Sanitation and Waste Disposal in Aldeia Tangkae, Timor-Leste

Phoebe Mack

School of Environmental Systems Engineering

CEED Partner: Engineers Without Borders

Abstract

This paper examines the various significant concepts associated with International Development work, relating these to the case study of the Engineers without Borders Timor-Leste program. The study attempts to express the complexity of International Development work through discussing the elements associated with key concepts such as capacity building, the Millennium Development Goals and issues which arise relating to stakeholder involvement and information flows. In addition, the importance of a holistic approach to such programs is demonstrated through exploring the environmental concerns relating to implementing typical sanitation and waste disposal programs.

Additionally, the key focus of the project relates to the issues of sanitation and waste disposal with the aim of characterising the situation in the Aldeia (Sub-Village) of Tangkae, Timor-Leste. Methods to investigate the Aldeia's current sanitation and waste disposal practices and the impact these practices have on the community's health and the health of the natural environment are discussed. Furthermore, the research process regarding the appropriate management options for the community's waste and sanitation problems will be discussed. The primary outputs of the project will include recommendations regarding waste disposal techniques most appropriate to the Aldeia. It is anticipated that these recommendations will be used to develop proposals for the implementation of latrines and educational programs supported by the research the project provides.

1.0 Introduction and Background

This project is in collaboration with two other University of Western Australia (UWA) final year engineering students, Vaughn Grey and Heidi Michael, who are focussing their respective research on the topics of water supply and quality in the Aldeia (Sub-Village) of Tangkae. In addition the project involves working with the National University of Timor-Leste (UNTL), and more specifically with six students from the Civil Engineering Department. The aim of working collaboratively with these students is to produce a more effective outcome for the Aldeia and also to contribute to building the capacity of the UNTL students to be able to work effectively on similar projects in the future.

1.1 Brief History of Timor-Leste

In 2002 Timor-Leste became the worlds newest nation after a 24 year occupation by Indonesia. This period was preceeded by Portuguese colonial control lasting approximately 450 years, an era which was scattered with conflict reflecting the effort of local rebel groups to gain independence. In 1975, only days after the Portuguese withdrew their political control of Timor–Leste the country was invaded by Indonesian troops. Over the subsequent 24 year occupation an estimated third of the population perished in the ensuing conflicts, forced resettlements and associated malnutrition and due to the insufficient public health services

(Government of Timor-Leste & UNCT 2004). This period was characterised by military repression and with minimal economic development in the form of a few local employment opportunities in an attempt to assure the Timorese that Indonesian rule was favourable (US Government 2005). In 1999 a national referendum was held to determine whether Indonesia would remain in political control of Timor-Leste. The the ballot revealed a 78% vote for independence. This outcome was followed by a violent rampage led by pro-integration militia, during which time between 1000 and 2000 people were killed and 70% of essential utilities and private and public buildings was destroyed (Government of Timor-Leste & UNCT 2004).

More than two years after the referendum, in May 2002, Government and Presidential elections resulted in the official recognition of Timor-Leste as an independent nation. Currently, as the poorest nation in Asia and with a population estimated as almost 1 million, about 41% of this fall below the national poverty line of $0.55 per day (Government of Timor-Leste & UNCT 2004). The nation is still recovering from the destruction which occurred following the 1999 Referendum with only 50% of the population having access to an improved water source, 42% access to piped or pump water and 19% (2001 estimates) access to improved sanitation facilities (Government of Timor-Leste & UNCT 2004). These figures clearly demonstrate that support to address these issues is urgently required.

1.2 Millenium Development Goals (MDGs)

In 2000 the world's United Nations member states met to discuss and develop the MDGs and each state signed a declaration to commit to achieving the eight goals by the year 2015. As summarised in Table 1, the eight goals aim to improve the health and living conditions of all people, targeting principal issues such as gender inequality, HIV/AIDS and other diseases, and environmental sustainability which are key factors in determining the stage of development a community or nation is at. More recently, in 2002 Timor-Leste became the 191st member-state of the United Nations. With this membership the Government of Timor-Leste formally agreed to the 2000 Millennium Declaration and thus committed to "aim to create an environment, at the national and global levels alike, which is conducive to development and the elimination of poverty" (Government of Timor-Leste & UNCT 2004). Critical to this project are the revisions made to the MDGs at the September 2002 World Summit on Sustainable Development, where specific targets on sanitation and hygiene were added (UN-Water 2004). Also summarised in Table 1 these additional targets represent the recognition by the global community of the importance of promoting sanitation and hygiene to achieving the other MDGS.

