



A review of sustainable sea-transport for Oceania: Providing context for renewable energy shipping for the Pacific



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ABSTRACT

This paper summarises research and options for sustainable sea transport in Oceania with a focus on domestic shipping. This debate is situated initially within the context of the current Pacific domestic shipping scenario, a region of minute economies connected by some of the longest sea transport routes in the world. All current options are fossil fuel powered and increasingly uneconomic and unsustainable. Many routes are marginal or unviable and a vicious cycle of old ships replaced with old ships prevails. Although a central and essential issue of many Pacific communities, the option of pursuing sustainable sea transport is currently invisible within the policy space at all levels. Various renewable energy options are possible and increasingly available. Recent research finds that these have strong potential for providing benefits across multiple wellbeings. The barriers to pursuing this agenda are complex and poorly understood but are perceptual and institutional more than technological. A small number of critical experiments during the last oil crisis provide critical lessons and direction.

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1. Introduction

This paper provides a summary of research and options for sustainable sea-transport in Oceania. Sea transport is an absolute necessity for most Oceanic communities. All current services are fossil fuel based and increasingly unaffordable and unsustainable.

The Pacific region is the most dependent on imported fossil fuels in the world with Pacific Island Countries importing more than 95% of needs [1]. Such dependency is recognised as having a crippling effect on national budgets and revenues and impacts on key productive sectors in the region [2]. Various strategies to reduce this dependency are being considered and implemented, primarily targeted at electricity generation. In March 2013 donors committed \$NZ613M at the Pacific Energy Summit in Auckland for programmes in this sector.

Transport generally has received far less attention, despite being the region's single largest sector user of imported fuel (48% regional average) [3]. There is no reliable data to calculate what percentage is attributable to sea transport but Mayhew [3] considers it could be as high as 75% of all fuel used for some PICs. Alternatives to current sea transport options are almost totally ignored in current regional and national debates and the issue is invisible within the policy and donor strategy space at all levels.

Recent Fiji centred research [4][5] suggests that renewable energy options for Oceania sea transport, if proven viable, offer numerous benefits for Pacific communities at local, provincial, and national levels and advocates for them to be pursued as a priority issue. A recent international conference, the Sustainable Sea Transport Talanoa 2012¹ saw input from leading expertise and has provided a starting point for this critical debate. Such findings have general relevance to a number of Pacific settings. This paper provides an overview of the subject and summarises relevant issues and options.

2. The current Pacific domestic shipping scenario

Issues of sea-transport remain universal and primary, a basic human need of Oceanic peoples today and tomorrow as throughout all past human interaction with the Pacific. The region's transport issues are unique; tiny economies scattered at the ends of some of the longest transportation routes in the world and arguably the most challenging network to maintain per capita and per sea mile with the resource base available to support it [5]. Sea-transport is essential at all levels of society from fishing and local transport needs of small isolated islands and villages to inter-regional shipping needs of nation states [6].

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¹ This conference was hosted by USP on behalf of a collaborative network of stakeholders. See <https://www.usp.ac.fj/index.php?id=12456> for programme, presentations and outcomes record.

All sources concur that policy priorities for Pacific shipping lie on the domestic front ([2,6–8]). There are an estimated 2100 domestic ships providing services at various levels in PICs [6]. Despite fuel now comprising ~40–60% of domestic fleet operating costs [9] and this figure projected to show an increasing trend over time, the search for alternatives is barely emergent. Prosecution of global-scale mitigation measures currently in train under the International Maritime Organisation (IMO) leadership are likely to lead only to increased costs and barriers for Oceania, whose contribution to the global issue is so minute as to be irrelevant, resulting in a double penalty for no visible benefit [5]. The changes to the MARPOL² Annex VI regulations, aimed at cutting levels of SO_x emissions from global shipping, will alone contribute a ~60% price increase in marine fuel for PICs at current oil prices by 2020 for all vessels over 400 gross ton [5]. Current domestic shipping, despite being often financially marginal and employing aged assets, maintains sufficient monopoly control of the industry to continue to use fossil fuel technology because there is a lack of sufficient incentive to adopt new technologies and a lack of research and working models of viable alternatives.

