

# THE POWER OF MAPS

Bringing the third dimension to the negotiation table

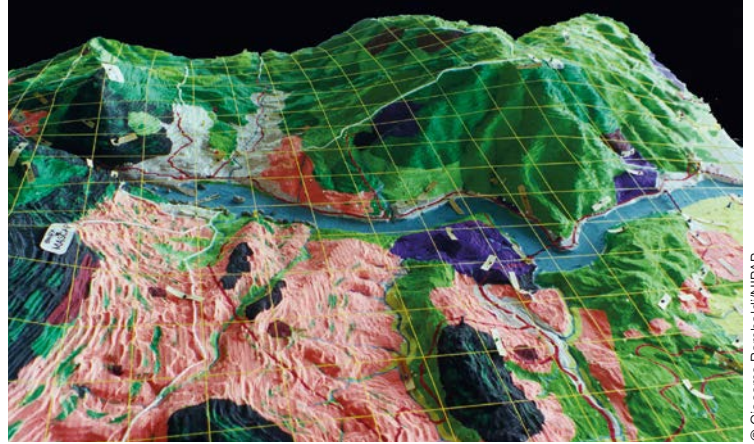
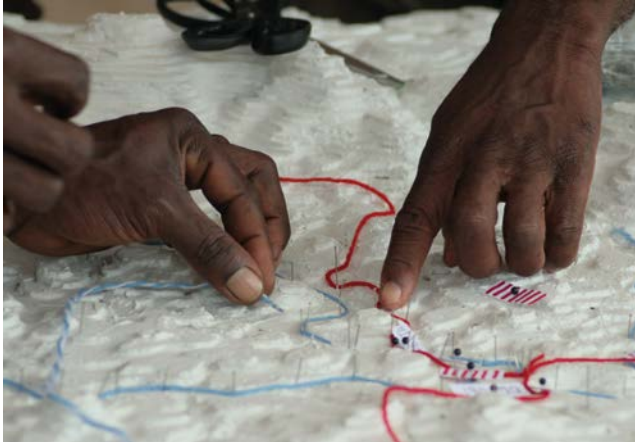


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*Knowledge built up over time and passed on from generation to generation represents a valuable asset for rural communities when it comes to their land and aquatic resources. Being able to collate rich spatially-defined/geo-referenced local knowledge and represent it in the form of 3-dimensional maps offers unique opportunities for local communities to plan effectively, communicate with decision-makers and make informed decisions on how to sustainably manage their resources.”*

**Michael Hailu,  
CTA Director**

This book is produced by the Technical Centre for Agricultural and Rural Cooperation ACP-EU (CTA). It draws on case studies documented and described by the actors involved, assisted by researchers conducting impact assessment exercises, and a professional journalist. All cases have a common trait which links the individual actors, as all are members of a worldwide community of practice. This community is promoting the generation and use of participatory spatial data to empower and give a voice to the grass-roots communities.



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# TABLE OF CONTENTS

4

PREFACE

**Africa tackles the climate challenge**

6

FOREWORD

**P3DM - A flagship participatory methodology for the 21st century**

8

INTRODUCTION

**Bringing the third dimension to the negotiating table**

10

CHAPTER 1

**Starting at the bottom of the value chain**

A stepping stone for genuine grass-roots participation

22

CHAPTER 2

**Giving a voice to local communities**

Whose knowledge counts?

50

CHAPTER 3

**Building on skills and reputation**

Mastering Participatory 3D Modelling: an empowering asset

# Africa tackles the climate challenge



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One of CTA's core values states that "CTA will strive to empower the individuals, groups, organisations and networks with whom it works, while respecting the richness and diversity of their voices, by enabling them to build and strengthen their capacities and become self-reliant." To become self-reliant in an increasingly challenging environment, rural communities must be capable of making informed decisions, fully documenting the knowledge and processes which led to such decisions, communicating with key stakeholders and advocating for their cause. In other words, becoming equal and respected actors in policy-making processes. Farmers, fishers, livestock herders, forest dwellers and hunter-gatherers all depend on their natural resources for their sustenance and livelihoods. Knowledge built up over time and passed on from generation to generation represents a valuable asset for rural communities when it comes to their land and aquatic resources. Being able to collate rich spatially-defined/geo-referenced local knowledge and represent it in the form of 3-dimensional maps offers unique opportunities for local communities to plan effectively, communicate with decision-makers and make informed decisions on how to sustainably manage their resources.

Mainly confined to government agencies up until the 1980s, geographic information technologies have since become increasingly accessible to ordinary people. These technologies are now pervasive in our day-to-day life, as most of our actions when using modern mobile devices are recorded in space and time. Data is gathered with the added value of its geographic location and becomes spatially meaningful as distribution over the territory becomes apparent. The "bird's eye view" helps people to get a broader picture of their environment and make better use of spatial data.

Participatory geographic information systems (PGIS) combine a range of geo-spatial information management tools and methods such as sketch maps, participatory 3D models (P3DM), aerial photographs, satellite images, global positioning systems (GPS) and geographic information systems (GIS). CTA has been in the forefront of activities to promote PGIS across African, Caribbean and Pacific countries.

Impact assessments undertaken in all six ACP regions have documented how empowering PGIS can be for rural and at times marginalised communities.

This publication documents some of the success stories that have emerged as a result of CTA's initiatives in PGIS in recent years. We are firmly committed to building the capacities of our partners to make better use of PGIS, so they can have a voice in the development of sound policies for agricultural development and sustainable management of natural resources.

**Michael Hailu**  
**CTA Director**



# P3DM – A flagship participatory methodology for the 21st century



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**P**articipatory 3D modelling (P3DM) is one of the most remarkable innovations of the late 20th century. It is remarkable because it brings together three elements that many would consider incompatible – local spatial and natural resource knowledge, geographic information systems (GIS) and physical modelling. As the inspiring accounts in this volume show, it can do this in many environments, of varied sizes and involving many people, sometimes more than a hundred and inclusively, both young and old. When well prepared and facilitated, as so amply illustrated here, the process gives rise to a progressive creative synergy. This empowers communities, by enabling them to share and express in lasting visual form the rich detail of what they know and by providing them with a tool for analysis, decision-making, advocacy, action and monitoring.

