United Kingdom
[d] The University of the South Pacific, Pacific Centre for Environment and Sustainable Development, Lower Laucala Campus, Suva, Fiji

ABSTRACT

Transition to low carbon sea transport is a logical response to the extreme dependency of the Pacific Islands region on imported fossil fuel, its significant vulnerability to the effects of climate change and the critical shipping needs of Pacific Island countries (PICs). Building on previous work in low carbon sea transport in the Pacific, this paper further considers the barriers to achieving such transition by assessing, through a 'post-Paris Agreement' lens, the Intended Nationally Determined Contributions (INDCs) submitted by PICs and contrasting these to the near total lack of investment and planning for low carbon transition in the transport sector with the parallel occurrence in the electricity sector where ~USD 2 billion of donor investment is deployed or queued despite electricity using only ~20% of fossil fuel across the region. Consistent with recent international studies, inadequate and inappropriate financing and policy have been identified as dominant transition barriers for low carbon sea transport development in PICs. This paper further examines the regional level barriers to policy development, and finds them inhibited by the silo nature of the major regional actors. The implications that the Paris Agreement has for climate financing to support the essential research and capacity development needed to underpin a successful low carbon sea transport transition strategy at any useful scale and speed are also considered in this paper.

1. Introduction

Pacific Island countries (PICs) have a long history of seeking sustainable low carbon solutions for sea transport, particularly domestic, that warrant reactivation now as a legitimate mitigation and adaptation response to climate change. The case for this has been set out in previous studies [1–5]. With transport consuming ~75% of imported fuel regionally [6,7], the justification was strong enough following the 1970s oil crisis to attract a number of donor-funded shipping efficiency pilot projects [3,5]. These proved that strong fuel savings and operational efficiency gains were achievable with minimal financial investment but were curtailed because of the global fall in oil prices [5]. Since 1986, these pioneering low carbon shipping projects were lost to history while the region continued to maintain a high fuel dependency status, reportedly spending USD 6.39 billion importing fuels in 2013, the highest petroleum fuel dependency of any sub-region in the world [8,9]. Papua New Guinea (PNG) is the only PIC that has fossil fuel reserves.

Extreme fuel dependency is not the only factor driving the transition toward low carbon shipping. The Pacific's extreme vulnerability to

Abbreviations: ADB, Asian Development Bank; BAU, business as usual; COP, Conference of the Parties; CROP, Council of Regional Organisations in the Pacific; EC, European Commission; EU, European Union; FAESP, Framework for Action on Energy Security in the Pacific; FATS, Framework for Action on Transport Services 2011–2020; FSM, Federated States of Micronesia; GCF, Green Climate Fund; GEF, Global Environment Facility; GHG, greenhouse gas; IMO, International Maritime Organization; INDC, Intended Nationally Determined Contribution; IRENA, International Renewable Energy Agency; LDCs, Least Developed Countries; MIAs, Multilateral Implementing Agencies; NIAs, National Implementing Agencies; NZ, New Zealand; PNG, Papua New Guinea; PICs, Pacific Island countries; PIDF, Pacific Islands Development Forum; PIFS, Pacific Islands Forum Secretariat; RMI, Republic of Marshall Islands; RIAs, Regional Implementing Agencies; SIDS, Small Island Developing States; SPC, Secretariat of the Pacific Community; UK, United Kingdom; UNEP, United Nations Environment Programme; UNFCCC, United Nations Framework Convention on Climate Change; USD, United States dollars; USP, The University of the South Pacific

* Corresponding author.
E-mail addresses: avnitag@siyaahi.com.fj (A. Goundar), alison.newell@usp.ac.fj (A. Newell), peter.nuttall@usp.ac.fj (P. Nuttall), isabelle.rojon@u-mas.co.uk (I. Rojon), jalecuruki5@gmail.com (J. Samuwai).
[1] Postal address: The University of the South Pacific, Private Bag, Laucala Bay Road, Suva, Fiji.
[2] Postal address: UCL Energy Institute, University College London, Central House, 14 Upper Woburn Place, WC1H 0NN London, United Kingdom.

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effects of climate change has become a primary driver influencing all development agendas of PICs. The justification is steadily increasing, with many already experiencing the devastating impacts of climate change. At the 21st Session of the Conference of the Parties (COP 21), Pacific leaders were strident in calling for global warming thresholds of no more than 1.5 °C. The resultant Paris Agreement includes a commitment to keep the rise in global temperatures "well below" 2 °C while striving for no more than 1.5 °C. Achieving this requires rapid and deep transition to low carbon futures across all sectors and in all regions. Without serious participation from the transport sector, there will be little real opportunity to limit the rise in global temperatures to these levels [10,11]. Minimal investments in low carbon shipping since the 1980s, both in the Pacific and globally, maintain the status quo contrary to the context of a global agreement to address climate change. There is little evidence to indicate that change is being planned for at a scale or speed sufficient to make any substantial impact.

The need for low carbon transition is more than an emission reduction or sustainable development goals driven agenda. After completing a recent assessment of five PICs following the devastation caused by Tropical Cyclone Pam in Vanuatu in 2015, the World Food Programme described “shipping as the single issue which has clearly emerged as being of vital importance to the overall development of the region, its ability to respond to emergencies and to build resilience in the recovery phase” [12]. Sea transport is the single biggest cost factor for the International Organization for Migration’s current Micronesian drought relief efforts. An effective regional low carbon transition programme targeting domestic and inter-regional shipping, could afford new and potentially game-breaking transport options to all disaster preparedness and response activities in the Pacific.

In light of new developments in the climate change discourse, with the signing of the Paris Agreement and the lodgement of the Intended Nationally Determined Contributions (INDCs), it is timely to assess their role in driving low carbon development in PICs’ shipping sector. Given that they set commitment targets, some binding, INDCs can be considered to be the most recent and highest level policy drivers. They provide a lens to derive PICs’ future intent and priority related to climate change policies.

