GOAL 11 Make cities & human settlements inclusive, safe, resilient and sustainable

Photo: GEF SGP

SDG 11 is concerned with ensuring that villages, towns and cities offer the best possible living conditions for all of their inhabitants, while minimising any negative impacts on the surrounding environment. It has a particular focus on meeting the needs of poorer and more vulnerable sectors of the population, and on maintaining the integrity and security of human settlements in the face of climate change.

How do ecosystems and biodiversity support this SDG?

Ecosystems and biodiversity underpin the day-to-day functioning of human settlements. Biological resources provide many of the foods, building materials, energy, and medicines that are consumed in urban centres. Ecosystems deliver the basic services and conditions that enable, support and protect human production, consumption and habitation. For example, forests, wetlands and grasslands help to maintain clean air and water, and also minimize the risk and impacts of floods, landslides and other natural disasters. In coastal areas, mangroves, coral reefs and seagrass beds provide a physical buffer against the effects of waves, winds, storms and extreme weather events that can threaten people's lives, livelihoods and property. In many cases this 'natural infrastructure' can lessen the gap between the level of services and facilities that rapidly-growing populations require, and that which they can access or afford. This is especially the case for the poor who lack basic services, cannot afford purchased alternatives, are particularly vulnerable to stresses and shocks, and tend to suffer disproportionately when natural disasters strike.

How does UNDP's work **support** this SDG?

Case study: Climate change adaptation in Matafa'a village, Samoa

Water had long been a problem for the residents of Matafa'a, a remote and isolated village in Samoa. The spring from which water supplies were drawn had become contaminated, and regularly dried up. The incidence of disease had risen, fisheries resources were dwindling, and crop and livestock production was in decline. Women were having to spend an increasing amount of time and cash searching for alternative sources of clean water. Furthermore, the fact that the spring was located on a part of the coastline that was highly prone to cyclones and flooding meant that most villagers were forced to reside in an unsafe area. These problems had been progressively worsening over time, as the population grew and land pressures intensified, and as local rainfall and weather patterns were disrupted by ongoing processes of climate change.

Working together with the Independent Water Scheme Association (IWSA), the Ministry of Natural Resources and Environment (MNRE), the Ministry of Health (MoH), the Ministry of Women Community and Social Development (MWCSD) Division of Internal Affairs and the Red Cross, this project upgraded the village water supply to a community-managed, gravity-fed system. The intake is now located in a steep mountain ravine, well away from the houses and farms that were leaching human wastes, agro-chemicals and other pollutants into the previous water source. Relocation of their water source has allowed villagers to move away from the coastal hazard zone into a much safer living environment. Restoration and conservation of the ecosystems that protect the water source was also an integral part of the project. Trees and vegetation have been re-established in the watershed helping to secure the sustainability of the water source itself,

Photo: GEF SGP

and safeguarding the springs and streams that flow down to the coast. As a result of this project, all members of Matafa'a village now have access to a safe living environment, enhanced agricultural production opportunities and an affordable, clean and secure water supply.

It is notable that after Hurricane Evan, which hit Samoa in 2012, the residents of Matafa'a were able to quickly repair the water system within the course of a few days, and maintain their resilience in the face of disaster – in contrast to most other villages under government water supplies, which took weeks to recover. In addition, the project has catalysed a series of further local community initiatives. Looking to the future, villagers are starting to work on measures to reduce water wastage, improve cost recovery and improve water quality.

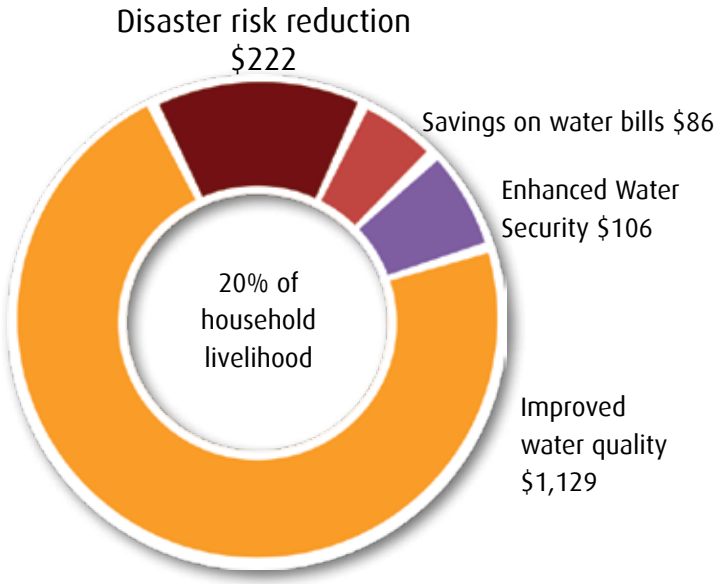
PROJECT: Adapting to climate change impacts in water resources and services in Matafa'a village, Samoa
FUNDED BY: UNDP-implemented GEF Small Grants Programme Community Based Adaptation Programme funded by the Australian Government's Department of Foreign Affairs and Trade (DFAT)
LOCATION: Matafa'a village (Upolu Island), Samoa
DATE: 2011-2012
WEBLINKS: https://www.weadapt.org/placemarks/maps/view/10401; https://sgp.undp.org/index.php?option=com_sgpprojects&view=projectdetail&id=16933&Itemid=272