P3DM has its roots in participatory mapping, which spread so rapidly in the 1990s. Like participatory mapping, it expresses the principles of PRA (participatory rural appraisal), such as ‘ask them’ (putting people’s knowledge first), ‘they can do it’ (having confidence that people can do something until proved otherwise) and ‘facilitate rather than teach’ – these three combining in outsiders’ attitudes and behaviour, which are empowering rather than domineering. To the many questions about who? and whose? – (whose knowledge? whose reality? whose legend? whose model?) – the answer is repeatedly ‘theirs’. And their knowledge is expressed in a dramatically striking and authoritative way, by adding geo-referencing and the third dimension.

This volume bears testimony to the multiple uses and values of P3DM. In the examples described, the uses to which communities have put their models include natural resource planning and management; land and ocean rehabilitation; mapping their ancestral territories and establishing their rights;

planning for conservation; disaster risk reduction and adaptation to climate change and variability; educating children in schools about their history and cultural heritage; bringing together community members with differences; and negotiating with officials and influencing policy.

P3DM transforms community perceptions, interactions and confidence. The process of making the model brings people together, as does the picture that is gradually built up through a cumulative sharing of knowledge. Through visualisation, the model represents much more than any one person knew, or more than anyone knew that they knew collectively. People have been surprised by the extent of their knowledge systems. Older members of the community are often the main sources of knowledge, while younger people do most of the modelling: this brings generations together in a collaborative, creative activity, over days or weeks. People are reconnected with their past and see their present in a new light. The model is like a mirror for the community, in which they see themselves and their environment and resources differently. Collective planning and action become easier and better through use of the model. Pride, trust and self-confidence have a chance to build up. Models have transformed relationships, as outsiders view the participants with new respect. Officials have been astounded. The playing field with outside organisations is levelled. Again and again and in so many ways, P3DM is empowering.

Models are fully owned by their creators. 2D participatory maps recorded on paper have often been removed by outsiders; even when they are retained, they are less valued, less cared for and less permanent. But with 3D models, there is no question who they belong to and where they stay. The community that made them keeps them. The models become part of the community’s lasting



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**A woman from the pastoralist community of El Fasher in Sudan explains the 3D model to Mr. Hamza Khalil, Minister of Environment, North Darfur State.**

heritage, a source of learning and empowerment that will be treasured and used for many years ahead.

P3DM has been spreading. South-South communication, training and facilitation have taken place, between Caribbean and Pacific Islands, between the Democratic Republic of Congo (DRC), Ethiopia, Kenya and Uganda and between Gabon and the DRC, to name but a few. Let me hope that the accounts written here will inspire many others to follow in these footsteps and that many more communities will be brought together and similarly empowered. This may not easily happen fast: to be done well, P3DM requires materials, skills, time, patience and good facilitation. Let there be more South-South sharing. Let many more funders, training institutes, NGOs and other agencies gain the skills and the commitment to spread P3DM wider and more rapidly. The potential is huge. It would be wonderful if this could become an exponentially self-spreading movement, which contributed to transforming relationships within

communities and between them and their outside world. It could increasingly empower those who are marginalised and weak, so that they gain a stronger voice, assert themselves with more confidence and negotiate with others for recognition and a fair deal.

I applaud and congratulate all those, CTA and Giacomo Rambaldi in particular, who have so boldly and creatively innovated and acted to make P3DM a reality. I wish them and all others who become committed to P3DM every success in bringing it to more and more communities. Let me urge all who read these pages to tell others about this extraordinarily powerful innovation and to do what they can to spread it. Here indeed is a flagship participatory methodology for our 21st century.

**Robert Chambers**  
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# Bringing the 3rd dimension to the negotiating table

**P**articipatory 3-dimensional modelling (P3DM) is a community-based mapping practice that is proving a powerful communication tool in a range of African, Caribbean and Pacific (ACP) countries, helping people in rural areas to record tacit knowledge and bridging language, education and cultural barriers in the process. Developed in the early 1990s in Southeast Asia, the technique integrates local spatial knowledge with data on land elevation and sea depth, producing stand-alone, scaled and geo-referenced relief models and derived maps that can be used for community advocacy and to visualise complex spatially-defined issues.

**In a growing number of cases, PGIS tools are combined with social media to help grass-roots communities add value and authority to their local knowledge and have a voice in policy-making processes**

One of a variety of geo-spatial information management methods that come under the umbrella of participatory geographic information systems (PGIS), P3DM is proving particularly effective in helping disadvantaged groups to enhance their capacity in generating, managing, analysing and communicating spatial information.

Essentially based on local spatial knowledge, a participatory 3D model portrays land use and cover – together with other features – with the use of pushpins (points), yarns (lines) and paints (polygons). The knowledge is generally supplied by elders in the community, while map-making is carried out by younger members. Once completed, the physical model remains with the community. Once free, prior, informed consent (FPIC) has been obtained, data is extracted, imported into a GIS and strategically shared by the knowledge holders or their trusted intermediaries.

Used appropriately, the practice can have profound impacts on community empowerment and sustainable natural resource management. More importantly, by placing control of access to and use of culturally sensitive spatial information in the hands of those who generated it, P3DM offers an opportunity to protect traditional knowledge from outside exploitation.

In a growing number of cases, PGIS tools are combined with social media to help grass-roots communities add value and authority to their local knowledge and have a voice in policy-making processes. Indeed, building on local knowledge and values has proved to be a driver of sustainable development tailored to local conditions.

CTA has been instrumental in introducing the practice in ACP regions. To date, it has launched P3DM in the Pacific (Fiji, 2005), East Africa (Kenya, 2006), Central Africa (Gabon, 2010) and the Caribbean (Trinidad and Tobago, 2012) and has supported its replication by building capacity within national and regional organisations and stimulating resource mobilisation. The outputs of P3DM-related activities – reports, blogs, multimedia, published papers and online maps – have been used at various international forums to document the value of local and indigenous knowledge in the domains of sustainable natural resource management, conflict management and climate change adaptation and in bridging the gap between scientific and traditional knowledge systems.