In order to gauge the potential of INDCs to drive low carbon development in the Pacific, this paper: (i) critically analyses the INDCs of 14 PICs for the provisions therein relating to transport emissions; (ii) assesses the adequacy of supporting regional policy mechanisms through a case study of the *Framework for Action on Transport Services* (FATS) [6]; and (iii) briefly examines the current climate financing opportunities to support low carbon transition.

2. Setting the scene

Though it is widely agreed that addressing the often chronic domestic shipping needs is a priority for PICs’ sustainable development [3,8,13,14], investment in low carbon solutions has yet to occur. In 2011, regional analysts recognised that transport was the dominant fuel user but favoured a low carbon electricity priority citing this as the ‘low hanging fruit’ and the ‘absence of transport solutions’ [15]. But neither rationale was subject to real scrutiny. There is insufficient data available to test the low hanging fruit assumption. However, there is now sufficient research to question the real size of the perceived technology barrier [16–18].

2.1. UNFCCC and shipping emissions

Maritime transport is already penalised in terms of visibility in climate change discourse due to its (and international aviation’s) separate treatment from other emitting sectors. The linkages between the United Nations Framework Convention on Climate Change (UNFCCC) and shipping emissions trace back to the adoption of the 1997 Kyoto Protocol, the first international agreement that committed UNFCCC parties to reduce greenhouse gas (GHG) emissions. Commitments made by industrial nations under Annex 1 applied to domestic flights and shipping only, not international bunker [19,20]. The International Maritime Organization (IMO) was entrusted with working with Annex 1 parties to limit emissions from the international shipping sector [20].

Not only did the Kyoto Protocol fail to induce any progress in the reduction of emissions from the domestic shipping sector, its overall ‘coverage was insufficient to stop the growth of global GHG emissions’ [21], further impacted by the lack of commitment from the world’s major GHG emitters, including the United States (US), China, Brazil and India, to set targets. Since 2005, the only substantive progress that the domestic transport sector has seen globally is in the aviation sector of the European Union (EU) and to a lesser degree in the electric and hybrid car market. The EU emissions trading system, comprising 28 EU Member States as well as Iceland, Liechtenstein and Norway, covers commercial airlines flying within and between these countries [22].

More than a decade later, UNFCCC introduced INDCs, inviting its parties for the first time to manage their GHG emissions by setting timeframe-based reduction targets in their national climate change action plans. Born out of COP19 in 2013, INDCs now form an important implementation element of the Paris Agreement. There is some assurance that the INDCs’ bottom-up approach could make it more successful than the Kyoto Protocol, noting that INDCs covered approximately 85% of global GHG emissions in 2010, including the top ten largest emitters in the world [23,24]. INDCs are reviewable at 5-yearly intervals, although they are not legally binding.

2.2. PICS’ GHG emission targets

The contribution of PICs to global GHG emissions is negligible, accounting for ~0.03% of the global emissions of CO_2 from fuel combustion [25]. Against this background and the fact that they are all Small Island Developing States (SIDS), PICs are not compelled to set ambitious emission reduction targets in their INDCs but they have done so, demonstrating solid commitment of a region that is already experiencing the devastating effects of climate change, and facing the existential threat of loss of cultures and countries.

As of 11 February 2016, 161 countries have submitted their INDCs, including 14 PICs – Cook Islands, Federated States of Micronesia (FSM), Fiji, Kiribati, Nauru, Niue, Palau, PNG, Republic of Marshall Islands (RMI), Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. RMI was the first to submit (July 2015) and all had submitted by 4 December 2015.

2.2.1. Data availability and reliability

The overall assessment of PIC INDCs reveals a high number of inconsistencies and data gaps (see Appendix Tables 1–3). A full discussion of these anomalies is beyond the scope of this paper but some key points are noteworthy.

The need for better data to support maritime transport decision-making at both national and regional levels has long been identified as a critical barrier for the sector [8,13]. Despite various programmes and funding being allocated to address this shortcoming via the regional architecture, no reliable data sets yet exist as discussed in previous papers [2,4,5]. As such it is not possible to verify the exact proportion of regional fuel use for transport though this is generally held to be 70–75% of regional totals [6,7]. Data gaps and barriers prohibit accurate accounting between the transport subsectors. Fiji offers a possible case for extrapolation to the region. Of the 67% of imported fuel used for transport, 23% is accredited to maritime (as opposed to 27% for aviation and 17% for land transport). The often dramatic differences between reported fuel end use at country levels and lack of a reliable or comprehensive regional data set, mean much of the available transport

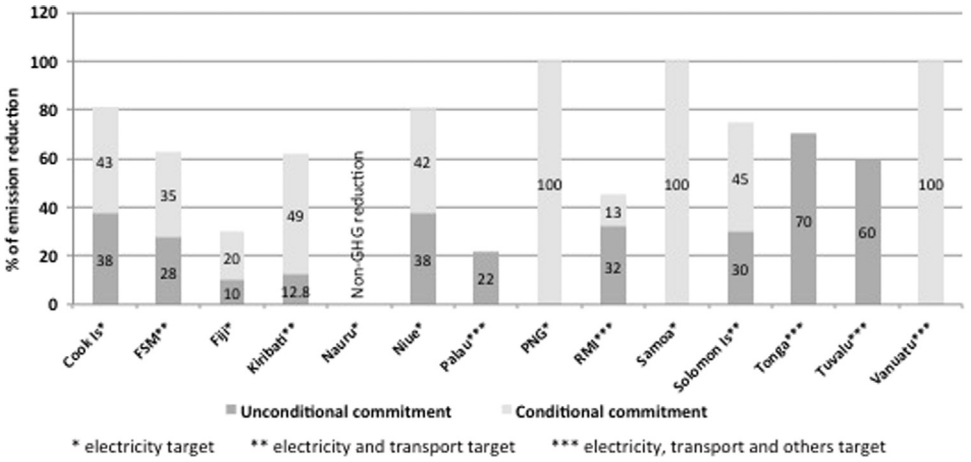

Fig. 1. Pacific Island countries GHG emission reduction commitments in INDCs leading to 2030.

data must be treated with caution, even scepticism. However, and more worryingly, it is also apparent that in a number of cases, the available data has either not been used or properly analysed and applied in preparation of national INDCs.