SGP The GEF Small Grants Programme
Australian Aid

Photo: GEF SGP

Nature count$: Key impacts of the project on village resilience and livelihoods

By securing adequate, safe and affordable water supplies at the same time as reducing the risk from disaster and strengthening resilience to climate change, shifting to an ecosystem-based water supply system generated added value, costs savings, and avoided damages worth a combined total of US$1,500 for every household in Matafa'a Village, Samoa. This is equivalent to an increase of 20 percent in local livelihood values. Overall, the project shows a return of $21 for every $1 invested, with a payback period of less than 15 months.



This project helped to achieve better access to upgraded, adequate, safe and affordable basic services for all poor rural households (✓SDG Target 11.1), planned and managed in an inclusive and participatory manner (✓SDG Target 11.3) and in a way that safeguarded natural and cultural heritage (✓SDG Target 11.4), resulting in better protection of vulnerable people, diminished disaster impacts and economic losses (✓SDG Target 11.5), reduced adverse environmental impacts (✓SDG Target 11.6), strengthened climate change adaptation capacities and improved disaster risk resilience (✓SDG Target 11.b).

How the economic impacts were calculated:

In 2011, when the project was initiated, 226 people were recorded as living in Matafa'a village and were counted as the primary beneficiary population. Average household size in this region of Upolu is 7.01 persons (SBS 2011) and the annual population growth rate is estimated at 0.6 percent (UNFPA 2014), meaning that today (in 2015) some 231 people or 33 households are supplied with water from the new scheme.

Because the scheme is community-managed, Matafa'a residents do not pay water bills to the government (as happens in neighbouring villages). Instead, each household pays a monthly user fee of $3.8 or 10 Samoan Tala (WST). This leads to considerable cash savings for residents. Even under the heavily-subsidized tariff structure of the Samoa Water Authority, where residents pay $0.52 or WST1.34 per 1,000 litres (including 500 litres per household per day offered free of charge), water consumption would cost each household an average of WST342 ($132) per year. This is based on an average water consumption figure of

169 litres per person per day in Samoa (PWWA 2015). It should be noted that this represents a conservative estimate: other estimates suggest figures of between 230-1,000 litres per person per day (various sources, cited in SOPAC 2007). The savings on water bills are valued as the difference between the user fees paid by Matafa'a residents ($46, WST120) and the price of an equivalent amount of water supplied by the Samoa Water Authority ($132, WST342): an average of $86 (WST222) per household per year.

By improving and maintaining both 'grey' (built) and 'green' (natural) water infrastructure, villagers no longer face water shortages. Records show that Matafa'a was not affected by the droughts which plagued other parts of the country in 2011 and 2012 (as compared to the past, when they suffered recurrent water shortage problems). This helps residents avoid costs associated with mitigating the effects of water shortage and drought, such as through investment in storage facilities (which is commonly employed in surrounding areas). The local price of a water storage tank in nearby Lotofaga Village was around WST2,700 in 2014 (Wilson 2014) or just over WST2,750 at current 2015 prices (using consumer price index deflators given in IMF 2015). With an average tank lifespan of 10 years, this equates to saved expenditure of around $106 (WST275) per household per year, representing the value of enhanced water security in terms of expenditure-avoided.

Conserving the watershed and protecting the water source against erosion and runoff improves the quality of both the water consumed by villagers and that flowing downstream into rivers and the sea. Work in nearby Palau calculated the impacts of solid waste pollution on water-related healthcare/illness costs and loss of nearshore fish catch, coming up with a best estimate average of $211 per household per year in 2004 (Hajkowicz et al. 2006). Meanwhile, studies carried out in the Cook Islands estimated that the costs of watershed degradation and associated water pollution were NZD2,900 per household in terms of healthcare expenditure, mitigation expenditures, lost earnings and productivity (Hajkowicz and Okotai 2006). At 2015 Samoa prices these figures equate to $277 and $1,980 per household per year respectively (using consumer price index and purchasing power parity exchange rate deflators taken from IMF 2015). The mid-point average of $1,129 (WST2,934) is used to express the value of improved water quality.