P3DM activities in Fiji won the prestigious 2007 WSIS World Summit Award (WSA) in the e-culture category. The WSA is the global follow-up initiative of the United Nations World Summit on Information Society (WSIS). ■





Members of the Ogiek people working on the 3D model of their traditional lands in Kenya.

# Starting at the bottom of the value chain

A stepping stone for genuine grass-roots participation

A value chain refers to the full range of activities required to take a primary product from production to consumption and disposal after use. It is a sequence marked by value growth and coordination at each stage of production, processing, marketing and distribution, driven by consumer demand. For many observers, the distinguishing feature of a value chain is that all actors work with the final market fixed firmly in their sights. A value chain carries with it a range of support functions, such as input supply, financial services, transport, packaging, market research and advertising. However, value chains come in all shapes and sizes. At its most basic level, a chain may simply involve a farmer, a processor and a buyer.

**Increasingly, value chain improvement and development are being actively pushed as the answer to problems of low producer incomes and poor market access for smallholders and a way of promoting sustainable management of the natural resource base**

Increasingly, value chain improvement and development are being actively pushed as the answer to problems of low producer incomes and poor market access for smallholders and a way of promoting sustainable management of the natural resource base. This is where participatory 3-dimensional modelling (P3DM) comes in - offering an effective and precise way to document current resource management practices.

The physical 3-dimensional representation of space offers users a “bird’s-eye view” and a common

perspective from which to acquire a holistic view of land and seascapes, in which landmarks and salient features are visible to all. The process of making a physical 3D model, or of using it as a reference for discussion and planning, facilitates mental comprehension of spatial data.

The transparency of displayed information is a valuable part of the process. All features presented on a model and included in its legend are the result of negotiated and cross-checked contributions by local knowledge holders. Having a shared understanding of the land and seascapes greatly enhances individuals’ capacity to analyse the territory for comprehensive planning, while interacting on a peer-to-peer basis. The concurrence of all these factors makes 3D models excellent tools for collaborative planning and helps stakeholders deal with issues and conflicts associated with the territory and use of its resources. It also helps to focus attention on growing demands by consumers – at the very end of the value chain – to guarantee sustainable natural resource management.

To date, P3DM processes have been successfully used to prepare management plans addressing land and resource use, watersheds, protected areas, ancestral domains, disaster prone areas and more.

The stories that follow document cases in Ethiopia, Fiji and Madagascar, where P3DM has led to the development of community-driven natural resource management plans. More importantly, the process has generated a perception that those who contributed their knowledge to them own such plans. The result has been intellectual appropriation and a greater commitment to implement the plans, with documented impacts in the cases of Ethiopia and Fiji. ■



View of a village in the Avaratrambolo water catchment area in central Madagascar.

## STORY 1

## Increasing production through sustainable land and marine resource management

More fish, more agricultural produce and more visitors – that is the result of a community-driven process launched a decade ago on a Fijian island. At the heart of the new approach was the creation of a 3D map. Building the model involved all the island’s villages and helped residents visualise where action was needed to manage natural resources sustainably.

A 3D participatory mapping (P3DM) exercise in Fiji has proved a powerful catalyst in developing improved natural resource management. Farmers and fishers on the island of Ovalau have adopted more sustainable land use and fisheries practices, with significant increases in production as a result. Concrete impacts have included a doubling of fish stocks, a sizeable increase in crop output and a rise in the number of tourists visiting the island.

**Managing resources in a sustainable manner has been hampered by ineffective methods of communication and knowledge sharing. Local knowledge is typically scattered or invisible and valuable historic data on resources is often transferred orally**

The building of a participatory 3D model was designed to promote informed decision-making by local communities on how to manage the land and marine resources on which their livelihoods depend. In Fiji, native communities are the custodians of 87% of land area and of all the coastal and marine environments up to 12 miles offshore. But managing these resources in a sustainable manner has been hampered by ineffective methods of communication and knowledge sharing. Local knowledge is typically

scattered or invisible and valuable historic data on resources is often transferred orally.

With support from CTA and local partners, the 3D initiative, carried out in 2005, mapped the entire island. Ovalau covers an area of 106 km<sup>2</sup> and has a population of 13,000. Pupils from two high schools built the model, while leaders of the 27 villages took charge of plotting features on the map on behalf of their communities. Eighteen trainees and three resource staff from various local, regional and international institutions also took part in the model-making.

The P3DM exercise, conducted as part of a new approach by the Fiji Locally Managed Marine Area (FLMMA) network to address overfishing and poor land-use practices, went on to win the 2007 World Summit Award in the e-culture category. The FLMMA network seeks to conserve ocean life by engaging local people in decisions on resource management. With the help of the 3D map, dwindling fish stocks and unsustainable farming practices were identified as key problems on the island.

“The fishing was not as productive as before, due to overfishing. There was serious pollution from the local fish factory and farming was done with no consideration of sustainable practices,” said FLMMA Technical Advisor Alifereti Tawake. “Farming was carried out on sleep



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Residents of Ovalau Island in Fiji discuss issues related to the inland valley using the 3D model as a reference.

slopes, causing soil erosion and farmers used large quantities of chemical fertiliser and pesticides. Increasingly, farmers were moving into watersheds and there was a general lack of awareness about land boundaries, causing tensions between some families.”

Taking the model as their starting point – and the problems that it clearly highlighted – the people of Ovalau decided to pursue a more sustainable development strategy, drawing up and implementing their own management and action plans. Twelve of the villages set up locally managed marine areas (LMMAs) – areas of nearshore water and coastal resources that are managed at local level.

The communities created eight taboo areas where fishing would no longer be allowed. Other

sustainable fishing management strategies developed in a series of post-mapping workshops and meetings included the introduction of rotational closures and periodically harvested closures. The latter is a system that closes the reef to fishing on the occasion of a village function, such as a wedding. Strict controls were placed on licences issued to commercial fishers, with a limit placed on catches.

“The natives of Ovalau saw from the 3D model that their fishing areas are very small compared to their population,” said Mesake Draniatu, a district development officer who took part in the 3D modelling exercise.