Major data gaps are obvious in almost all INDCs, particularly the sectoral and sub-sectoral GHG emissions data, with this paper questioning the reliability of data in some cases. The sectors chosen for setting targets varied considerably across all PICs (such as covering the electricity sub-sector only or transport and electricity or economy-wide). In all cases, reference to transport data applies only to domestic and not international use. The target years varied and some PICs chose to keep targets for two different years. One PIC had a non-GHG reduction target without any numerical value attached. Moreover, some INDCs are not clear on whether targets are conditional or unconditional commitments or a mix of both. The graph in Fig. 1 captures these commitments based on the best interpretation of available data.

3. Pacific INDCs and transport

The analysis of PIC INDCs in this study revealed the following trends regarding sea transport and low carbon development:

3.1. Sea transport features in the INDCs targets for one PIC only

Of 14 PICs, only RMI has included sea transport (domestic shipping) in its INDC targets and specified a corresponding reduction action. RMI estimates that in order to achieve its overall INDC target for 2030, emissions from its transport sector (including land and shipping emissions) have to decrease by 16% in 2025 and by 27% in 2030.

The transport sector (land and sea combined) in RMI is considered to contribute approximately 12% of GHG emissions, making it the third largest emitter, behind the electricity sector (54%) and waste (23%). The RMI INDC however provides no breakdown of specific land and sea transport emissions, and so the contribution of sea transport emissions to overall GHG emissions is unknown. A more questionable inclusion is the single shipping-related reduction action listed in the INDC – the introduction of solar-charged electric lagoon transport. Further analysis is required to assess the feasibility of introducing this type of vessel in RMI waters.

The Tuvalu INDC acknowledges growing emissions from its transport sector (from increased numbers of vehicles on land and vessels for sea transport) and states the need for these to be addressed through technological innovation. There is no elaboration or specific action outlined on the nature of these technological advancements, leaving this open to interpretation. The transport sector is stated as being responsible for 40% of GHG emissions but there is no breakdown by sub-sector. However, Tuvalu reported in 2012 that transport was its single largest imported fuel user and maritime transport used 64% of that [5].

The Cook Islands INDC mentions embracing proven low carbon transport technologies and exploring the most effective incentives for promotion of transition towards clean energy transportation. 'Low carbon transport' is mentioned in the INDC but it is not clear whether this includes domestic shipping. Given that road transport is considered the second largest emitter of emissions (33%) in Cook Islands, it is likely that efforts will be focussed on land.

3.2. The domestic shipping sector's contribution is stated for two PICs only

The Cook Islands and FSM's INDCs provide an estimate of emissions from their domestic shipping. The figures for Cook Islands show the transport sector (land, air and sea) as the biggest emitter accounting for 42% of GHG emissions. Domestic shipping contributes 1% of emissions, making it the smallest emitter compared to all other sectors. In the case of the Cook Islands' identification of 1% of its national energy use on domestic maritime transport, it must be pointed out that this is a maritime country comprised of multiple scattered islands over 1.8 million sq. km, therefore this estimate appears highly questionable. In FSM, with a similar sized EEZ and proportion of population living on maritime islands to the Cook Islands, domestic shipping is considered to account for 10% of the transport sector emissions (38%), with land transport at 28%. It is difficult to verify the accuracy of these estimates but there is clearly an enormous data gap that needs to be addressed for all PICs.

3.3. Overall transport sector emissions feature in the INDC targets of eight PICs

The overall transport sector is referenced in the INDC targets of eight PICs – FSM, Kiribati, Palau, RMI, Solomon Islands, Tonga, Tuvalu and Vanuatu – but only RMI has specified an exact target for reduction of transport emissions. The Palau and Tonga reports in this regard are confusing. Both list transport as a sector for emission reduction but the actual targets cover only electricity generation. Palau lists three targets, which are all electricity related. Palau also mentions the intent to look at legislation needed to mandate the sale of higher energy efficiency four-stroke outboard motor engines but does not link this to any specific target.

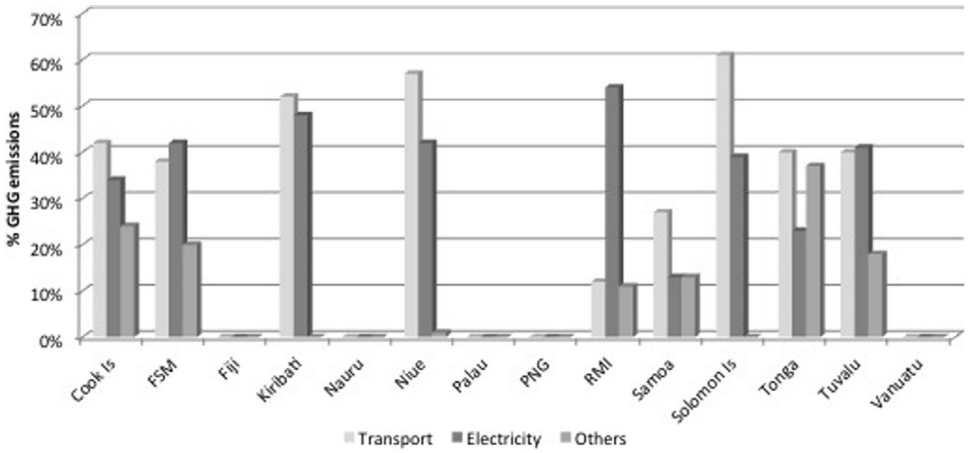

Fig. 2. Pacific Island countries sectoral GHG emissions.

3.4. The energy sector is the largest emitter

The INDCs collectively consider the energy sector as the largest consumer of fossil fuel in PICs and the highest emitter of GHG emissions, and this is where most mitigation efforts are concentrated. In Cook Islands, for example, the energy sector contributed 79% of the total emissions in 2006, with 34% attributed to electricity generation. The energy sector in Tuvalu is reported to be the major emitter of CO_2 emissions (100%) and includes emissions from electricity generation (41%), transport (40%) and other sectors (18%).

