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Report on the Infrastructure Priorities for Ministry of Foreign Affairs and Trade

DRAFT
July 2001
Executive Summary

Introduction

The New Zealand Ministry of Foreign Affairs and Trade (MFAT) commissioned Opus International Consultants Ltd (Opus) to undertake the Tokelau Infrastructure Study. The study was carried out under the New Zealand Official Development Assistance (NZODA) programme.

The primary objectives of the study are:

- **Objective 1:** To identify local priorities for infrastructure development on each of the atolls of Tokelau, taking into account the Tokelau Development Plans and NZODA principles and policies.
- **Objective 2:** To assess each of the possible infrastructure developments identified and draw conclusions about their technical feasibility, economic viability and contribution to economic development, and social and environmental impact.

The project provides both Tokelau and New Zealand with useful information as a basis for decision-making and funding allocation. It will be the foundation of joint talks between the two governments on New Zealand Official Development Assistance (NZODA) infrastructure funding.

Project Context

Tokelau comprises three small islands located 265km north of Samoa, lying along a north-south axis extending approximately 150km. The land consists of low islets of varying size set along the reef circle and none of them is more than 5 m above sea level. The total land area is 12 sq km and total area of the three lagoons is 187 sq km. The population of Tokelau was 1,507 at the time of the 1996 census.

Tokelau has no deep-water anchorage, harbour or safe anchorage. All transfers between ship and shore from visiting vessels are by canoes or lighter barges. The barrier reefs are awash at high tide, but bare and exposed in lower tidal phases, completely cutting off the transfer of water between the lagoon and ocean with no deep-water passages through the reef to open sea. Small channels have been created within the reef in each atoll to enable small boats to access landing places close to each village.

Study Framework

Infrastructure needs and priorities are closely linked to the national vision. In the Tokelau case, this is embodied in the "Modern House" initiative.

The terms of reference for the project required identification of key stakeholders and consultation to identify infrastructure development options and priorities, as well as the assessment of associated social, environmental and technical issues. Walks through the villages, followed by consultation with the major categories of stakeholders by means of focus groups and semi-structured interviews and a second more-detailed walk with lafa elders, were the prime tools used to identify and prioritise options for infrastructure development. A questionnaire was used to provide additional demand and ability-to-pay information and to cross-validate information gained by other means.

Projects Considered

Projects considered in this study include the following:

- Seawall
- Solid waste disposal
- Airstrip
- Fuel storage
- Wharf
- Improved transport
- Women’s building (Fakaofo only)
- Causeway (Fakaofo only)
- Channel (Nukunonu and Atafu)
- Sports centre (Atafu only)
- Guest House (Atafu only)
- Cultural centre (Atafu only)
- Mechanical equipment
- Sand pump

Not all the benefits associated with the national vision are counted in cost/benefit analyses. Each project has therefore been reviewed in the light of a range of attributes. The resulting ranking and project programme is subjective in part, but takes account of the views of those most directly concerned and provides a logical order for supporting infrastructure for growth as a nation.

Evaluation

The prioritisation of the projects has been carried out by considering the full list of projects raised during consultation on each atoll and scoring these on each of the following attributes:

- Project benefits (Tokelau preference)
- Project benefit (Consultant’s prioritisation)
- Environmental impact
- Social impact
- Contribution to the Modern House of Tokelau (MHT) vision
Results

Priority Assignment

Priority assignments chosen by each of the groups consulted in the villages are given below. The projects that the groups selected are given priority numbers. Where no numbers are given, the project was not raised by that particular group as an issue.

<table>
<thead>
<tr>
<th>Potential Project</th>
<th>Taupulega</th>
<th>Aumaga</th>
<th>Fatupapea</th>
<th>Youth</th>
<th>Tokelau Public Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rawaiwai</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Old Waste</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>strip</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Tel Storage</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>marf</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>improved Transport</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Women’s Building</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>runway</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

The prioritisation has been given on a national basis by

(i) For each atoll, giving the rankings of each community group a score equal to its order in the list (highest score at the top of the list). The scores have then been added and the order of these total scores has then been used to form the “community” ranking.

(ii) Combining the Taupulega and community prioritisations, with Taupulega given a double weighting (as is the Tokelauan custom).