The impact as the strategy developed over the next few years after the model-making was tangible. “The result has been that catches off

Ovalau have doubled since these management tools were introduced,” said Tawake. “For example, when the taboo area was opened after 5 years, 600 fish were caught in 3 hours. Before, it would have taken twice that time to catch the same volume.”

The post-mapping strategy encouraged more farming using sustainable practices in order to reduce pressure on fish stocks. The map helped communities to locate relatively flat areas where farming could be practised without causing soil erosion. Better land management practices led to significant increases in agricultural output and with support from the Department of Agriculture, some farmers started exporting their produce. A programme was launched to involve young people in agriculture and many farmers turned to organic production.

At every stage of planning, the 3D model has been the point of reference. “One of the unique achievements for Ovalau is that they were able to use the model to base their future development,” said Tawake. “The mapping exercise helped to bring all the communities together and they saw the need for more holistic plans for marine management, waste management and sustainable farming. They used the model to plan all development on the island.

**The mapping exercise helped to bring all the communities together and they saw the need for more holistic plans for marine management, waste management and sustainable farming. They used the model to plan all development on the island**

“There are other impacts from the 3D mapping process which cannot be measured scientifically, such as the motivation it has brought to the entire community and the respect it has taught them for the environment,” he added. “Almost everyone now understands the value of sustainable natural resource management and the benefits of no-take areas. So there is an indirect link between P3DM and increased productivity.”

In keeping with the participatory approach favoured by the FLMMA network and embodied by the 3D mapping process, many of the improvements have been developed and implemented by the islanders themselves. Villages have set up committees – known as *yaubula* – for natural resource management and 22 of the 27 villages now have village development plans, based on the 3D model.

Recognition of the enlightened approach adopted by the people of Ovalau has spread far beyond the shores of this small Pacific island. The capital, Levuka Town, which was once the capital of Fiji, was listed as a UNESCO World Heritage site in 2013. Anecdotal evidence indicates that the 3D model played an important role in the proclamation process. Primary schoolchildren from the rest of Fiji frequently visit the island to see the map and learn about Ovalau’s sustainable farming and fisheries practices. Tourism has increased and a number of villages are developing this sector, using the ecotourism approach to attract visitors drawn by the well-managed coastal resources and the healthy coral reefs. More than 10,000 tourists visited Levuka in 2013, a considerable increase on previous years and the village development plans are helping with the task of organising hospitality and entertainment for the visitors.

“All the villages in Ovalau use the 3D model as a tool to develop their management plans. It has also been used by the Lomaiviti Resource Committee as a tool in setting up the natural resource management strategic plan for 2014 to 2018,” said Mesake Draniatu. “Ovalau has become a model for other islands in the province.” ■

## STORY 2

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# An Ethiopian community takes its future into its own hands

Rural dwellers in a remote part of Ethiopia were spurred to take action when a participatory mapping exercise confronted them with the true extent of their ecosystem degradation. Now, the whole community is involved in rehabilitating the landscape.

The images are striking. Video [<https://vimeo.com/22123738>] footage shot in December 2010 shows the devastation caused by decades of unsustainable land management in the once fertile foothills of Ethiopia's Oromiya region. An area scarred by erosion and deforestation, soil fertility declined rapidly after the clearance of the natural forest in an unchecked campaign of massive tree felling for construction timber. As a result, harvests dwindled to a fraction of what they had once been. Streams and rivers were reduced to a trickle. Wildlife disappeared. The people said it was a curse from God.

Fast forward to August 2013, where a follow-up video [<https://vimeo.com/90771778>] shows an already very different scenario. A series of dams built by villagers using natural materials has trapped precious topsoil for growing crops on the lowland. A new drainage system has been dug into the steep slopes to capture run-off and gabions have been built to halt erosion. The crops are performing better as a result and harvests are more abundant. A tree nursery cared for by the community is generating saplings and several thousand new trees have been planted. A community seed bank has been built to give farmers access to locally adapted crop varieties.

The catalyst for this transformation was a 3D participatory mapping exercise in Telecho, an isolated rural community in Oromiya. Over a period

of 12 days in late 2010, more than 140 villagers drawn from the surrounding area came together to recreate the landscape through their own eyes. The map that they constructed enabled farmers to compare their past and present ecosystems, identify the root causes of their problems and develop their own solutions for the future.

In keeping with participatory mapping practice, the community was closely involved in all stages of the exercise. Local youngsters took care of the physical work in building the model, using corrugated cardboard to shape contours – a deliberate and crucial step to engaging youth in their traditional culture. The elders used their knowledge and memory to pinpoint features of the landscape and draw up a legend that would have meaning for community members. Even some not-so-young villagers could remember times when there were still forests.

The experience, which mapped an area of 28 km by 20 km with a scale of 1:10,000, helped the community to reconnect with its land and discover what it had lost.

“It gave them a bird’s eye view and helped them to discuss how this landscape-level change was affecting their livelihoods,” said Million Belay, Executive Director of MELCA-Ethiopia, the NGO that implemented the P3DM exercise, with support from CTA. “It helped them to understand the scale of the problem.”



View of the Oromiya landscape in Ethiopia from the top of Foata Mountain.

The experience also jolted villagers out of their complacency into realising that it was time to take action. “It gave them a shock. They had come to see the drying up of rivers and decreasing productivity as normal. But out of this experience came the realisation that they had to do something,” said Belay.

“In the past, this area was fully covered by forest. It was our generation who destroyed the forest,” said one farmer, shortly after the mapping exercise had been completed.

“If more disasters come, be it hunger or deforestation, everyone is responsible,” said another.

Other approaches had already been tried to help the people of Telecho and surrounding area to halt the degradation of their environment and

restore their ecosystem. But most of these had been top-down development packages, which had produced little lasting improvement.

“People were told to do this and do that and use certain seeds and fertiliser. But it did not work because there was no consultation. The people had no say in the matter,” Belay recalls. “There were just meetings, meetings and more meetings.”