According to PIC INDCs, energy has two main sub-sectors – electricity generation and transport. A comparative analysis of emissions accorded to these two sub-sectors shows that in six out of 14 PICs, the transport sector is a larger emitter than electricity (see Fig. 2). Considering that data is unavailable for five PICs, the fact that nearly half of PICs have indicated transport as the bigger GHG emitter is sufficient to rationalise a larger portion of investment being channelled to this sub-sector. However, the PICs clearly prioritise the electricity sub-sector as this is where most unconditional commitments have been made and where greater external funding is being channelled. The INDC apportionment of emissions between energy subsectors is inconsistent with all previously published regional estimates.

3.5. Reflections on PIC INDCS

The analysis concludes that the PIC INDCs, as currently presented, are not adequately powered to drive transition to low carbon shipping in the Pacific region. Firstly, most PICs are defining their INDC targets on a sectoral basis, targeting reduction of GHG emissions in one or two key sectors only. The only exception is RMI, which is looking at economy-wide reduction targets, inclusive of sea transport. The rationale for sector selection in INDCs appears to be linked to the sector that is emitting the highest level of GHG – in most cases argued as being electricity generation. Application of selective sectoral approaches to INDCs may not work in favour of low carbon shipping if the domestic shipping sector is assessed to be one of the lowest emitters of GHGs, which is the case for PICs that have specified shipping emissions in their INDCs.

Secondly, the PIC INDCs reveal a major gap in terms of data on emissions contributed by domestic shipping or in some cases, the overall transport sector. In almost all cases, there is a large question mark over the quality, validity and consistency of data used and consequent assumptions made. Where total transport emissions are reported, there is no data on the specific transport sub-sectors (land, air and sea). Some PIC INDCs acknowledge this data gap. The BAU (business as usual) emission estimates for Nauru for example are deemed inaccurate due to substantial gaps in data. Paucity of sectoral data is also held responsible for PNG's decision to limit target setting to the electricity sub-sector. A fair assessment of GHG emissions per sector hinges on availability of accurate data. Until this critical gap is closed, it will penalise any drive for low carbon shipping development.

4. Barriers to low carbon transition

A recent study points to policy and financing as primary barriers hampering PICs' transition to low carbon futures in shipping [26]. Inability to attract donor funding for economic analysis and 'proof of concept' projects has been attributed to the 'marginal economic viability of domestic routes' [3], when in fact this is the very reason why low carbon shipping should be explored diligently by PIC governments seeking a cost-effective alternative. The Fiji government, for example, spends around USD 1.1 million per year on subsidizing its 'uneconomical' domestic shipping routes [27]. These are the same routes that 1980s trials were showing use of renewable energy for auxiliary ship power could reduce fuel use by 30% while also reducing other major operating costs [28]. Many PIC governments are required to subsidise or directly provide such services as negative state expenditure.

Regional research concurs with international findings [17,29–31] that barriers to such transition are complex and poorly characterised [5]. In regard to policy barriers, there is some indication that high level policy is beginning to shift with the critical cross-cutting nature of transport being increasingly recognised in sustainable development goals and climate change discourse for SIDS [14,32,33].

A less understood aspect is the role of regional agencies in driving low carbon development in the Pacific. The Pacific Islands region is unique, save possibly only for the Caribbean, on its reliance on a complex regional architecture overlay to supplement, complement and often provide, for the smaller states particularly, technical and policy development capacity of national institutions. This, coupled with the region's high dependency on donor and development aid and financing, and often extremely narrow economies means the regional architecture has a greater role in determining national policy and response than would be found in other parts of the world.

Thus far, there is little evidence to suggest the current architecture is adequately geared. The regional coordination of transport related work relies on a unified mandate from the Regional Transport Ministers Forum since 2009. However, a recent internal review [34] shows the resultant regional Framework for Action on Transport Services 2011–2020 (FATS) to have not resulted in uptake of regionally identified policy at national level. Nor has there been adequate progress on developing synergy between regional energy and transport strategic

direction. No major work has yet begun on addressing financing constraints to low carbon sea transport in the Pacific. The impact of climate financing on this in the wake of COP21 is considered below.

4.1. Readiness of the regional policy landscape to support transition

Achieving Paris Agreement objectives presupposes a paradigm shift in terms of decarbonisation of the energy sector and by extrapolation of the transport sub-sector. Anything less will not achieve change at the speed and scale necessary to prevent dangerous global warming. For the Pacific, such a move will best be achieved through a prioritised and coordinated regional strategy, enabling PICs to contribute to international action. Nuttall et al [26] and Newell et al [5] set out the case to support such transition. However, the INDC analysis suggests there is serious work required for enabling policy to support this. If the INDCs are seriously flawed, as this paper suggests, then it can be assumed that the available supporting architecture is not significantly geared to stimulate adequate data collection, provide the necessary supporting analysis and/or develop adequate capacity to interpret it sufficiently.

In part this is a simple resourcing issue. As with every aspect of climate change and sustainable development, there are simply inadequate resources for an ever-increasing list of priorities. In part, it is also because the Pacific is a policy taker rather than a policy maker and is simply following global trends. World superpowers and UN environmental, development and energy institutions alike all struggle similarly to define energy and to synergise transport, electricity and other energy users' policies for decarbonisation. Unfortunately, this does not solve the problem for PICs or remove or reduce the need to do so. Fiji's Green Growth Framework [35], the first for the Pacific, is a national attempt to coordinate all such policies through a centralised planning structure. While Fiji might have the national capacity to drive this, this is not so for the smaller states. Again, this brings us back to the need for strong and progressive regional policy support and technical backstopping.

The deficiencies in the production of the PICs' INDCs highlight the lack of coordination and synergy between transport and electricity strategic policy at all levels. At the regional level, this disjunct is one of the primary reasons for the imbalance in investment in renewable energy and climate change mitigation/adaptation funding favouring electricity. The SAMOA Pathway [32], the prime output of the UN SIDS 2014 summit, demonstrates a shift at the top of the policy process. However, there is little to suggest that this is now trickling down to the regional frame. Analysis of the INDCs strongly suggests it has had marginal effect at national policy level to date.