(iii) Placing the priorities for all projects (from the three atolls) in order, with more importance placed on those higher up the order using an exponent-in-ranking system.

(iv) Combining all three resulting atoll prioritisations.

Final Scoring Results

Final scoring results are presented in the following table. They are presented in priority ranking, in order of combined score.
Priority Summary and Next Steps

The highest priority in the rankings is given to seawalls. This involves repairing the existing walls and providing new walls to armour unprotected parts of the islands. These projects have been ranked highly because of the history of hardship and loss from cyclone damage. The projects are a form of insurance and would be expected to provide tangible returns in cost savings. If they succeed, the projects should, however, commence with a small study to ensure that the wall design is the optimum for resisting cyclone waves.

The next priorities are issues with a large environmental impact. There is a concern about how solid waste is disposed and a desire to address this issue. There is also enthusiasm to try obtaining sand from the lagoon bed with a pump, to ease pressure on the beaches as the primary source of sand supply.

Next, priority is given to cargo handling equipment, to free up labour at the wharves to other duties and to enable large items to be brought onshore. Work on the channel to improve conditions and safety and provide better access, is also important.

Improvements to transport are seen as important, to give greater efficiency and to provide cargo and passenger capacity to cater for future demand. The single ship now in use lacks flexibility in scheduling and appears to be at the limits of capacity. With a number of projects going ahead in the future and a desire to develop a fishing industry as a mainstay of revenue-earning enterprise, it will be necessary to have an adequate and regular service.

The study team has included an item in the project list for a study of transport, to integrate all needs for overseas and inter-island travel.

Similarly, an amount has been included for a study of fuel storage options. Some work has been carried out on this already.

An alongside berth in the lagoon, capable of taking small container carriers, will be necessary in time, particularly if the fishing project expands to its potential. The study team has included one of these in the project list, but has not made any judgement as to where this should be located.

The issue of an airstrip, or three airstrips, has polarised people more than any other project. This is seen by some as highly desirable, especially for emergency use, to support administration and to support tourism. Others are against an airport and would prefer an improved shipping service. The study team has included a single airstrip in the project list again without any judgement as to its location. This project would come at the end of a priority programme, after other transport improvements.

The causeway at Fakaofo appears well down the list. The study team believes that there would be social advantages in uniting the villages in this way, but the cost for doing so is very high. For a much lesser cost, a number of other projects and ways of unifying the community could be given priority.
Early consideration should be given to the introduction of a sand pump and a project to add machinery to assist the local labour force with the projects finally agreed. Both these matters should be addressed before any large-scale construction work is commenced.

A number of other miscellaneous projects were mentioned in discussion, but have not been included in the study. These include:
- Radio equipment - with the conversion to telephone connection with the outside world, the previous radio communication capacity has been lost. There was a period when the phone link in Nukunonu was out for nine days and there was no communication over this time. People found this distressing.
- Emergency locator beacons - for fishing boats.
- Hand tools - the Public Works team is critically short of hand tools.
- Channel markings and lights.

2.6.3 Other Transportation

Most households have some form of water transport, usually an aluminium dinghy. On Atafu all households have both a modern dinghy with outboard and the traditional form, adapted to take an outboard engine on the outrigger. This is the preferred form of transport for tuna fishing. These boats are used, often on a daily basis, for subsistence fishing to provide the fish that is the major source of dietary protein. They are used within the lagoon and moved when the tide is high to the outside of the reef for deep-sea fishing.

On land, each island has a one lane road formed from coral and small pebbles linking houses with the main channel access, with a number of smaller roads/access tracks leading off it. The Aumaga have use of a truck (although the Fakofo truck has been in Apia for three months awaiting transportation on a ship larger than the MV Tokelau. Each atoll is reputed to have a digger in operation but that in Nukunonu had been out of commission for some time awaiting spare parts. Bicycles are used on the island mainly as entertainment for children. On Atafu there was a motor scooter and others may exist elsewhere.

