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Participatory 3D Modelling in Samoa

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Participatory 3D Modelling in Samoa

Triggering behavioural changes and climate change resilience

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The Technical Centre for Agricultural and Rural Cooperation (CTA) is a joint international institution of the African, Caribbean and Pacific (ACP) Group of States and the European Union (EU). Its mission is to advance food security, resilience and inclusive economic growth in Africa, the Caribbean and the Pacific through innovations in sustainable agriculture.

CTA operates under the framework of the Cotonou Agreement and is funded by the EU.

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List of acronyms

CTA	Technical Centre for Agriculture and Rural Cooperation
GEF	Global Environment Facility
ICCRIFS	Integration of Climate Change Risks and Resilience into Forestry Management in Samoa
MNRE	Ministry of Natural Resources and Environment
P3DM	Participatory 3D Modelling
SGP	Small Grants Programme
UNDP	United Nations Development Programme

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Summary

Since 2012 the local government together with local communities in the Independent State of Samoa have carried out a total of 19 participatory 3D modelling (P3DM) exercises in the context of agroforestry management, water management and tourism development.

A participatory research was conducted between February and April 2016 to explore the effectiveness and potential of P3DM in the region. The study was done by Barbara Dovarch, PhD candidate at the Department of Architecture Design and Urban Planning, University of Sassari, Italy, sociologist and independent researcher, in partnership with the Technical Centre for Agricultural and Rural Cooperation (CTA) and Samoa's Ministry of Natural Resources and Environment (MNRE). This participatory evaluation involved diverse members of local communities and MNRE technical staff. It focused particularly on the capacity of P3DM to generate deep-seated and long-lasting behavioural changes.

The study demonstrated that P3DM contributes to natural resource management and climate change resilience and showed the transformative power of the approach at various levels, such as community, NGO and governmental level. Through the P3DM process, meaningful interactions between government representatives and community members resulted in greater collaboration and mutual learning. While government representatives have changed the way they approach local communities – from 'teaching' to 'listening' – communities have also changed their attitude towards land management and development.



Top UN officials Helen Clark, United Nations Development Programme Administrator, and Naoko Ishii, Chief Executive Officer and Chairperson of the Global Environment Facility, are introduced to the participatory 3D model of the Lauili'i to Falevao area, Samoa, during the Small Islands Developing States Conference in Samoa in September 2014.

Photo credit: Paulo Amerika

Introduction

Participatory 3D mapping (P3DM) is a participatory mapping process that integrates local peoples' spatial knowledge with elevation data. Topographic information from scale maps is used to collectively construct a georeferenced relief model, which community members then use to map their settlements and territories, and locate physical and social features (Rambaldi, 2010). The maps represent contexts and territories according to local peoples' life experiences, their sense of belonging and local knowledge; all of which provides an important richness when planning or managing for sustainable development. Local communities are then able to use these maps to analyse their vulnerability, identify existing resources and capabilities, and plan possible actions for improvement and rehabilitation of land.

Since its introduction in Fiji in 2005, P3DM has been widely used in the Pacific region. A 5-year project (2011–16), 'Integration of Climate Change Risks and Resilience into Forestry Management in Samoa' (ICCRIFS), funded by the Global Environment Facility (GEF) and executed by the Samoan Ministry of Natural Resources and Environment (MNRE) with support from the United Nations Development Programme (UNDP), was the first to use this method on a large scale. During the project's implementation, P3DM attracted the interest of several MNRE divisions and government agencies, which resulted in P3DM being replicated within other projects. For example, P3DM has been included in a UNDP project executed by the Samoa Tourism Authority, 'Enhancing the Climate Resilience of Tourism-Reliant Communities in Samoa', and within a Food and Agriculture Organization-GEF project implemented by MNRE's Forestry Division, 'Forest Protected Area Management'.

While the main purpose of all of these projects was to sensitise communities on climate change, they covered a diverse range of topics including: agroforestry and water resource management; diversification and resilience of tourism activities; and livelihood sustainability, particularly for communities living in and around natural protected areas.

The application of P3DM in the Independent State of Samoa sets an important precedent for two main reasons. Firstly, whereas participatory processes are generally initiated at the community level with the intent of building platforms of dialogue with local authorities, the Samoan initiative was introduced at government level. Model construction was then used to reach communities, gain their trust and ensure their meaningful involvement. Secondly, P3DM in Samoa is soon to become a consolidated practice, significantly contributing to rural development planning and natural resource management.