Regionally, policy can be considered as politically driven through the various irregular combined leaders' statements or developed through the technical offices of the regional architecture. Regionalism has been a hallmark of the Pacific, especially since the independence era, given the small size of most island states [36]. Prior to COP 21, there was a plethora of climate change statements from Pacific regional and sub-regional leaders' groupings. Of these, only the Suva Declaration on Climate Change [33], coordinated by the Pacific Islands Development Forum (PIDF), has specific reference to shipping (both international and domestic). Progressive annual leaders' summits of the PIDF since 2013 have also identified low carbon transport as one of the 10 top priorities for the region.

It is also apparent that there is insufficient regional effort to adequately or accurately consider the energy sector as a whole and rationally relate its sub-sectors – electricity, transport, biomass, etc. Energy is often mislabelled as primarily concerned with electricity and efficiency or decarbonisation effort and priority skewed accordingly. Sitting alongside the Framework for Action on Transport Services in theory is the *Framework for Action on Energy Security in the Pacific* (FAESP), developed under a similar mandate from the region's energy ministers.

In reality, however, there is little similarity between these policy siblings. Almost all technical support programmes are highly or exclusively dependent on funding provided from outside the region and the two agendas have very different drivers, processes, pressures and political masters. While 'energy', (aka electricity with a little biofuel on the side) is heavily aligned to international advances and drivers in both energy efficiency and renewable technology development, transport is more closely aligned to an international sector dominated by industry interests rather than national prerogatives. This divide is then repeated at national levels. Considerable effort has been expended by major regional and international players, especially since the NZ-EU hosted Pacific Energy Summit in 2013, to support a more coordinated regional electricity effort with the International Renewable Energy Agency (IRENA), UN Environment Programme (UNEP), Asian Development Bank (ADB) and others partnering with SPC's Energy Programme resulting in an overall regional renewable energy approach worth upward of USD 2 billion in recent and queued programmes.

Under the regional energy programmes, neither FAESP nor the plethora of country energy profiles and readiness appraisals undertaken by SPC, IRENA and others contain more than a passing reference to the need to also decarbonise transport. Neither do they provide the direction or the tools necessary for emission policy related to the broad energy sector to synergize across sub-sectors as an essential planning prerequisite.

Transport policy to support decarbonisation lags significantly behind electricity. This is attributable to a variety of factors, many of which are institutionally embedded. The international leadership in shipping has not been particularly conducive. The IMO's 2014 think piece, "Sustainable Maritime Transportation System" [37], strategically released prior to COP 20, does not mention climate change or low carbon and shipping emissions are glossed over.

Given the regional reliance on IMO sourced or sanctioned technical assistance, it is difficult for the regional technical agencies to criticize or deviate from such high-level direction, regardless of its lack of regional relevance or specificity. This slavish and top-down adherence to doctrine has seen the regional "line" on shipping largely ignore to date low carbon and climate change related policy. However, now that the IMO stance has changed, and especially since the European Commission (EC) announced plans to resource low carbon shipping for Least Developed Countries (LDCs) at the end of 2015,[3] low carbon shipping has now appeared in the regional architecture's lexicon.

The development of FATS in 2011, again in line with international trends, saw a nod given to the 'new' concept of energy efficiency for shipping, as a low placed item on a long list of regional transport priorities. Safety at sea, oil pollution prevention, ship waste management and even the threat of oil seepage from World War II wrecks have all taken a higher priority.

The internal review of progress under FATS in late 2015 [34] identified many core failures. Firstly, the much vaunted 'many partners, one team' approach to implementation has not resulted in uptake outside of the designated lead regional agency. Attempts by other agencies, such as the regional university's initiative to develop complementary regional programmes in education and research [3] have been viewed as competitive and predatory on limited donor purses and treated accordingly. Such silo mentality over what are effectively poorly defined mandate issues does nothing to inspire national or donor confidence in the capacity of the regional architecture to deliver to national interests. Although regional protocols state a commitment to collaborate in the best interest of PICs, practice in this case indicates the opposite.

Secondly, there has been no discernible uptake of the FATS principles in any of the 20 national programmes reviewed. Almost exclusively, national transport policies appear to have been developed in total isolation to FATS. As no regional institution has direct

[3] http://www.imo.org/en/MediaCentre/PressBriefings/Pages/01-2016-MTCC-.aspx.

governance weight in isolation of national sovereignties, the overriding concept of developing a regional framework must be to better inform and influence national policy and programming. The fact that this hasn't occurred, points to a potentially fatal flaw in the FATS design and implementation.

Thirdly, the dependency on donor support to drive FATS implementation means strategic interest is generally limited to only short-lived (one to three year) projects and results in an uneven and disjointed implementation programme that delivers donor-sanctioned projects and not necessarily nationally-determined priorities. Low carbon transport transition requires a long horizon. Investment regionally is seldom coordinated with individual bilateral programmes.

Fourthly, climate change has a limited profile within FATS or transport planning across the region generally. In FATS, 'climate change' warrants only six passing mentions. There is no evidence it has been a primary driver in the framework's development or implementation. Fast moving advances in climate change discourse for SIDS question whether the FATS blueprint is now out dated.

Fiji's "Green Growth Framework" [35] is the first sign of national change and raises the bar for PICs generally. But it is difficult to see this policy instrument cancelling out or overriding economic development imperatives in setting government strategic or budgetary programming around transport and related infrastructure. The recent investment in Fiji's road infrastructure of hundreds of millions of dollars (see for example [38]) has been planned and is being rolled out with little, if any, regard to national or regional climate change agendas. This conundrum only serves to highlight the pressure on PIC decision-makers, both chasing first world development standards and simultaneously repeating calls for the global community to act responsibly in regard to climate change.