The difference made by the participatory mapping process is palpable and more progress is being made with every day that passes. With support from the NGO, community members have joined together to form an association and reclaim the land and its water sources, through a series of well-planned conservation and land management strategies. They have set about recovering their lost seed varieties – the farmers had lost 9 of their





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**Residents of the area being mapped discuss the distribution of resources on the 3D model. Telecho, Ethiopia.**

19 indigenous varieties of barley due to a reliance on improved varieties. Through exchange visits to farmers in other communities, villagers have now retrieved them all. Their community seed bank ensures there will always be a plentiful supply of indigenous seed; the building that houses the seed, which was built by villagers, also serves as a focal point for discussions and planning.

More than 100,000 indigenous saplings have been planted to cover the once bare hillsides. The young trees are already helping to protect the soil. Fodder trees and bushes have been planted to feed the cattle and the villagers have received training in compost making, in an effort to wean them off chemical fertiliser. Farmers report better grazing for their sheep and cows, as well as increased crop production. A new water system, developed by the villagers from a local spring, ensures a supply

of safe drinking water for the community and for their animals, with enough to irrigate home gardens where the women have planted vegetables.

Most of all, the community project has resulted in changed attitudes, with people learning new skills and developing greater social cohesion.

“The P3DM process is much more important than the product,” said Belay, who has conducted a total of ten exercises in Ethiopia since he was first trained by CTA in 2006 in Kenya and later mentored through CTA-led network support. His services are now widely sought as a professional facilitator and consultant for participatory mapping.

“The most important aspect of this modelling is the opportunities it creates for discussions. It brings

generations together to talk about the past, the present and the future.”

The mapping exercise has stimulated self-reflection among many community members. Older villagers working on the model said it provoked powerful memories of the way the landscape had once looked, with rich forests and abundant rivers, making them realise that their unsustainable practices had destroyed what they once had.

“The P3DM process enables the community to look at itself using the model as a mirror,” reflected one villager afterwards. “I felt that, as we destroyed the natural resources in our surroundings, we lost the soil, the forest, wild animals and more,” commented another. “This in turn is harming ourselves and creating problems for coming generations.”

### **Involving community members has been key to the success of the mapping exercise and its follow-up.**

**The process involved both men and women, working in shifts, with lively discussions and exchanges taking place**

The process of building the model also helped the community to make discoveries about its own environment and gave the people a sense that they could do something to change their future.

“I noticed that it [the process] helped me understand the importance of participation. I also realised that the community has valuable knowledge that we were not aware of,” said one farmer.

Involving community members has been key to the success of the mapping exercise and its follow-up. The process involved both men and women, working in shifts, with lively discussions and exchanges taking place and traditional dances staged to herald the start of the activities each morning. Once completed, the model stored 48 layers of information and was proudly presented to the wider community and government

representatives during the closing ceremony. As well as 300 villagers originating from all 28 *woredas* or districts covered by the map, also present at the inauguration were representatives from parliament, local government, CTA, the Finnish Embassy in Ethiopia and delegates from nine African countries, representing NGOs and universities. Impressed by the initiative, the Finnish Embassy has since given financial support to help fund follow-up activities to rehabilitate the environment in the project area.

In tandem with the map-making, a group of local young people took part in a participatory video-making exercise to document the process. Being involved in the experience has helped young people in this remote corner of Oromiya to learn about their community’s past and culture. It has also galvanised them into taking action, giving them determination to shape a new future. The map is still being used by the community. School children come to visit and to learn from it.

A professional media team documented the mapping exercise and returned two and a half years later to record the considerable progress that had been made. Some 20 delegates from Benin, Cameroon, Ethiopia, Kenya, South Africa, Tanzania and Uganda were involved in co-facilitating the Telecho 2010 participatory mapping process. All the national and international trainees involved in the initiative have expressed their intention of replicating P3DM in their own areas. The hope is that the experience in Telecho will have repercussions that go far beyond the boundaries of this remote corner of rural Ethiopia. ■

## STORY 3

# Mapping in Madagascar – from scepticism to ownership

A community in a vulnerable watershed area in central Madagascar was deeply suspicious when the idea of a P3DM exercise was first suggested. Now the farmers and their families have proudly embraced the model and are queuing up to take advantage of the new potential it has unveiled for improved resource management and income generation.

A participatory 3D mapping exercise in the Avaratrambolo water catchment of central Madagascar did not have an auspicious beginning. Of the 2,000 people living in the area, only about 40 turned up for the preparatory phase in September 2014. Many members of the local community were convinced that the initiative would somehow end up depriving them of their land. Land grabbing is a highly sensitive issue in this part of Madagascar. Even the water engineer, who represented the main contractor in the P3DM project implementation, was unenthusiastic. For Serge Lala Rakotoson, it was his first experience with participatory mapping and he had doubts about the outcome.

“Being more used to working with aerial photos or satellite images, I was quite sceptical at the beginning about the idea of a P3DM exercise for the research project in the Avaratrambolo watershed,” said Lala Rakotoson.

It did not take long for all those involved in the P3DM initiative to change their minds. Encouraged by some of the village elders, who had intuitively understood the potential of reproducing their landscape in the form of a physical and tangible 3D model, other community members warily agreed to take part in the exercise, which took place over a 10-day period in February 2015.

Slowly at first and then more rapidly, the villagers started allowing themselves to be drawn into the process of mapping the land where most of them had spent their entire lives. Even the poorest farmers, initially reluctant to attend the sessions due to lack of self-confidence, were gradually encouraged to make a contribution.

Avaratrambolo, an area of hills and valleys, suffers from low fertility and badly eroded soils. Rice cultivation in terraced valley bottoms forms the heart of the farming system, with irrigation water mainly drawn from natural springs. But these are not sufficient to irrigate the whole valley. Farmers plant off-season crops, such as potatoes and green peas, after the rice harvest and rain-fed agriculture – cassava, sweet potatoes, maize and beans – is practised on the steep hillsides. With a rapidly increasing population, better water productivity is urgently needed if households are to improve their livelihoods.

Gradually, as the community became involved in building the 3D map, pinpointing features on the landscape – young and old working side by side to create a physical map of their shared land and space – a subtle shift took place.