Fuel Handling and Storage

As is described above, fuel is unloaded from the barges that service the MV Tokelau by hand, in the same way as all cargo is handled. This means that there is a risk of loss of fuel drums at the edge of the reef if the barge overturns. The manual lifting and rolling of drums on the shore is already the cause of many leaks and spillages in Nukunonu and Atafu. In Nukunonu, drums may be left for up to three days in the sun on the landing area before removal to storage.

Storage is in a range of corrugated iron storage facilities - one each atoll. In each instance, but particularly in Fakofo village (Fakofo) there is strong feeling that there are too close to the nearby housing and people fear an explosion. There are only limited and environmentally risky fuel storage facilities on the three atolls. There is no evidence of bunding to prevent leaking into the soil, but the new powerhouse that will be developed under the electricity project will remedy this situation at the powerhouse locations.

2.7 Communication

An up to date international telephone service was established in 1997. This system allows access to the Internet and is expected to contribute to the territory's progress toward self-determination by facilitating contact with the rest of the world. Although heavily subsidised, communication with New Zealand is still expensive, and as is seen by the results of the household questionnaire, telecommunication cost forms a considerable part of average household expenditure. Services are still not optimal, with line capacity limited to two lines. Internet access is expensive, with line costs at NZ$22.50/minute and considerable delays in connection are experienced, placing a constraint on internal and external communication.
Fish poisoning has been linked to the blasting of coral in the formation of reef passages. However, this has not always been so and may be related to the extent of unwanted additional killing of the coral caused by the blasting and the way that debris is subsequently disposed of.

4.2.5 Fuel Storage

Tokelau does not have a means of properly handling or storing chemicals and fuel. Fuel comes ashore in drums, which are manhandled onto the shore and rolled to storage areas, risking puncture. Tracks used are not sealed and consist of porous coral. There is no way of containing spillage or cleaning up and so there is always a risk that spillages will soak into the ground and reach the water table very close below ground level. Volatile or inflammable fuels can then linger in the environment.

Fuels are stored in semi-open storage sheds near the channels. At Fakaofo, for example, the store is 20m from the nearest house and 70m from the centre of the village. Children play in this area among empty drums and there is a fear that they will cause an accident.

Used drums are reused for as long as possible. There is no system of removal or proper storage of old drums. In all locations, these were tossed onto the surface dumped with other solid waste. In all cases, the dump areas are close to the coast and community groups stated that in high winds, these, as well as other waste, could be blown into the lagoon.

4.2.6 Hazardous Waste Disposal

Tokelau does not have an adequate means of disposing of hazardous wastes. Currently hospital wastes are disposed of in the deep ocean.

4.2.7 Cyclone Damage Costs

The 1987 NZ Meteorological Service report on the climate of Tokelau notes that since the beginning of this century there have been four reported incidents of high winds and storm surges over Tokelau - 1914, 1925, 1936 and 1967. Severe damage to buildings and trees was sustained in these events. Since then, there has been Cyclone Ofa in 1990 and Cyclone Val in 1991. All these events are remembered by some of the people on the islands, with debate as to whether the 1914 or 1967 events were the worst ever experienced.

4.2.8 Cyclone Ofa Damage

Records from the official Tokelau report on Cyclone Ofa damage note that Cyclone Ofa began on the 31st of January in 1990 and by the 1st of February was...
Tokelau and these are thus against the airport. They are concerned that this will increase the social disparities between those who can afford to travel in comfort and attract tourists that do not appreciate the attractions of such a remote location.

It was made clear in all the focus group consultation that the majority of the population would not be able to afford to travel by air. There was a justified concern that an airport would increase the disparities already beginning to develop within the community, undermining Tokelau's relatively egalitarian values.

5.5.6 Environmental Analysis

An airstrip would remove between 5 and 11 Hectares of plantation, depending which atoll it is constructed on.

This may be regarded as an inevitable consequence of living on a small atoll and the price to be paid for development. However, it does reduce a scarce resource and must be regarded as environmentally less desirable than many other projects.

There are many other environmental impacts associated with airstrip construction, including the effect of construction activity on the lagoon waters, the need to deal with filled vegetation, affects on wave protection, the impacts of aviation fuel storage and use and the impacts of fast transport links with the outside world. These are able to be managed and are discussed in detail in the project environmental report of 1985\(^2\).