5. Climate financing

This section discusses the potential role of climate financing[4] for PIC low carbon transport transition. With lack of appropriate financing and the imbalance in financing between electricity and transport identified as a substantive barrier to transition, what does the Paris Agreement offer? The current financial mechanisms of UNFCCC comprise the Global Environment Facility (GEF), the Adaptation Fund and the Green Climate Fund (GCF). These are considered the primary global modalities for climate finance. The global climate finance environment is experiencing a proliferation of pledges with an upsurge of commitments from developed countries evidenced.

The Paris Agreement prioritizes reduction of emissions through transformation to low carbon economies as a primary objective of climate finance. To achieve this ambitious objective, developed countries have been "strongly urged" to scale up and mobilize additional financial support from a floor of USD 100 billion per year by 2020 up until 2025. So far, responses are positive with many developed countries having pledged to double their financial commitments to UNFCCC.

The US, for example, made a number of significant pledges leading up to COP 21, including a USD 3 billion commitment to GCF, doubling of grant-based public finance for adaptation by 2020 (~USD 860 million), a USD 10 million contribution to the Pacific region for climate risk insurance and a guarantee to join 10 other countries in contributing USD 248 million for the Least Developed Countries Fund, a specialized multilateral fund managed by GEF [41].

Other traditional donors have followed suit. France has pledged to increase its support from EUR 3 billion to more than EUR 5 billion by 2020, while UK has pledged USD 8.8 billion from its foreign aid budget for climate finance between 2016 and 2020 [41]. Germany has pledged it will double its climate finance to USD 4.58 billion per year by 2020 and Japan has pledged to direct USD 453 million to assist the climate change needs of the Pacific [41].[5] While it is yet to be determined how and where these funds will be applied, these investments significantly expand the global pool of climate finance.

This expansion under the Paris Agreement recognises three important issues. First, it has broadened the 'donor pool' of UNFCCC to include developing countries, resulting in the recognition of countries such as Vietnam and Chile that have voluntarily pledged contributions to GCF, and China who plans to avail USD 3.1 billion of climate finance under its South-South initiative. Secondly, the Agreement encourages funding support to projects that align to the overall objective of low carbon pathways for parties outside of UNFCCC. This provision is largely aimed at private sector organisations and civil society. Major finance sector actors such as the ADB, the European Reconstruction and Development Bank, and the European Investment Bank have also made significant pledges to ramp up their investments in climate change specific projects [42]. Finally, the need for adaptation to receive parity funding with mitigation initiatives has been recognised.

These proliferating sources of global climate finance potentially offer the Pacific a resourcing pathway to achieving low carbon economies and for transition to low carbon sea transport. Through the Paris Agreement, not only have countries been strongly encouraged to promote economic growth via a low carbon pathway, it has also been clearly articulated that some level of financial support will be made available to those developing countries that choose to do so. Sea transport is critical for both global mitigation and for building resilience, delivery of adaptation programmes and disaster response within the Pacific region and fits across both mitigation and adaptation funding streams.

For PICs, a transformation of how they are approaching low carbon pathways is now critical. Without decarbonising the maritime transport sector, aspirations to become 'models' of low carbon economies are incomplete and expose them to valid criticism of 'playing around the edges'. Now is the opportune time to explore and leverage the current global climate finance available as a potential source of financing that can change the trajectory of the maritime transportation sector.

However, PICs are reminded that these promised large scale-finance flows may be both a 'blessing and a curse' [43] as extant climate finance literature has argued a positive correlation between more finance availability and stricter access barriers. Gomez-Echeverri [44] and Jakob et al. [43] revealed that despite increased climate finance commitments and pledges in the past, the ability of developing countries, especially the most vulnerable countries, such as PICs, to access these has become more difficult. Others have argued that developing countries will continue to face such 'access' problems despite the adoption of the Paris Agreement citing recent performance of GCF, the preferred UNFCCC financial mechanism for climate financing [45].

Such scepticism is not misplaced. To date, adequate developed countries' pledges have yet to materialise, resulting in underfunding of GCF. GCF has so far raised USD 10.3 billion and it is still not clear how much and how fast the pledges will become contributions. Pledges are contingent upon the domestic political environment of donor countries. In US, the USD 3 billion pledged to GCF ran into legal hurdles when Republican Congress members threatened to block the climate aid package during budget negotiations. Despite strong domestic opposition, the US has deposited USD 500 million into GCF as part of its initial payment, but it is uncertain whether the full pledge will be

[4] The definition of climate financing is still under debate. This paper adopts the broader understanding of climate finance that refers to all financial flows relating to climate change mitigation and adaptation [38]. These funding flows are channelled through international public, private, multilateral, bilateral and alternative sources to developing countries to spur and enable their transition towards low carbon and climate resilience growth [39,40].

[5] These examples are a snapshot of early commitments preceding the Paris Agreement. A comprehensive list of climate finance pledges by developed countries during and post Paris Agreement is available on the UNFCCC website.

forthcoming in light of the current dynamic and volatile political environment.

Such uncertainties in the replenishment model of GCF further strains already resource constrained small developing countries as they compete with other larger and better-resourced developing countries to access limited funds. Small developing countries are more likely to come second best in such scenarios as GCF access modality tends to prioritise the quality of the funding proposal rather than country need. There is a shortage of local personnel specialised and competent in quality funding proposal design in the region [41] and this penalises the ability of PICs to access financing.

The GCF has allocated USD 30 million specifically to help developing countries achieve GCF readiness status in recognition of the capacity gap. While the GCF readiness programme is designed to enhance the 'direct access' capacity of developing countries through the possible establishment of a National Implementing Agencies (NIA), recent accreditation experiences from India and Namibia have indicated that such processes can be 'excruciatingly painful' due to the very strict fiduciary standards, environmental and social safeguards, and gender policies requirement of GCF. At a minimum, the accreditation process can take more than two years meaning alternative options to access GCF via accredited implementing agencies are required.