“Their behaviour changed,” said Andrianjafy Rasoanindrainy, an ICT specialist who organised the P3DM exercise. “They soon began to see the



Local stakeholders and guests listening to the chief presenting the content of the 3D map.

3D model as a point of reference, to clear up confusion on any point regarding their territory.”

The 3D mapping exercise, the first of its kind in Madagascar, was launched as a planning tool in a watershed where land and water shortages were creating tensions. Introduced as part of a rural development project called *Ndao Hivoatra* (Let’s move towards change), the 1:3,000 model covered an area of more than 13 km<sup>2</sup> in the rural commune of *Ambohitrolomahitsy*, encompassing three *fokontany* – traditional Madagascan villages or groups of villages.

“Until then, no one had tried to tackle the problems, but when the community built the map, it focused their attention on these issues and prompted constructive discussions. It helped people to see in greater depth what

was available,” said Rasoanindrainy, who is Executive Director of Farming and Technology for Africa, a development organisation based in Antananarivo. “It showed all participants there was actually a lot of space available, so they could see the potential for better water catchment, management and irrigation and reorganise some of the land.”

Water engineer Lala Rakotoson was among those swiftly converted to the value of the 3D mapping exercise, though it produced some surprises even for him:

“It was seeing the active involvement of men, women and especially children in making the 3D model that I was able to understand the power of the P3DM exercise in mobilising the community and building collective knowledge,” he said. “I

have been working in this area for 3 years now and the map has made me realise that there were water points which I didn't even know about." Other details to emerge were the existence and location of sacred places, of key importance to local culture.

The post-mapping phase, which involved planning improved land and water management, attracted an enthusiastic response. This stage was aimed at helping local farmers to increase their revenues, diversifying from onion, garlic and rice production to grow other crops, including medicinal, fruit and nitrogen-fixing trees to increase long-term incomes and improve nutrition. The 3D model enabled planners to identify new areas for food production and technical staff were brought in to show producers sustainable production techniques. Demonstration plots were set up. Unused spaces clearly visualised on the model were planted with other trees to supply fuel and timber and leaves for composting, as well as to combat soil erosion and improve water retention.

The number of people wanting to be involved swelled almost overnight. "All the farmers quickly began to see the potential for them," said Rasoanindrainy. "The demand was so great that the technicians were overwhelmed."

The process was led by Barthélemy Boika Mahambi, a skilled P3DM facilitator from the Democratic Republic of Congo (DRC), engaged by CTA for the purpose. He was supported by Dominique Bikaba, Executive Director of a sustainable development and conservation NGO in DRC and 10 Malagasy students who acted as co-facilitators. Bikaba attended the event with CTA support. The Centre invests in promoting the adoption of the P3DM process throughout ACP countries.

"It was a very useful exercise, not just for planning forestry, but also for land management," said Bikaba. "It put the community in a position to be able to advocate for their territory, their land and their community."

Farmers involved in the mapping later spoke of their initial hesitation, of their change of heart and of the way the P3DM experience brought the community closer together.

"There was a real sense of group solidarity," said one farmer. "And a sense of development throughout the process," added another.

### **Farmers involved in the mapping later spoke of their initial hesitation, of their change of heart and of the way the P3DM experience brought the community closer together**

For Rasoanindrainy, the most striking feature of the participatory mapping exercise was the way that community members quickly became attached to the physical 3D model, seeing it as their own creation and acknowledging it as something to be proud of. Little more than a month after building the model, the people of Avaratrambolo were invited to show it to officials from the Ministry of Agriculture and to describe their thoughts about the experience.

"The ministry officials were astonished by the level of understanding shown by the farmers," said Rasoanindrainy. "The people had taken ownership of the 3D model and the process. They built it and they now use it, like something that they know in detail – something that is theirs. Now, when farmers talk about land, water or forests, it is always in relation to the model." ■

# Giving a voice to local communities

## Whose knowledge counts?

The P3DM process fosters the emergence of local knowledge about the agro-ecosystems that people depend on for their livelihoods and daily trade. In the presence of elders – custodians of traditional knowledge – and youth, it facilitates inter-generational knowledge exchange and raises awareness across different age groups about changes over time. The experience also helps to stimulate community cohesion, encouraging people to share information and concerns and often reinforces community self-actualisation through the revival of local culture and knowledge. In many instances, participants report that the P3DM process enables them to gain a more holistic understanding of their social, cultural and biophysical environments and they realise the importance of working together towards a common goal. They also become aware of the value and potential authority of their knowledge after it has been collated, geo-referenced, documented and visualised. Evidence collected in the field shows that P3DM, conducted in response to local needs or external threats, has yielded positive effects in terms of community identity. A well-displayed 3D model is appealing, fuels self-esteem and a sense of intellectual ownership and becomes part of the local cultural landscape. Villagers frequently use these models to introduce visitors to the area – a simple act that signifies peer-to-peer information sharing and calls for silent acknowledgment of the existence and relevance of local knowledge.

Information on a 3D model is easily understood because multiple stakeholders have played an active role in compiling it and defining its legend – the key to decoding what is on display. In providing open access to information, 3D models add transparency and create common ground for discussion. They broaden individual perspectives and limit the distortion of messages between communicating parties by offering a shared language of colours, shapes and dimensions. In

doing so, 3D models and derived maps bridge language barriers and facilitate communication on issues linked to territory and its resources. This is particularly valuable for people of different education levels, cultural backgrounds and with diverse or conflicting interests.

The power of participatory data – complemented by scientific data – has laid the foundations for successful community-led negotiations on land occupancy and resource access and use. Participatory geo-referenced maps, produced through the integration of P3DM with other information and communication technologies (ICTs), serve as powerful evidence in negotiation processes. Maps reproduce people’s geo-referenced knowledge in a cartographic format that is understood by “outside” recipients; this places insiders (i.e., community members) and outsiders (e.g., scientists, government officials, consultants, etc.) on an equal footing, thus facilitating interaction, reciprocal learning and negotiation.