An airstrip would also have environmental impacts during operation from fuel spillage, noise, litter, run-off from the runway and biosecurity. The impacts of these would need to be covered in a more through analysis, should the project continue.

Option F5 – Improved Fuel Storage

5.7.1 Description

On Fakaofo fuel is stored in a galvanised general storage shed, close to both the wharf and the high density housing on Fala. This shed has a packed coral floor and there is no fencing of any sort. There is no evidence of serious spillage in the shed, nor on the ramp leading from the wharf, but there is a serious concern about fire hazard. Fuel (diesel, kerosene, etc) is transferred into 10 litre containers for each household.

There is no other location available on Fala for storage, but there are areas on Fenua Fale where a purpose built storage area could be constructed. While householders could travel to Fenua Fale to receive their allocation, there may be some risk in transporting the bulk supplies to Fenua Fale by barge. As access over the reef to Fenua Fale can only take place at high tide, double handling may be required to off-load and temporarily store drums until an appropriate site increasing the potential for spillage.

There is interest in the possibility of bulk storage in large tanks on Fenua Fale, or supply by tanker. There is concern about the possibility of large-scale diesel leakages into the lagoon and potential for catastrophic fire. Despite this, the focus groups considered this a solution to the fuel shortages currently experienced.

Infrastructure and a process for safe handling and storage of fuel are a high priority for all three villages. However, a detailed study is required to fully determine the way ahead. There are difficulties with either option of retaining, improving the current fuel drum system, or installing large tanks for direct supply by tanker. There are also issues relating to the way that each atoll is treated according to the different circumstances of each. The study team was advised that a study of this type was carried out a number of years ago (possibly by Mobil) which if so, would make a good starting point for further evaluation. Because of uncertainties in the way forward, however, the budget estimate in this report allows only for the cost of the study itself and not for infrastructure provision.

5.7.2 Technical Analysis

Technical Feasibility (engineering/construction)

There is a need to be able to deal with fuel spillage, whatever the adopted fuel storage system. This involves an impervious pad or floor wherever there is a potential for spillage. The pad must be drained to a sump or trap that can be emptied by pumping into barrels for proper disposal.

Storage should be located away from houses. There should also be protection from hurricane waves.

Key Resource Requirements and Sources

Not evaluated at this stage, but evaluation would be carried out as part of a more detailed study, as discussed above.

Sustainability (project activities to promote sustainability)

Not evaluated at this stage, but evaluation would be carried out as part of a more detailed study, as discussed above.

Institutional Requirements (structures/capacity skills/human resources)

Not evaluated at this stage, but evaluation would be carried out as part of a more detailed study, as discussed above.
5.7.3 Economic Analysis

Project Development Cost
An allowance of $60,000 has been made in the budget for the study of an appropriate fuel management system.

Recurrent Costs (plus issues – long-term costs to sustain benefits)
Not evaluated.

Potential for Cost Recovery
Not evaluated, but likely to be limited simply by a lack of discretionary funds in the average household.

Economic Benefit and Likely Profitability
There are indirect benefits to be obtained by better management of fuel. If the option of tanker supply to storage tanks is adopted, for example, a considerable amount of capacity would be freed up on the MV Tokelau for passenger and freight transport. In this case also, there would be an end to fuel shortages on the islands.

5.7.4 Contribution to the Wider Economic Development of Tokelau
The above comments indicate there may be a positive effect on the ongoing development of Tokelau, in addition to the prevention of potentially damaging accidents.

Social Impact
The social benefit of improved fuel storage is indirect. Construction of alternative, improved sites would remove a potential danger to the community and would prevent some of the potential environmental damage. There would be a secondary benefit from reduced potential damage to the fish stock in the lagoon, providing increased food security.

If large storage tanks are investigated and a safe location and design used, there would be considerable direct benefits to all the community from having continuity of fuel supply. In turn, this would reduce the current cargo capacity pressure on the MV Tokelau, enabling other shortages to be reduced, faster shipping of materials for construction projects and increased passenger capacity. This would benefit all community members. While these benefits would apply to all atolls, they are particularly relevant for Fakaofo as they experience greater fuel shortages due to the separation of the population into two communities.