To date, no PIC has managed to accredit a NIA for the GCF. As a result, they continue to submit proposals through Multinational Implementing Agencies (MIA) and Regional Implementing Agencies (RIA). PICs have long been criticizing these access modalities as ineffective. Such criticism revolves around climate finance being project-driven (based on funding availability) rather than country programme driven. Moreover, MIAs and RIAs charge a percentage for their services that usually range from 7% to 10% of the funds secured. While these percentages might seem marginal to some, they are significant in the context of PICs given the actual amounts received and their economic size. The continued dependence of PICs on external parties to access funds has led some to argue that it has significantly slowed fund utilization and inhibited the funds from being used in a manner that is supportive of equity and inclusive development [41].

The Paris Agreement has directed GCF 'to support country-driven strategies through simplified and efficient application and approval procedures'. However, actual implementation of this directive has yet to eventuate and small developing countries continue to struggle in accessing climate finance. In light of the shortfall in commitments, PICs face a potential scenario where rather than having access to fast and adequate finance across the spectrum of their climate change needs, they are likely to be only able to access financing for one or two major projects.

Without simplification of GCF's direct access requirements, developing countries might be alienated prompting them to look for faster financing modalities, such as loans and concessionary funding from alternative sources outside of UNFCCC. It can be argued that this goes against the principles on which GCF was founded. In addition, a situation where countries that have contributed the least to climate change have to take loans for climate change adaptation projects is considered to be morally wrong and unethical.

The prioritisation of funding by GCF may also inhibit access to much needed finance for low carbon projects. In its objective, GCF stresses "the Fund will promote the paradigm shift towards low-emission and climate-resilient development pathways by providing support to developing countries to limit or reduce their greenhouse gas emissions" [46]. If this is the case, then the logic of investing such funds in projects that support transition to low carbon maritime transport appears assured. However, facing a funding shortfall and intense scrutiny of its initial roll-out it is likely that the GCF management will continue to be highly risk averse, MIAs particularly.

Promoting a paradigm shift implies the funding of revolutionary projects where risk is accepted and built in to the investment in research, development and education to support change. The perceptual barrier [2,5] that technologies to decarbonise maritime transport are unproven and experimental, although unsubstantiated, is still prevalent. Yet all evidence points to an increasingly mature case for low carbon sea transport that has strong potential to demonstrate substantial savings and co-benefits realizable. Yet, GCF, through many of its MIAs, continues to promote and approve funding for 'safe' projects and seems unwilling to take on an increased risk appetite. By adopting such 'safe' investment positions, the Fund has been criticized for engaging in shifting inside the fiscal envelope rather than transforming it.

6. Conclusion

Low carbon shipping continues to be viewed as a 'high hanging fruit' and is still not a priority in regional and national development agendas when compared to electricity generation. This trend has now been carried over and is entrenched in the INDCs PICs submitted to COP 21. Reports of 14 PIC INDCs were assessed for content and reference to transport, energy and electricity, and the assessment has clearly revealed large gaps that negatively affect the development of low carbon shipping in the Pacific Islands region.

The fact that most Pacific INDCs acknowledge the high rates of emissions in the transport sector and yet only one PIC has made any commitment in sea transport suggests an urgent need to assess the energy/transport nexus in light of climate change. For PIC INDCs to be able to demonstrate any real policy role, as opposed to aspirational but unrealistic goals, these gaps will need to be addressed and rectified, preferably before they are converted to NDCs and definitely by the first review period in less than five years' time. This in itself represents a major challenge to Pacific capacity.

The urgent development of more robust methods and data analysis for determining and applying INDCs is an obvious immediate need. This will only be achievable when greater prioritisation and resources are dedicated to securing adequate base data at both national and regional levels. This has been clearly identified as a core need for more than a decade and yet has not been addressed despite several attempts, which points to systemic issues, including insufficient capacity development at all levels.

Addressing the policy barriers is critical to any transition agenda. The current regional architecture is clearly not sufficiently geared to support the paradigm shift required.

Accessing finance for low carbon sea transport transition has proved elusive prior to COP 21 due in large part to its lack of visibility at most policy levels of PICs [5]. While GCF is committed to funding projects that "take into account the needs of developing countries, particularly the most vulnerable" [46], it is unfortunate that the INDC process has not produced a more realistic identification of actual need. Questions are also raised as to how GCF will continuously meet the multiple needs of vulnerable countries, such as PICs, where development needs are now inseparable from climate change. Given the cross cutting nature of maritime transport to most Sustainable Development Goals, climate change adaptation agendas and the reiteration of this in the 2014 UN SIDS outcome, it could be assumed that prioritizing this sector would now be a logical step. However, it still fails to gain visibility within the GCF project pipeline. The highly uncertain replenishment model of the Fund coupled with prolonged and complex application and administrative processes combined with the multiple needs of PICs makes its highly likely that low carbon maritime transport will continue to take the backseat when compared to other national climate change priorities such as water and food security, health, and electricity generation.

A radical change in the region's policy landscape is needed to set the course for low carbon sea transport in the Pacific. This must be comprehensive in nature and include embedding the need to now

strategically plan for decarbonisation of the maritime sector within relevant policy frames, institutional approaches and funding modalities at national and regional levels and by states and donor/development partners alike. The dialogue that accompanied negotiation of the Paris Agreement was clear. The ambitious targets and programme require nothing short of a paradigm shift.

Appendix

Table 1
PIC INDC sectoral emissions.

Country	Inventory year	GHG emissions per sector		
		Transport (%)	Electricity (%)	Others (%)
Cook Is	2006	42	34	24
FSM	2000	38	42	20
Fiji	–	No data	No data	No data
Kiribati	2000	52	48	0
Nauru	–	No data	No data	No data
Niue	2009	57	42	1
Palau	–	No data	No data	No data
PNG	–	No data	No data	No data
RMI	2010	12	54	34% (23% waste; 11% others)
Samoa	2007	27 (road only)	13	60 (9% waste; 38% agriculture; 13% others)
Solomon Is	no data	61	39	0
Tonga	2006	40 (primarily road)	23	37 (5% energy (other); 21% agri; 11% waste)
Tuvalu	no data	40	41	18
Vanuatu	–	No data	No data	No data

Table 2
PIC INDC commitments.