Table 1 Millennium Development Goals and Sanitation and Hygiene targets (UN-Water 2004)

MDGs		Sanitation and Hygenie Targets
1. Eradicate extreme hunger and poverty	i	Halve, by 2015, the proportion of people without access to basic sanitation
2. Achieve Universal Primary Education	ii	Improve sanitation in public institutions, especially schools
3. Promote Gender equality and empower women	iii	Promote safe hygiene practices
4. Reduce child mortality	iv	Promote affordable and socially and culturally acceptable technologies and practices
5. Improve maternal health	v	Integrate sanitation into water resources management strategies
6. Combat HIV/AIDS, malaria and other diseases	vi	Implement plans, national policies and incentives for waste minimisation and improved recycling and use of wastewater
7. Ensure Environmental Sustainability	vii	Develop innovative financing and partnership mechanisms
8. Develop a global partnership for development	viii	Build institutional capacity and develop programmes for waste collection and disposal services for unserved populations; strengthen existing information networks

1.2.1 Problems with achieving targets

As the worlds newest nation Timor-Leste faces a difficult challenge in achieving the targets set due several factors. Reflecting the historical turmoil described in Section 1.1, a key constraint towards achieving the MDGs is due to the lack of available baseline data (Government of Timor-Leste & UNCT 2004). This constrains the ability of the government to accurately assess the countries state of development and poverty. As it is necessary to compile this information for this assessment this adds to the complexity of the tasks required by the Government of Timor-Leste to meet the proposed targets. Additionally, the newness of the nations independence has resulted in a lack of human resources within the public sector and also a limit to the technical skills available (Government of Timor-Leste & UNCT 2004).

In addition to these institutional challenges the Timor-Leste MDGs Report (2004) identifies the three critical factors to attaining the targets as the combination of high economic growth, low inequality (i.e. in population wealth distribution) and only moderate population growth. However, concern has been raised that the high population growth currently being experienced of 76% is likely to continue and that it is likely that maintaining 6% agricultural growth rate is an unrealistic aim, given that this growth has only resulted from the virtual inexistence of infrastructure after the national destructive acts occurring in 1999 (Government of Timor-Leste & UNCT 2004).

Challenges also identified in the MDGs Report (2004) relating to the lack of policies caused by the resource constraints and newness of the nation's governance. In particular challenges are identified with forming environmental policies which enforce environmental impact assessment practices, so that natural resources are properly managed (Government of Timor-Leste & UNCT 2004). The most recent political instability reflects the difficult task ahead in rebuilding the nation and developing policies to address these issues. This recent conflict has caused development setbacks through the destruction of infrastructure and unsettling of the population's confidence in the nations governance as demonstrated by the mass displacement of people.

1.3 Capacity Building

Capacity building is a term commonly used in development projects which can broadly be explained as the process by which an organisation builds the ability of another organisation, community or individuals to improve their own development situation. More specifically this improvement can be explained as one which strengthens the ability of the community to build their structures, systems and skills so that they are better able to achieve objectives and engage in consultation, planning and manage their own community projects (Skinner 1997). Capacity building is important for health and environmental projects in developing countries so that the MDGs discussed in Section 1.2 can be addressed.

Building the capacity of a nation to address the targets can mean to assemble resources, strengthen institutions and to train individuals so that the appropriate skills become accessible (UN-Water 2004), however capacity building as a direct training approach may not always be adequate (Kaplan 2000). A key criticism of typical capacity building practices relates to the uniformity of most capacity building programs. Kaplan (2000) remarks that such uniformity is both inadequate and inappropriate for the primary purpose of capacity building. Instead, it is suggested that development workers should not only be trained to deliver the package but to also read the individual situation so that the most appropriate response to that situation and time period can be delivered (Kaplan 2000). In saying this, it is also important to note that there are significant benefits of general programs for large organisations dealing with mass program delivery, given that they are easy to manage, fund and implement. However Kaplan's (2000) remarks are important given the available timeframe and individual situation of this project.