Shifting the site of the water supply has allowed people to relocate away from the disaster-prone coastal strip, thereby reducing the incidence of flood and cyclone-related damages and economic losses. Samoa has a tropical cyclone risk that is rated as 'extreme'; models show that the country is subject to five serious cyclones per decade on average, usually accompanied by severe wave damage and flooding (Yeo 2001). Hydro-meteorological disasters are reported to have impacted 'over 324,000 people between 1983 and 2012, causing damages and losses of around $724 million (Holland 2014, Guha-Sapir et al. 2015). This translates to an average 2015 cost of $440 per year for affected households (converted using consumer price index deflators given in IMF 2015). Over the next 50 years it is projected that costs averaging $6.9 million a year will be incurred by coastal dwellers in Samoa as a result of tropical cyclones and associated flooding events, 75 percent of which represents damages to houses and crops (PCRAFI 2011, 2015). Some 70 percent of the population lives in low-lying coastal areas and is deemed vulnerable to the effects of cyclones and to the rise in sea levels associated with climate change (IFRC 2013). The resulting 2015 figure of $222 per year for each potential flood or cyclone-affected household (converted using consumer price index deflators given in IMF 2015 and based on population projections given in UNFPA 2014) is taken as the value of disaster risk reduction benefits in terms of avoided economic damages, costs and losses.

The project is therefore calculated to have generated total value-added, costs savings and damages avoided worth $1,542 or WST4,008 for every household in Matafa'a village.

Across the whole of Samoa, average GDP per capita is currently $4,487 or WST11,666 (IMF 2015). Actual income is, however, considerably lower in remote, rural areas such as Matafa'a village. In 2009, average household income in Upolu was estimated as WST18,589, including cash earnings, remittances and the value of food grown or caught by the household (Gibson 2010). This translates into a 2015 figure of $7,853 or WST20,420 (using consumer price index deflators given in IMF 2015). As a proportion of these household

income levels, the benefits generated as a result of the project are equivalent to an increase of 20 percent in local livelihood values.

The total cost of the project (including both the cash grant provided by UNDP-GEF Small Grants Programme and AusAid and in-kind co-financing provided by the community) was $63,500. Assuming that the water supply infrastructure will continue to be operational for at least the next 25 years, this shows a return on investment of $21 dollars for every $1 of funding provided and a payback period of 1.2 years (15 months) until the value of benefits generated started to outweigh the funds invested.

References

Batagoda, B. (2003) *The economic valuation of alternative uses of mangrove forests in Sri Lanka*. The Hague, Global Programme of Action for the Protection of the Marine Environment from Land-based Activities.

Cesar, H. (1996) *Economic analysis of Indonesian coral reefs*. Environment Economic Series. Washington, D.C., World Bank Environment Department.

Das, S. (2009) *Can mangroves minimize property loss during big storms? An analysis of house damage due to the Super Cyclone in Orissa*. Kathmandu, South Asia Network for Development and Environmental Economics (SANDEE).

De Mel, M. and Weerathunge, C. (2011) *Valuation of ecosystem services of the Maha Oya*. Colombo, Environmental Foundation.

Emerton, L. & Kekulandala, B. (2003) *The economic value of Muthurajawela Wetland, Sri Lanka.* Colombo, International Union for the Conservation of Nature (IUCN) Regional Environmental Economics Programme and Sri Lanka Country Programme.

Emerton, L., Erdenesaikhan, N., de Veen, B., Tsogoo, D., Janchivdorj, L., Suvd, P., Enkhtsetseg, B., Gandolgor, G., Dorjsuren, Ch., Sainbayar, D. and Enkhbaatar, A. (2009) *The economic value of the Upper Tuul ecosystem in Mongolia*. Washington, D.C., The World Bank.

Gerrard, P. (2004) *Integrating wetland ecosystem values into urban planning: the case of That Luang Marsh, Vientiane*. Vientiane, IUCN – The World Conservation Union Asia Regional Environmental Economics Programme and WWF Lao Country Office.

Gibson, J. (2010) Recent shocks and long-term change in the Samoan economy. *Pacific Economic Bulletin 25 (3)*, 7-23.

Guha-Sapir, G., Below, R. & Hoyois, Ph. (2015) *EM-DAT: The CRED/OFDA International Disaster Database*. Brussels, Université Catholique de Louvain. Available from: http://www.emdat.be/advanced_search/index.html [Accessed 14 December 2015].