Country	Unconditional commitment		INDC target sectors	Conditional commitment		External funding required (USD)	Total commitment		Comments
	Year	% emission reduction		Year	% emission reduction		Year	% emission reduction	
Cook Is	2020	38	Electricity generation	2030	43	Not data	2030	81	Customs Tariff Act 2012 duty rates on import of motor vehicles. Looking to embrace proven low carbon transport technologies and exploring most effective incentives for promotion of transition towards clean energy transportation.
FSM	2025	28	Electricity and transport	2025	35	No data	2025	63	INDCs provide an estimate of emissions from domestic shipping.
Fiji	2030	10	Electricity generation	2030	20	500 million	2030	30	Report mentions increasing # of motor vehicles at around 5% pa from 1970s. Focus on fuel switching and infrastructure in land transport
Kiribati	2030	12.8	Electricity and transport	2030	49	No data	2030	61.8	Investigate viability of (i) setting aside the VAT charged for fuel; (ii) charging carbon levies to offset GHG emissions for international air transport to the country. Also has a 2025 reduction target.
Nauru	2030	non-GHG reduction	Electricity	2030	non-GHG reduction	50 million	2030	non-GHG reduction	No numerical value set for target
Niue	2020	38	Electricity generation	2025	42	No data	2025	80	The majority of fuel use is for land transport and the other major fuel user is the airline industry.

									Focusing mitigation efforts on land transport. Regulations encourage import of fuel-efficient vehicles, and targets have been set to deploy more fuel efficient vehicles.
Palau	2025	22	Energy sector figure used only for this analysis (but INDC states coverage of electricity, transport, waste sectors)	2025	Not clear	no data	2025	22	22% is taken for energy sector reduction. States inclusion of transport sector but specific target is not clear. The three targets seem electricity related. Mentions legislation needed to mandate sale of 4-stroke outboard motor engine. 22% target not clear conditional or not.
PNG	2020	Not stated	electricity sector	2030	100	No data	2030	100	Electricity sector to become carbon free by 2030. Not clear about unconditional target.
RMI	2025	32	Economy-wide targets	2030	13	No data	2030	45	As currently estimated, progress towards achieving RMI's targets would entail reducing emissions from: the electricity generation sector by 55% in 2025, and 66% in 2030; transportation (including domestic shipping) by 16% in 2025 and 27% in 2030; waste by 20% by 2030; and 15% from other sectors (cooking and lighting) by 2030.
Samoa	2025	Not stated	Electricity generation	2025	100	No data	2025	100	Mentions energy sector as target but focus on electricity only
Solomon Is	2030	30	Electricity and transport	2030	45	No data	2030	30	Set two targets (one for 2025 and one for 2030). Can reduce its emissions by more than 50% by 2050.
Tonga	2030	70	Electricity generation	2030	Not clear	No data	2030	70	Sector Emission Reduction Targets: Transport is included but no value estimated (primarily land based). Conditional target not clear
Tuvalu	2025	60	Electricity, transport and other (cooking)	2025	Not clear	No data	2025	60	Growing emissions in the transport sector, as evidenced from the increased numbers of vehicles on land and vessel for sea transport, needs to be addressed through technological innovations. Goal: a zero carbon development pathway by 2050.
Vanuatu	2030	Not stated	Electricity sector	2030	100	180 million	2030	100	100% below BAU emissions for electricity sub-sector and 30% for energy sector as a whole. States that with ancillary mitigation possible in forestry, agriculture, transport and energy efficiency sector wide.

Table 3
PIC INDC transport analysis.

Country	Contribution of transport emissions				Inclusion of transport sector in INDCs			
	Overall (%)	Sub-sector emissions			Inclusion in INDC target	% reduction by 2025	% reduction by 2030	Conditional or unconditional
		Land	Air	Sea				
Cook Is	42%	33%	8%	1%	no	n/a	n/a	n/a
FSM	38%	28%	no data	10%	yes	no data	n/a	no data
Fiji	no data	no	no	no data	no	n/a	n/a	n/a

Kiribati	52%	no data	no data	no data	yes	no data	no data	no data
Nauru	no data	no data	no data	no data	no	n/a	n/a	n/a
Niue	57%	no data	no data	no data	no	n/a	n/a	n/a
Palau	no data	no data	no data	no data	yes	no data	no data	no data
PNG	no data	no data	no data	no data	no	n/a	n/a	n/a
RMI	12%	no data	no data	no data	yes	16%	27%	unconditional
Samoa	no data	27%	no data	no data	no	n/a	n/a	n/a
Solomon Is	61%	no data	no data	no data	yes	no data	no data	no data
Tonga	40%	40%	no data	no data	yes	no data	no data	no data
Tuvalu	40%	no data	no data	no data	yes	no data	no data	conditional
Vanuatu	no data	no data	no data	no data	yes	no data	no data	conditional

Inclusion of sea transport in INDC targets					Inclusion of land transport in INDC targets			Inclusion of air transport in INDC targets		
Inclusion	% reduction	# of actions	specific mitigation actions	Conditional or unconditional	Inclusion	% reduction	# of actions	Inclusion	% reduction	# of actions
no	n/a	n/a	n/a	n/a	yes	no data	no data	no	n/a	n/a
no	n/a	n/a	n/a	n/a	no	n/a	n/a	no	n/a	n/a
no	n/a	n/a	n/a	n/a	yes	no data	no data	no	no data	no data
no	n/a	n/a	n/a	n/a	no	n/a	n/a	no	n/a	n/a
no	n/a	n/a	n/a	n/a	no	n/a	n/a	no	n/a	n/a
no	n/a	n/a	n/a	n/a	no	n/a	n/a	no	n/a	n/a
no	n/a	n/a	n/a	n/a	no	n/a	n/a	no	n/a	n/a
yes	no data	no data	1	unconditional	yes	no data	conditional	no	n/a	n/a
no	n/a	n/a	n/a	n/a	no	n/a	n/a	no	n/a	n/a
no	n/a	n/a	n/a	n/a	no	n/a	n/a	no	n/a	n/a
no	n/a	n/a	n/a	n/a	yes	no data	no data	no	n/a	n/a
no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data

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