To undertake this shift in approach as suggested by Kaplan (2000) requires the capacity builder to have a unique ability to engage with the organisation, or community in focus. Kaplan's (2000) suggestion that the development practitioner must closely observe the situation (without judgement, sensitivity or empathy) and create an atmosphere of trust so that the situation of the organisation in focus may be accurately read is a suggestion which although theoretically possible, preferable to others, and one that would embrace the real 'people-centred development' approach (Kaplan 2000) it is foreseeably difficult to maintain in practice. Discussed in greater detail in the extended final dissertation for this project are the difficulties faced when the project working environment involves stakeholders with cultural and economic differences. These issues are important controlling factors in the progress and outcome of a project and must be identified in order to achieve effective solutions. Kaplan (2000) does acknowledge the complexity of the challenge in changing the approach to capacity building and perhaps this is why he exits the discussion with a series of unanswered questions.

1.4 Sanitation and Waste Disposal

Sanitation is generally understood to relate to water and sewerage systems, and the associated issues of maintenance and public health. More specifically for the purposes of this study, the term sanitation will imply the practices and principles of collection, reuse and disposal of human excreta and domestic wastewater (Elledge 2003). Also critical to the definition of sanitation is the association with terms such as hygiene and cleanliness. It is well understood that poor sanitation and hygiene is associated with high morbidity and mortality resulting from diarrhoeal and other infectious diseases (Taha et al. 2000; WHO 2000). Addressing sanitation, and applying good home hygiene has been demonstrated to lower the rate of such diseases by up to 35% (Waterkeyn & Cairncross 2005).

Achievement in cutting morbidity and mortality rates depends on cutting the transmission routes of diseases, which largely relies on the safe disposal of disease spreading faecal waste (Hadi 2000). Inclusive in tackling these issues are not only implementation of infrastructure such as latrines and wash houses, but introducing health education relating directly to sanitation and personal hygiene (Taha et al. 2000). Typically, sanitation and hygiene education aim to encourage the community to adopt practices such as hand washing (after defecation, handling children's faeces, and before food preparation or consumption), as well as the use of latrines for proper faeces disposal (UN-Water 2004).

For implementation of education and infrastructure to successfully occur it is important that the community in focus identifies a need for such things. Hadi (2000) defines the unmet need of a safe latrine to be present when there is an "expressed intention to buy or build latrine", the critical point from Hadi's (2000) discussion being that community participation and involvement in all stages, especially the development stage phase, is essential. It is well documented that raising awareness of why sanitation and hygiene are important will increase community enthusiasm to change harmful behaviours (UN-Water 2004). In addition to the necessity for an initial 'need' to be expressed it is important to recognise that a critical factor in success of sanitation and hygiene programs relate to direct behaviour changes made by the community. In order to change behaviour culturally sensitive and appropriate health education programs are needed, which demonstrate that the improved health of the community depends on the adoption of the new practices, and thus a behavioural change (UN-Water 2004).

1.5 Environmental Concerns

The impact the current sanitation practices have on the environment can be linked to the issues of water quality being examined by Heidi Michael in her paper *Water Quality Assessment and*

Treatment in a Developing Community: Tangkae, East Timor. The current practice of open defacation in the Aldeia of Tangkae is harmful not only to the community health as previously discussed, but also to the physical environment, as local waterways can become contaminated with nutrients and microorganisms sourced from the wastes. In addition gross pollutants are an issue affecting waterways and the ecosystem fauna as plastics and other unbiodegradable wastes are currently left open in the environment with no formal waste disposal site utilised.

Although recognised as important in reducing morbidity and mortality, latrines and proper waste disposal solutions may also have significant negative environmental impacts. Most notable is the risk of ground and surface water contamination, as implementing an organised waste disposal system will concentrate harmful nutrients, chemicals and microorganism's associated with the waste to a specific area. In order to assess the environmental risk of implementing sanitation and waste disposal infrastructure the physical environmental factors within the region should be characterised. This is achieved through examining the interaction with the environmental parameters such as the hydrology and surface-ground water interactions and how these may be affected by a change in waste disposal and sanitation practices.

Given the data available for this project only includes limited rainfall data and topographic maps of the area it is difficult to characterise hydrologic characteristics. Fortunately, several models such as TOPMODEL (a topography based hydrological model) have been developed in attempts to model the relationship between the physical characteristics of topography and catchment groundwater properties. The potential for such modelling in data limiting situations is great, with financial benefits as they have the potential to reduce the need to conduct costly drilling and pump tests. In order to fulfil investigations for water and sanitation deliveries, determining the groundwater characteristics can provide additional support for sustainable social and environmental solutions.