Context

"*O Samoa ua uma ona tofi*" is a popular Samoan saying that means "Samoa is a land where all positions have been allocated" (AsofouSo'o, 2008: p.22). An extraordinary sense of commonality and order within the conventional land distribution system (81% of the country's land is customary) is mirrored by a unique traditional social structure rooted in ancient Polynesia.

Samoa people are fully aware of their place within society, the related rights of expression, land entitlements and personal duties according to local customs. With citizens at all levels respecting the fixed, hierarchical *matai* system, everyone is mindful of their ascribed roles.

This indigenous leadership structure has historically controlled Samoa's socio-political affairs, keeping communities profoundly cohesive and organised. The ancient system offers a stable social structure and has persisted despite European influence since the 19th century and 'Western' principles becoming basic tenets of the Samoan Constitution after independence in 1962.



Figure 1. A typical matai meeting painted on the catholic church dome in Apia.

Photo credit: Barbara Dovarch

Samoa is a *de facto* parliamentary republic and the balance between the two different systems of authority, represented by democratic values and indigenous institutions, is still a mystery for many scholars. However, daily life for Samoans is far from conflicting, based around legitimised power dynamics, consolidated procedures and shared values, without question or uncertainty. Participatory processes in this distinctive social milieu can be understood only through an attentive contextualised analysis, particularly because participatory tools are adopted to involve communities in managing land and natural resources, which, in the Samoan context, is strongly connected to people's culture, roots and customs.

Mobilisation and community attitude change

The MNRE mobilised communities by sending formal ‘consultation’ invitations to the high-ranking *matai* of each village through the Ministry of Women, Community and Social Development – the only ministry allowed to communicate directly with *matai* leaders. During the consultations, the government presented community leaders with information about P3DM and invited them to be a part of the process. Once back in the village, the leaders met with other *matai* to decide whether they would accept the government’s proposal or not. If everyone agreed, they then informed the government of their availability and chose other community representatives. These representatives, together with the *matai*, were the main participants of the model-making process.

From an outsider’s perspective, this highly structured mobilisation process could be seen to undermine the meaning of ‘participatory’ and its open and democratic nature. However, in the Samoan context, this kind of interaction has a positive effect on the participatory processes. Indeed, local cultural aspects constituted a good foundation for community involvement, such as the easy information dissemination at the community level, the strong social cohesion and community commitment. Samoans are used to working collaboratively and discussing decisions collectively, while they deeply respect both the indigenous leadership system and the government.



Figure 2. A typical Samoan *fale* where *matai* and other community representatives frequently meet.

Photo credit: Barbara Dovarch

Prior to P3DM, community representatives were often seen by government officials as having a passive attitude during consultations. Government officials usually adopted a lecturing style in meetings with community members, using PowerPoint presentations and information leaflets, often without success. When MNRE staff first talked about the participatory mapping activities and the process of 3D model construction, people became much more interested and engaged. However, many leaders initially thought that the government wanted to map their land to get more information and take it over. A few persisted with this belief so did not take part, but most *matai* gave P3DM a chance because they were attracted by the opportunity to build a model of their lands.

The P3DM process offered community members the chance to express their understanding of their lands and resources and actively take part in a resource management process which could benefit their livelihoods. The interest generated by P3DM, and the resulting desire to collaborate, was necessary for the government to initiate a proactive dialogue with local communities. This was particularly important for MNRE projects, where adaptation measures to mitigate environmental impacts generated by climate change, require active community involvement. Generally, a high level of community awareness is required for adaptation measures to be sustained in the long term, and community-driven resource management is among the most effective approaches to management of customary land.



Figure 3. Ministry of Natural Resources and Environment staff with Laulii-Falevao completed P3D model.

Photo credit: Paulo Amerika

Model construction and perspective change

Construction of the 3D model was, everyone agreed, an amazing and useful experience. Although some conflict arose about village boundaries when people started populating the model, community members were able to ‘think beyond borders’ when they considered their territory as an ecosystem. “We thought we knew our land like the back of our hand but thanks to the model we were able to learn much more,” one community member explained.