Models and derived paper or digital maps can be used as part of a communications strategy to foster legal and policy reform at national level. Consensus surrounding a map lends legitimacy to political debate in an open society (Alcorn, 2000). The combination of P3DM, Web 2.0 and social media has proved to be effective in strengthening community identity and communication capacity, as well as in empowering local stakeholders to interact with national and international institutions, as documented in the cases of Democratic Republic of Congo, Kenya, Saint Vincent and the Grenadines, Samoa and Trinidad and Tobago. ■



Ethiopian elders addressing policy-makers and using the 3D model as a visual support to their narrative.

## STORY 4

## Scaling up P3DM: A powerful community engagement tool

A move to introduce participatory 3D modelling into government-led climate change adaptation and sustainable environment management has attracted wide interest in the Pacific Island State of Samoa. Success in drawing communities into more sustainable land-use development has led to the practice being replicated in the fields of forestry, water, environment, conservation and tourism planning.

The evidence was plain for all to see. In Samoa's Mauga o Salafai National Park, on the island of Savai'i, a participatory 3D model (P3DM) clearly revealed that farming and grazing activities were encroaching on the protected area. The P3DM process raised awareness within the community about the dynamics of the terrain and the challenges posed by current land use. With support from the Ministry of Natural Resources and Environment (MNRE) Forestry Division, the Integration of Climate Change Risks and Resilience into Forestry Management in Samoa (ICCRIFS) project and technical assistance from the Disaster Management Office, the community could see the implications of environmental and climate-related risks in the area and altered its land management practices as a result. The 3D model also laid the foundations for identifying safe zones on higher ground and planning escape routes in the event of a tsunami or other natural disaster.

**The approach has stimulated significant interest from communities involved in the exercises, as well as from others who have requested P3DM initiatives of their own and has attracted co-funding from the European Union**

In Lalomalava, another village on the same island, a 3D model helped community members to consider alternative income-generating activities.

They resolved to rehabilitate coconut trees, once a key local crop, whose livelihood contribution had declined in recent times. They also identified potential areas of cultural interest for tourism development. Meanwhile in Saoluafata, a coastal community in North Eastern Upolu – Samoa's most densely populated island – a separate 3D mapping exercise helped villages to identify the steep slopes and water catchment areas. The village decided to protect the catchment area to ensure a safe quality and quantity of water supply.

Stronger community engagement is one of the many tangible impacts resulting from the Government of Samoa's decision to embrace P3DM, after being introduced to the practice during a regional workshop organised by CTA and the United Nations Development Programme (UNDP) in Honiara, Solomon Islands in 2012. Showing a strong commitment to work with communities to improve land-use management by taking into account climate change and disaster risks, the government has since completed no fewer than 17 participatory 3D models in various parts of this Pacific Island State. A further four are in the planning stage. The approach has stimulated significant interest from communities involved in the exercises, as well as from others who have requested P3DM initiatives of their own and has attracted co-funding from the European Union.





Ms Helen Clark, UNDP Administrator and Dr Naoko Ishii, GEF CEO & Chairperson are introduced to the 3D model done by representatives from 14 villages in Lauli'i to Falevao area on Upolu Island, Samoa.

Initially used as a pilot practice by the GEF-funded ICCRIFS project, which provides seedlings, sets up agroforestry demonstration plots and helps with the creation of tree nurseries, P3DM has been rapidly scaled up by the Samoan Government's MNRE in recent years. A number of divisions within MNRE, which implements the ICCRIFS project together with UNDP, have opted to use the participatory 3D mapping approach. Following the completion of the first five P3DM exercises, there has been a ripple effect in Samoa. Two schools have since undertaken P3DMs and other ministry divisions dealing with forestry, water, environment, conservation and tourism have also built 3D models.

Impressed by the result, the Samoa Tourism Authority has asked MNRE to facilitate a series of P3DM workshops to encourage sustainable

planning in view of risks posed by climate change. In the first few months of 2015, eight P3DMs were completed for tourist locations in Samoa. Tourism is the dominant sector of the Samoan economy, contributing more than 20% of its GDP. Small to medium-scale tourism operations are scattered along the coastline of the two main islands of Upolu and Savai'i, with most infrastructures located within 100 m of the shore, making them vulnerable to the impacts of extreme events induced by climate change and other factors, such as a rise in sea level.

Government staff involved in the model-building exercises and the follow-up activities planned as a result, report a far greater level of community acceptance once local people have been involved in mapping their territory and been able to visualise the challenges they face.



© Paulo Amerika/MNRE

Lord Fulvai, the Governor of Vavau in Tonga, SPREP, UNEP, Tonga Government officials and Vavau community and school children at the launching of the 3D model for Vavau.

“P3DM has been identified as a community-based planning tool where community and government are able to be at the same level – one-to-one – and agree on management actions in the best interests of the community and the government,” said Yvette Kerslake, ICCRIFS Project Coordinator and Manager at Samoa’s Ministry of Natural Resources and Environment.

In common with many Small Island Developing States (SIDS), Samoa has been promoting a reef to ridge approach to land use planning – a holistic method of managing watersheds and coastal areas. [<http://bit.ly/1VhTmEe>] But in the past, working with communities has proved difficult due to lack of interest in government initiatives dealing with land issues. International development projects are often delayed because of procurement, or other administrative reasons and communities involved

in long series of consultations struggle to recognise the link between projects’ intended objectives and actual implementation on the ground.

This was precisely the case with the ICCRIFS project, which was in its infancy and facing delays in implementation when a decision was made to try P3DM. Two staff members had been trained during the Solomon Islands workshop in 2012.

The benefits of using P3DM were quick to make themselves felt in Samoa.

“Through introducing this method we saw the change in the community in terms of commitment and interest in the project,” said Kerslake. “The P3D Model development and workshops have been a great success for the ICCRIFS project. This is true not only in terms of delivery, but in terms of

reaching key objectives of the project for engagement, sharing of experiences and building local ownership into the project. The P3DM model provides a bridge with the community in terms of seeing and relating to the end product of the project.”

“After constructing this model you gain a community’s trust,” added ICCRIFS Agroforestry Officer Luaiufi Aiono. “Any time you come around town they know who you are, they trust what the project is trying to deliver and they trust you as an individual, who is trying to do something useful in their communities.”