2.0 Methods

2.1 Latrines and Waste Disposal

It is widely accepted that the implementation of safe and hygienic latrine and waste disposal technology dramatically reduces the risk of direct faecal contact an individual has, and this consequently reduces the occurrence of disease. There are extensive volumes of literature relating to the specifications and design of latrines however implementing the right technology for a project relates to having effective alternatives and making the correct choices for the individual situation (UN-Water 2004). This choice involves an assessment of many project specific factors all relating to the environmental, economic and social costs and benefits of the alternatives.

The following discussion is the outline of an incomplete selection process for the most appropriate latrine and waste disposal technology for the case study of the Aldeia Tangkae. The initial step taken in this selection process is a large research based assessment where individual alternatives are examined and comparisons are made which aid the selection process. As can be seen in Table 2 there are many different alternatives for the implementation of latrines, which will be examined in greater detail in the final project report, and Table 3 represents a brief list of the key categories and concerns require to be analysed when assessing each alternative.

Table 2 Several Latrine alternatives

Table 3 Required assessment categories when considering each option**Latrine/Sanitation Alternatives**
Pit Latrine – Ordinary or Ventilated Improved
Water Bourne Sanitation
Compost
Dry
Dry Urine Diversion
Double Pit

Key Assessment Categories
Advantages
Disadvantages
Education Required
Maintanence Required
Capital Costs
Environmental Requirements (e.g. water table depth)

The second stage of the selection process involves an assessment of the environmental factors influenced by the intended project. These environmental issues are discussed in Section 1.5 and include the critical assessment of the risks relating to contamination of the community water supply, as well as the predicted overall environmental impact of the proposed technology. In addition to this environmental cost benefit assessment the advantages and disadvantages of the proposed technologies must be considered from a social perspective. This is the most critical factor to success of a project and as previously discussed community acceptance, involvement and most importantly a sense of ownership must be generated. Thus all technologies must be assessed for their cultural sensitivity, applicability and appropriateness. As previously discussed in Section 1.3 this will involve high levels of community consultation, often involving workshop sessions, interviews and informal discussions with all types of community members as well as a complete characterisation of the community social and physical demographics.

2.2 In-Country Field Visits

During February 2006 the Western Australian project team, consisting of three engineering students from the University of Western Australia travelled to Timor-Leste in order to develop the project. This process involved investigating the most appropriate location, defining the project focus and developing stakeholder relationships. During this initial in country placement many connections were made with relevant government bodies in order to begin developing the project scope and obtain the relevant information and data sets. On completion of the first trip there were three research projects defined involving an analysis of the respective water supply, quality and waste disposal issues present in Tangkae.

2.2.1 Tangkae

The project location was decided on using a number of indicators. These indicators were explained to the project team by the Governmental Water Supply and Sanitation Department, *Serviço De Águas E Saneamento* (DNAS) who have placed each community of Timor-Leste into a priority listing founded on a needs based assessment of the individual communities. The chosen community is in the Aldeia (sub-village) of Tangkae in the Suco (village) of Balibar, Sub-district Cristo Rei and District Dili. It is a priority one listed community due to the health, water supply and sanitation conditions of the population. After preliminary social and physical surveys of the Aldeia it was concluded that the main areas of concern for the community were the problems with water access and sanitation related health issues. The social surveys consisted of community consultation in the form of informal discussions with community members including the Aldeia Chefe who is the head community leader to obtain demographic information as well as details specific to the communities current practices for sanitation and waste disposal. In addition, the physical surveys included mapping of the community water sources and identification of environmental characteristics such as soil and vegetation. The summarised results of these surveys can be seen in Table 4.

Table 4 Brief summary of results from survey of Tangkae conducted in February 2006