Community members stated that P3DM allowed them to better understand the distribution of resources such as springs, water courses and different types of forests. They were able to identify, physically locate and evaluate their territory’s vulnerabilities and potentials, and understand why mitigation measures were required. The presence of experts from different MNRE divisions (Forestry Division, Disaster Management Office and Water Resource Division) during model-making, contributed significantly to the learning process.

In particular, people developed a clearer understanding about spatio-temporal interrelations between causes and effects within their own territories, and were able to visualise current and potential future impacts of their actions. They realised that they played a central role in environmental protection and that changes in their behaviour could increase quality of life in the long term and reduce the risk of disasters. For example, cattle farmers learned how important it was to keep their livestock away from springs and streams, and the community realised the consequences of environmental pollution such as throwing rubbish into rivers. Communities identified the edges of nature reserves and the extent of flood prone zones, and became conscious about balancing forest preservation and agricultural land productivity, both in upland and lowland habitats.

Together with MNRE’s technical team and using the 3D model as a reference, communities planned and then implemented several interventions: they established intercrop plantations in collectively-managed agroforestry plots for village consumption, sale and export; put up fencing to keep livestock 20 metres away from rivers; built water catchment and water delivery systems; and constructed and managed tree nurseries. In collaboration with the Samoa Farmers Association which actively supported the initiative and all intervention activities included farmers’ training.



Figure 4. Nurseries intercrops water catchment and demo-plots. All implemented after P3DM.

Photo credit: Barbara Dovarch

The process of model-making and consequent collaborative implementation of actions, triggered an important behavioural change within the community. The P3DM's eco-systemic perspective called for an integrated community engagement and management approach which was fundamental in developing deep-seated environmental awareness within the community.

Mutual learning and model custody

Elders and young people had the chance to talk around the model, allowing intergenerational knowledge exchange on nature, culture and history. Elders, for example, were able to identify and locate toponyms – ancient place names related to indigenous narratives and local history. The learning environment, however, involved not only community members but also government officials. Government officials learned a lot from this process. They admitted they ignored some information provided by the local communities, particularly relating to cultural aspects, traditional techniques (both in fishing and in agriculture) and 'secrets' related to local biodiversity. For example, they were made aware of a little-known fish species called *aa* in Samoa which can be found only off the beach of one specific village. Also, government officials and young people learned about the origin of some traditional Samoan sayings and proverbs, particularly relevant in Samoan culture, with many strongly related to the physical environment. This enabled communities,

to map out local ‘biocultural diversity,’ which Maffi and Woodley (2010) defined as the strong and rich contextual interlinkage between culture and nature.

The value and sense of pride that people developed towards the P3DM process and the relief models was extraordinary. It was common to find P3DM participation certificates hanging on the walls of farmers’ living rooms, positioned among important family pictures and religious icons.



Figure 5. P3DM workshop attendance certificates and pictures feature on the walls of farmers' homes.

Photo credit: Barbara Dovarch

The models expressed, in many different ways, the community’s sense of belonging to a specific territory. However, the sense of ownership communities felt over their models did lead to some conflict. ICCRIFS, for example, involved numerous villages within a project site. Not only did the size of the model make it difficult to move, but all of the different communities involved wanted to keep it. The models are being temporarily stored in government buildings until an agreement can be reached. In theory they are accessible for everyone; however, during evaluations with participants many highlighted the absence of models in their villages, the importance of keeping them for planning and management purposes and the need to have them readily accessible.



Figure 6. United Nations Development Programme and Ministry of Natural Resources and Environment staff discussing around P3D models stored at the government building.

Photo credit: Paulo Amerika



Figure 7. Community representatives posing around the 3D model of Mt Salafai they proudly contributed to.

Photo credit: Paulo Amerika

P3DM processes under the GEF Small Grant Programme

The positive effects of P3DM generated interest among villages adjacent to project sites and from communities that had initially refused to be involved. While ICCRIFS did not have the financial resources to conduct additional P3DM processes, the communities were encouraged to pursue alternative funding options, such as UNDP's GEF Small Grants Programme (SGP). Leaders from two villages, Faleseela and Letogo, presented a joint P3DM project proposal to SGP and explained their objectives and budget. The application was accepted, the grant was assigned and community representatives were able to directly manage funds for the model's construction and for the implementation of resulting actions (different from ICCRIFS and other MNRE projects in which the financial aspects were managed by the government).