5.7.5 Environmental Impact
This project is intended to deal with or manage a number of existing negative impacts. Any steps to prevent the spread of fuels into the coral base and to mitigate the hazard posed by loose fuel drums must be regarded as environmentally beneficial.

5.8 Option F6 – Channel/Safe Mooring

5.8.1 Description
The existing method of freight and passenger transfer is risky and subject to weather delay. It also requires a considerable effort in manual labour to unload stores, diverting workers from other tasks. In addition, the lead transfer method would not be ideal for exporting fish catches, as this activity grows. There is a need for an anchorage to be cut into the reef or lagoon to provide a sheltered harbour that can cater for passenger and freight vessels.

This project has been described for Fakaofo. It is suggested, however, that there would be a need for only one major harbour/alongside berth for Tokelau in the five-year timeframe considered by this study and it has not necessarily been determined that it should be located in Fakaofo. Further study is required.

Consideration has been given to cutting through the reef to provide a sheltered berth in the lagoon. However, there are fears for the impact of this on the lagoon and a preference has been expressed for the harbour to be formed in the reef.

This was proposed by the study team during the visit as a way to avoid the problems expected with a direct link between the ocean and the lagoon. However, the cost analysis carried out below shows the proposal to be very expensive. A time analysis also shows that it would be difficult to complete the project using a local workforce and low-technology machinery in a sensible timeframe (more than 100 m² per day would have to be removed to complete the project in twenty years).

A third alternative is recommended, that of providing a channel through the reef to the lagoon, but preventing a direct link by encircling the lagoon end with a bund formed from the dredged material and forming an associated harbour area.

Alternative 1: Lagoon Wharf
The facility would cater for small container and freight ships. This would require a channel to be cut through the reef coral into the lagoon. Ships would berth at a massive concrete or sheet pile wharf constructed on the lagoon shore of one of the islands.

An appropriate design ship for the first stage of development would be a vessel of 1200DWT, length 55 metres (L), breadth 10 metres (B) and draft 3.5 metres. This vessel is the minimum that should be designed for and a study of vessels trading
Projects – Nukunonu

The consultation with key stakeholder groups resulted in the following ranking of preferred infrastructure projects:

Table 6.1: Ranking of Preferred Infrastructure Projects, Nukunonu, June 2001

<table>
<thead>
<tr>
<th>Nukunonu Potential Project</th>
<th>Taupulega</th>
<th>Aumaga</th>
<th>Fatupapea</th>
<th>Youth</th>
<th>TPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Wharf</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Seawall</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Airstrip</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel Storage</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Solid Waste</td>
<td>6</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved Transport</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

Source: Consultants ranking, Tokelau Infrastructure Study, June 2001

6.5 Option N5 – Improved Fuel Storage

6.5.1 Description

The requirements for improved fuel handling and storage are discussed in the Fakaofo projects (Section 5.7). The comments and evaluation given there are equally applicable for all three atolls. Therefore, no further evaluation is made in this section.

6.5.2 Social Impact

Although Nukunonu is not as densely populated as Fale in Fakaofo and there is thus a slightly lower fire risk, the community concerns are the same. Please therefore refer to the social impact analysis for Fakaofo (Section 5.7.5) for discussion of the issues.

6.5.3 Environmental Analysis

See comments for Fakaofo (Section 5.7.6).

6.6 Option N6 – Improved Transport

6.6.1 Description

The transport system, by providing an interface with the outside world and a link between the atolls, has a key role to play in establishing the Modern House in Tokelau. Requirements are:

- Punctuality to enable administrators, visitors, tourists and others to keep engagements and transport bookings to meet deadlines.
- Greater frequency of visits to provide scheduling convenience.
- Greater flexibility and frequency in inter-atoll travel, to allow administrative links and more effective sharing of facilities.
- Improved linkages to allow tourist travel and emergency evacuation.
- Adequate freight capacity, for importing supplies and exporting fish.
- Adequate capacity for transporting fuel, particularly with increased fuel demand expected after the 24hr power generation and the fishery projects are implemented.
- Adequate passenger capacity, particularly in peak demand periods.

An adequate freight capacity would be important for the viability of the fishery project, which would be the basis of future Tokelau revenue-generating activity.