Location	20km south of Dili (Approx.)
Elevation	750m above sea level (Approx.)
Population	264 (57 families, 8-12 persons per family)
Water Sources	Laratema: Spring closest to Tangkae (approx 500m down steep slope) Fatnamudu: 2-3 kms from Tangkae, this spring was previously connected to the Aldeia via pipes which were destroyed in 1999 Airabat: Well 3-4 kms from Tangkae, only used when water is very scarce due to its distance from the Aldeia
Water Collection	Water carried in 5-10L containers and collected at least three times per day from Laratema
Water Use	Water is used for cooking, washing clothes, bathing and as a drinking source. Most villagers wash at the spring site.
Water Treatment	Water is boiled before use, and food is washed with spring water before being consumed.
Village Agriculture Practices	There are scattered agriculture practices, and the community lifestyle is mostly subsitence living. The main crops and stock include maize, tapioca, sweet potato, beans, coffee plantations, and animals include cows, pigs, chooks, buffalo, horses, goats – some stock are penned, but not all
Waste Disposal Practices	Currently there is no defined waste disposal site, and the most common practice is to dispose of solid wastes into the open environment. It was also stated that once a year all accessible solid wastes are raked into a pile and incinerated.
Sanitation Practices	Three households have a non-flush pit latrine system. Each latrine is linked to a cement pit each, approximately 2 m deep, 1 m wide & long, with no cement base. The remaining households used a hole in their pig pens as their latrine. The pigs then eat the human waste because the community water supply does not provide enough water to wash away wastes.
Health Issues	Common illnesses include: Coughing, fever, headaches, running nose, diarrhoea & worms and it was stated that most of the children are constantly sick. No prevention of worms seemed to be understood or taught In the last 5 years, approximately 5 babies in the village died.

2.2.2 Second In Country Field Visit

A second in-country field visit was planned for June 2006 however, due to the recent political instability the trip was postponed and is proposed to be carried out in December of 2006 (providing adequate national stability exists). It is expected that this trip will allow for a more detailed characterisation of the Tangkae community, including a more thorough assessment of the environmental risks associated with implementing latrines and other waste disposal measures. Given that the second trip will likely occur at the conclusion of the project it is also anticipated that the visit will involve more detailed community consultation where recommendations which have been researched in the time between the two trips can be discussed with the community. It is also anticipated that this trip will involve the organisation of the implementation phase of the project in collaboration with the stakeholders including the community, relevant local NGOs, the UNTL students and government departments such as DNAS.

3.0 Recommendations

The anticipated outputs of this project will include a series of recommendations relating to the research conducted as described in Section 2.0. It is expected that these proposals will include the implementation of latrines and hygiene education programs as previously descirbed which will be in collaboration with the other recommendations relating to the water supply and quality in the Aldeia made by Heidi Michael and Vaughn Grey. Together these three projects aim to provide research based management plans which offer environmentally, socially and economically sustainable long term solutions for the water supply and sanitation problems of the Aldeia.

4.0 References

Elledge, M. F. 2003, *Sanitation Policies: Thematic Overview Paper*, IRC International Water and Sanitation Centre.

Government of Timor-Leste & UNCT 2004, *Timor-Leste Millennium Development Goals Report*, United Nations Country Team, Dili.

Hadi, A. 2000, 'A participatory approach to sanitation: experience of Bangladeshi NGOs', *Health Policy and Planning*, vol. 15, no. 3, pp. 332-337.

Kaplan, A. 2000, 'Capacity building: shifting the paradigms of practice', *Development in Practice*, vol. 10, no. 3 & 4, pp. 517-526.

Okun, D. A. & Lauria, D. T. 1991, 'Capacity Building for Water Sector Management: an international initiative for the 1990s', in *A Strategy for Water Sector Capacity Building: Proceedings of the UNDP Symposium*, eds G. J. Alaerts, T. L. Blair & F. J. A. Hartvelt, International Institute for Hydraulic and Environmental Engineering, Delft, pp. 39-69.

Skinner, S. 1997, *Building Community Strengths: A Resource Book on Capacity Building*, Community Development Foundation, Great Britain.

Taha, A. Z., Shahidullah, M., Sebai, Z. A. & Ahmed, M. H. H. O. 2000, 'Assessment of Water Use and Sanitation Behaviour in a Rural Area of Bangladesh', *Archives of Environmental Health*, vol. 55, no. 1, pp. 51-57.

UN-Water 2004, *The Sanitation Challenge: Turning Commitment into Reality*, United Nations Water (World Health Organisation, United Nations Department of Economic and Social Affairs, UNICEF, UN-HABITAT, United Nations Environment Program), Geneva.

US Government, (2005), *Background Note: East Timor* [Online], US Department of State, Available: http://www.state.gov/r/pa/ei/bgn/35878.htm [29 June 206].

Waterkeyn, J. & Cairncross, S. 2005, 'Creating demand for sanitation and hygiene through Community Health Clubs: A cost-effective intervention in two districts in Zimbabwe', *Social Science & Medicine*, vol. 61, no. 9, pp. 1958-1970.

WHO 2000, *World Health Report*, World Health Organization, Geneva.