The two villages operated independently but both asked for the technical assistance of MNRE; this allowed the models to be manufactured in, and kept by, the villages. In both villages, anybody could participate in model-making together with the *matai* and the main representatives. After the model was constructed, participants were able to show it to the rest of the community, so everyone was made aware of the process and its purpose, and had a say on the model's features.



Figure 8. Completed P3D model of Faleseela.

Photo credit: UNDP Small Grant Archive

In Letogo village the model is used as a reference during community meetings and discussions related to village social issues and land management. Schools also use it to teach children about their territory and climate change. Moreover, as the representatives within the community rotate often, the model is a useful tool for new representatives to understand why certain decisions were made previously, and to be aware of villagers' intentions for the future. In Faleaseela village the model is based at the Lalotalie ecotourism resort and used as an 'orientation device' before waterfall and rainforest tours as well as to show the location of culturally significant places.

The P3DM process financed by SGP represents a very interesting example of an entirely community-driven process. It proves the benefits of P3DM, and shows how a government initiative can turn into a bottom-up process and how communities can learn from each other to improve the process.

Relational, procedural and structural changes

Through P3DM, communities felt that the government had changed the way they related to people, from a 'teaching' to a 'listening' approach. They moved away from 'consultations' towards active 'participation' (Arnstein, 1969), generating relationships of trust with communities. Government staff visited the villages more often after model construction to support the implementation of actions, and became more collaborative and open towards people's requests and proposals.

From the government's point of view, P3DM completely changed the attitude and approach of communities towards their own environment and land management, even when their behaviour was conditioned by cultural values and was harder to modify. For example, in Samoa, trees are cut down, not only for the provision of wood or agricultural purposes, but also because trees create shadows and a sense of oppression. Too many trees close together are considered by Samoans to impede the view of the sky and contact with God. According to officials, P3DM helped to sensitise people to the benefits of conservation and monitoring of forests, and generated an interest in natural resource management and a willingness to learn. These are all crucial conditions for effective implementation of programmes aimed at improving environmental management.



Figure 9. Meetings for participatory evaluation of P3DM practice with *matai* and community representatives of different villages.

Photo credit: Barbara Dovarch

Behavioural changes on both sides completely transformed the relationship between government and communities which resulted in other 'procedural' and 'structural' changes. P3DM is now indicated as a community involvement tool in various Management Plans of several government divisions (Forestry, Water, Urban Planning). P3DM is also mentioned in the proposed new National Forestry Policy. The new policy, which is being approved by the government, also addresses climate-change-related issues. MNRE technical staff are collaborating with the Secretariat of the Pacific Regional Environment Programme and CTA in South–South initiatives aimed at promoting P3DM in other countries through peer collaborations with local governments. So far, the alliance has promoted P3DM in the Cook Islands, Nauru and Tonga.

An important precedent

By the end of 2016, 19 models had been constructed and four models had been digitised, in just 4 years. This conveys the remarkable level of P3DM activity that has taken place and the reliance on this approach. Features represented on the models are georeferenced and this means that they can be easily digitised using geographic information system software. This enables stakeholders to easily update models, allowing data layers to be added and

data to be integrated for cross-cutting analysis, risk assessment and impact evaluation or prediction.

The fruitful interaction between the government and communities in Samoa has demonstrated the effectiveness and value of this approach. P3DM is soon to become a consolidated practice for rural development planning, integrating community participation in natural resource management procedures.

The Samoan P3DM experience challenges the common perception of such processes as either top down or bottom up. While the process was initiated by the government as a way to engage with local communities (top down), these communities subsequently called for greater engagement in the process and initiated new processes themselves, such as the SGP (bottom up). In this sense, participation in the Samoan case can be conceived as a circular process, with actors from different levels (from the 'top' and from the 'bottom') interacting in a continuous and multidirectional collective cycle.

In summary, the Samoan experience demonstrates how such a collective, hands-on approach can trigger deep-seated behavioural change and how positive transformation in relationships among different stakeholders, as well as in their attitudes and perspectives, can influence both approaches and policies while contributing to institutionalising participatory practices.

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