The current operation of a single ship severely constrains flexibility. The ship is operating near to its turnaround capacity and the need to respond to a multitude of demands, combined with near-full bookings for passengers and freight, gives no margin for unforeseen delays or adverse events. This can only heavily reduce the operating efficiency.
ranking as the conservation of the limited land area of Tokelau and protection of the private and communal resources of the atolls are essential to the existence of the country and its economic, political and social viability.

8.5.5 Solid Waste Management

The obvious environmental and social benefits of solid waste management are detailed in Sections 5.7 "Projects". A high MHT ranking has been given because of the importance of preservation of the marine environment for the development of commercial fisheries and for maintenance of food security for the future.

8.5.6 Improved Transportation

This received a "-1" Environmental Rating as a more frequent service, or the commissioning of additional cargo capacity would increase the consumption of fuel with negative implications for the global environment. There would be a small increase in the potential for marine accident and associated pollution. Improved transportation is essential for the social and economic development of Tokelau and thus has been given a high MHT ranking.

8.5.7 Causeway

Careful design can eliminate the majority of potential negative environmental impacts. While the social impacts are positive, these are only considered to be moderate. The majority of these are desirable rather than essential or high priority, so a social rating of only "1" has been assigned. Similarly, while the causeway would contribute to the unity that is desirable under the MHT, these benefits are small in scale relative to the integration and unity that would be achieved by other projects such as the improved transportation option. A lower MHT ranking of "1" has been assigned for this reason.

8.5.8 Fuel Storage

Improved fuel storage facilities would minimise potential pollution of the water table and lagoon through fuel leaks. While protection of the marine environment and food security would contribute to the MHT objectives, it is less essential to the development of a sustainable future than facilities such as seawalls and transportation improvements and has only been assigned a MHT ranking "1."

8.5.9 Lagoon Wharf

This received a "-2" Environmental Rating. The development of a lagoon wharf for Tokelau is proposed as a long-term project. The scale of such a development means that there is the potential for significant environmental impact, but the proposed bunded lagoon wharf concept, along with careful detailed design should minimise these impacts during construction. It would not be possible to completely remove the increased environmental risk from potential fuel spillage.
10 Priority Summary

The highest priority in the rankings is given to seawalls. This applies to repair of existing walls to maintain an asset and providing new walls to armour unprotected parts of the islands. It is understandable that these projects have been ranked highly, given the history of hardship and loss from cyclone damage. The projects are a form of insurance and would be expected to provide tangible returns in cost savings. If the proceeds from the project should, however, commence with a small study to ensure that the wall designs are optimum for resisting cyclone waves.

The next priorities are issues with a large environmental component. There is a view about the solid waste issue and a desire to tackle this. There is also enthusiasm for obtaining sand from the lagoon bed with a pump, to ease pressure on the beaches as the primary source of sand supply.

Next priority is given to cargo handling equipment, to free up labour at the wharves for other duties and to enable large items to be brought ashore.

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An alongside berth in the lagoon, capable of taking small container carriers, will be necessary in time, particularly if the fishing project expands to its potential. The team has included one of these in the project list, but has not made any judgment as to where this should be located.

The issue of an airstrip, or three airstrips, has polarised people more than any other project. This is seen by some as highly desirable, especially for emergency use, to provide air administration and to support tourism. Others are against an airport and would prefer improved shipping service. The study team has included a single airstrip in the project list, again without any judgement as to its location. This project would come at the end of the programme, after other transport improvements.

The causeway at Fakaofo appears well down the list. The study team believes that it would be social advantages in uniting the villages in this way, but the cost for doing
very high. For a much lesser cost, a number of other projects and ways of uniting the community could be given priority.

Early consideration should be given to the introduction of a sand pump and a mechanisation project should be undertaken before any large-scale construction work is commenced.

Other miscellaneous projects were mentioned in discussion, but have not been included in the study. These include:

- Radio equipment – with the conversion to telephone connection with the outside world, the previous radio communication capacity has been lost. There was a period when the phone link in Nukunonu was out for nine days and there was no communication over this time. People found this distressing.
- Emergency locator beacons – for fishing boats.
- Hand tools – the Public Works team is critically short of hand tools.
- Channel markings and lights.