Hajkowicz, H. & Okotai, P. (2006) *An economic valuation of watershed pollution in Rarotonga, the Cook Islands*. Apia, SPREP. International Waters Project-Pacific Technical Report no. 18.

Hajkowicz, H., Tellames, K. & AItaro, J. (2006) *Economic cost scenarios for solid waste-related pollution in Palau*. Apia, SPREP. International Waters Project-Pacific Technical Report no. 28.

Holland, P. (2014) *Economic dimensions of improved meteorological services in the Pacific*. Suva, Secretariat of the Pacific Community Applied Geoscience and Technology Division. SOPAC published report: PR185.

IFRC. (7 November 2013) *Helping communities adapt to climate change by reducing disaster risks in Samoa*. International Federation of Red Cross and Red Crescent Societies. Available from: http://www.ifrc.org/en/news-and-media/news-stories/asia-pacific/samoa/helping-communities-adapt-to-climate-change-by-reducing-disaster-risks-in-samoa-63677/ [Accessed 14 December 2015].

IMF. (2015) *International Monetary Fund World Economic and Financial Surveys: World Economic Outlook Database* (October 2015 version). Available from: http://www.imf.org/external/pubs/ft/weo/2015/02/weodata/weoselgr.aspx [Accessed 14 December 2015].

MARD. (2008) *Values of forest on water conservation and erosion control, Da Nhim Watershed, Lam Dong Province*. Hanoi, Dong Nai River Basin Conservation Landscape Project, Ministry of Agriculture and Rural Development, Winrock International and USAID.

PCRAFI. (2011) *Country Risk Profile Samoa*. Washington, D.C., Pacific Catastrophe Risk Assessment and Financing Initiative, The World Bank.

PCRAFI. (2015) *Country Note Samoa*. Washington, D.C., Pacific Catastrophe Risk Assessment and Financing Initiative, The World Bank.

Powell, N., Osbeck, M., Sinh Bach Tan and Vu Canh Toan. (2010) *World Resources Report Case Study: Mangrove restoration and rehabilitation for climate change adaptation in Vietnam*. Washington, D.C., The World Bank.

PWWA. (2015) *Pacific Water and Wastes Association: International Benchmarking Network for Water and Sanitation Utilities IBNET Database*. Available from: http://pwwa.ib-net.org/database/?action=country [Accessed 14 December 2015].

Rao, N., Carruthers, T., Anderson, P., Sivo, L., Saxby, T., Durbin, T., Jungblut, V., Hills, T. & Chape, S. (2013) *An economic analysis of ecosystem-based adaptation and engineering options for climate change adaptation in Lami Town, Republic of the Fiji Islands*. Apia, Secretariat of the Pacific Regional Environment Programme.

Rosales, R., Kallesoe, M., Gerrard, P., Muangchanh, P., Phomtavong, S. and S. Khamsomphou (2003) *The Economic Returns from Conserving Natural Forests in Sekong, Lao PDR*. IUCN – The World Conservation Union Asia Regional Environmental Economics Programme and WWF Lao Country Office, Vientiane.

Sathirathai, S. (1998) *Economic valuation of mangroves and the roles of local communities in the conservation of natural resources: case study of Surat Thani, South of Thailand*. Ottawa, Environment and Economics Program for South East Asia, International Development Research Centre. EEPSEA Research Report.

SBS. (2011) *Population and Housing Census 2011*. Apia, Samoa Bureau of Statistics.

SOPAC. (2007) *National Integrated Water Resource Management Diagnostic Report Samoa*. Suva, Secretariat of the Pacific Community. SOPAC Miscellaneous Report 644.

Tri, N., Adger, W. & Kelly, M. (1998) Natural resource management in mitigating climate impacts: the example of mangrove restoration in Viet Nam. *Global Environmental Change*. 8 (1), 49-61.

UNFPA. (2014) *Population and Development Profiles: Pacific Island Countries*. Suva, United Nations Population Fund, Pacific Sub-Regional Office.

Van Beukering, P., Grogan, K., Hansfort, S. and Seager, D. (2009) *An economic valuation of Aceh's forests: the road towards sustainable development*. Amsterdam, Institute for Environmental Studies, VU University. Report R-09/14.

Wilson, C. (1 September 2014) Struggling to Find Water in the Vast Pacific. *Inter Press News Agency*. [Online] Available from: http://www.ipsnews.net/2014/09/struggling-to-find-water-in-the-vast-pacific/ [Accessed 14 December 2015].

Yeo, S. (2001) *A review of flooding in Apia, Samoa, April 2001*. Suva, Secretariat of the Pacific Community. SOPAC Technical Report 338.

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