Providing adequate, efficient, and reliable domestic shipping is one of the most difficult challenges for PICs. Coastal and inter-island shipping services are generally operated by governments or small, independent shipping companies. Many routes are commercially marginal and a significant proportion are simply unviable. Governments are required to subsidise or otherwise provide for these, with ever increasing costs. Given that the vast bulk of commodities and manufactured goods are transported by ship in the Pacific, and that much domestic travel is by sea, the cost and quality of shipping immediately affects the welfare of the poor as consumers and producers [8]. Transport is a priority area for Pacific Forum Leaders under the Pacific Plan and its importance as a facilitator of economic growth is recognised [2].

The provision of transport services is affected by numerous geographical, socio-economic, and technical factors including population mobility, susceptibility to natural disasters and other effects of climate change, national policies and regulations, and international instruments. Additional factors include appropriate vessel/craft operation and maintenance, route profitability, existing petroleum supply (quantity and quality), level of infrastructure, technical capacity, proximity of maintenance facilities, as well as mandatory safety and security auditing services [6]. Large distances, high fuel costs and low economies of scale make the cost of developing and maintaining transport infrastructure relatively high. Narrow markets for local products and dependence on international trade create vulnerability to global developments as well as fewer employment and livelihood options. Trade in remote locations is limited by high freight costs leading to increasing urbanisation [2]. Where it is lacking, access to reliable and affordable shipping is a major impediment to development at all levels of Pacific economies.

The marginal nature of the industry has always meant that financing shipping investment, either for governments or private operators, is difficult. The ships used are sometimes unsuitable, often old and in poor condition [7]. The current global economic environment has only exacerbated this with industry advisors pointing to the finance market becoming increasingly cautious of such investments. Many vessels do not meet recognised safety standards, and arguably should be banned from service. However, because they provide essential services to remote communities, this step is rarely taken [8]. Shipping disasters directly attributable to substandard ships are regular events, the *Princess Ashika* in

Tonga with loss of 74 lives in 2009 and the *Rabual Queen* in PNG in 2012 (more than 200 lives lost) drew international headlines; smaller scale tragedies are common place.

3. Options for reducing shipping fossil fuel dependency

Studies by the International Council on Clean Transportation [10] and IMO [11] concur on the range of technological and operational strategies available to the current global fleet. These include innovation in: propeller polishing, hull cleaning, speed reduction, autopilot upgrade, air lubrication, main engine retrofits, water flow optimization, hull coating, speed controlled pumps and fans, weather routing, high-efficiency lighting, propeller upgrade, waste heat reduction, alternative fuels, wind power, and solar technology. These analyses also note that, the last three items apart, these are largely already available and most responsible operators are already, at least partially, using. None of these measures individually achieves more than minor savings, nor do they represent any major paradigm shift. The cost of many of these innovations makes them unavailable to Pacific shipping where much of the asset is at the end of its working life and is uneconomic or impractical to upgrade.

Most international operators already employ a policy of 'slow steaming', reducing average passage speeds to reduce fuel consumption, particularly since the global economic slow down since 2008. Production of larger ships to employ greater economies of scale and new generation designs incorporating more efficient hull and motors are coming on stream. LNG is increasingly being targeted as the primary fuel for large and new shipping. Such developments will almost exclusively benefit the large-scale shipping market and offers little immediate potential for the Oceanic scenario where ships are smaller and older. It could be some decades before such technology is affordable in second hand mode to Pacific operators. It can be described as a classic North–South divide scenario. Those operators that can access investment capital to procure new technology have an operating advantage. Those that can only afford second (third, fourth or fifth) hand ships will have to wait in line and pay ever-increasing costs and penalties.

What options are available from renewable energy? There are a range of solutions potentially available, ranging from various measures to retrofit existing fossil fuel powered vessels with renewable energy technologies, to hybrid vessels combining both renewable energy and fossil fuel power, to custom built non-fossil fuel designs. Each has various advantages and disadvantages



Fig. 1. B9 Ship designs.
Source: B9 Shipping Ltd.

² The International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978.

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