As more and more P3DM exercises were held, government staff became increasingly convinced of the value of this approach.

The first exercise - conducted with technical support from Papua New Guinea-based NGO partners with Melanesians (PwM) and CTA - was ambitious. It covered 14 villages in the North East of Upolu and saw the active participation of 80 *matai* - village and family representatives - and 150 other community members, including women and girls. The 3D mapping process was broadcast on television and covered by the main local newspapers, attracting wide interest. More participatory 3D models soon followed, many of them demand-driven and all of them with one thing in common - increased support from the communities involved.

“P3DM is a great tool for us in Samoa. It is really helping our communities, schools and all stakeholders to understand the different scenarios, topography and the allocation of different resources,” said Suluimalo Amataga Penaia, Chief Executive Officer of MNRE. “Sometimes when we are carrying out consultations [without a 3D model] people are a little bit confused on what we are talking about. However, a picture speaks more than a thousand words.”

The first 3D model-building initiative proved an excellent tool for discussing watershed management and land use priorities. Communities

identified areas for conservation and forest rehabilitation as part of the ICCFRIFS project. Villagers reported being better positioned to influence land use policy-making as a result of the 3D mapping. The information plotted on the model was used to plan for Baseline Ecological Surveys and to prepare community-based management plans. It provided a grass-roots contribution to Samoa’s new forestry policy, which integrates climate change into forestry management and was also used to shape watershed management policy.

When the ICCRIFS project was showcased, during the Third International Conference on SIDS in September 2014, the P3DM component attracted strong interest. One of those present was UNDP Administrator, Helene Clark.

“It’s very important to have government involvement, support from GEF and UNDP, but in the end, the most important element is that villagers themselves are able to say: ‘this is important to us because in this way we are able to shape our future,’” she said. “I heard a lot about the 3D model. I have seen the 3D model and I think it’s fantastic.”

MNRE staff are now working to streamline P3DM technical expertise within the ministry and are already looking further to spread the technology further afield. With support from CTA, Kerslake and colleagues have invited officials from the Cook Islands to be trained at one of their P3DM workshops in Samoa. They are also planning to conduct a workshop in the Cook Islands, so as to develop South-South P3DM cooperation. “We have developed not only an interest, but a passion to share knowledge on P3DM,” said Kerslake.

“This is due to its satisfactory results for our ICCRIFS project’s overall objectives and especially to ensure community participation in planning and ownership of management activities. P3DM is certainly a best practice for community engagement.” ■

## STORY 5

## P3DM kick-starts dialogue for ousted indigenous people

A participatory 3D model is proving a powerful advocacy tool for a pygmy community evicted from its traditional lands. The exercise has helped to drive talks based on growing recognition that the indigenous people should play a key role in managing protected areas.

**T**he battle is far from over. But a participatory 3D modelling initiative (P3DM) has helped to move negotiations forward in a decades-long dispute over a decision to expel an indigenous community from its homelands. The controversy has revolved around a move in 1970 to evict the Bambuti-Batwa people from their ancestral forests in the newly formed Kahuzi Biega National Park (PKNB) of eastern Democratic Republic of Congo (DRC). The park was created as part of a strategy to protect lowland gorillas and other wildlife species.

CTA's role in the ongoing story has been indirect. In 2009, with help from the Forest Peoples Programme (FPP), representatives from the Batwa people, based in neighbouring Uganda, visited the Ogiek Community in Kenya, who developed a 3D model of their ancestral territories in 2006 and 2007, with support provided by CTA and ERMIS-Africa. That P3DM exercise helped the Ogiek to engage Kenyan agencies over their rights to their ancestral territory, the Mau Forest. The Batwa, who have strong links with the Bambuti-Batwa people in neighbouring DRC, returned from the visit keen to replicate the P3DM technique in their own setting. Two years later, in June 2011, the Batwa began modelling their ancestral territory, Bwindi Impenetrable National Park.

In 2014, FPP engaged a Gabonese facilitator to oversee a similar P3DM process undertaken by

the Bambuti-Batwa community in DRC. He had learned his skills in participatory 3D mapping during training offered by CTA in Gabon in 2010.

The building of a model to map the Kahuzi Biega landscape was to prove a pivotal point in the struggle for the DRC Bambuti-Batwa community in making their case for what they claim is the injustice of being expelled from the land they had inhabited for generations. The 3D model has served as a powerful advocacy tool. In September 2014, it formed the basis for the Bukavu Whakatane Dialogue, opening up talks between the indigenous community, government and conservation organisations.

The Whakatane mechanism was developed by the World Conservation Union (IUCN) in 2011. It offers a consensual approach to bringing indigenous communities and conservation authorities together in a relationship based on an understanding that indigenous peoples can become effective partners in conservation when their rights to their territory are acknowledged. The case of the Bambuti-Batwa people is only the third time that the Whakatane mechanism has been used. The first two pilot Whakatane assessments took place in 2011 and 2012, in Mount Elgon, Kenya and in Ob Luang National Park, Thailand, respectively.

The fortunes of the Bambuti-Batwa spiralled downhill rapidly following their enforced removal



© Barthélemy Boika Mahambi Yela

The tree dimensional nature of the medium makes it very easy for individuals to locate themselves vis-à-vis the miniaturised representation of their lands.

from their land four and a half decades earlier. Most of them have been installed in villages belonging to Bantu farming communities, a lifestyle which contrasts strongly with their nomadic hunter-gatherer traditions. Many are hired to tend crops for local farmers, but they face severe discrimination, both economically and socially. They are in danger of losing their language, having had to adopt the languages of the other peoples with whom they now live.

“They are living in a state of extreme poverty in every sense,” said Patrick Kipalu, DRC Country Manager for FPP.

The making of a 3D model of their traditional territories and usage zones appears to have marked an important turning point for the

Bambuti-Batwa. With support from FPP, the *Centre d’accompagnement des peuples autochtones et minoritaires vulnérables* (CAMV) and the ARCUS foundation, they have mapped the sacred spaces, use zones and ancient villages in an area to which they no longer have physical access.

The 3D map was unveiled at the first Whakatane meeting between the Bambuti and PKNB, local authorities, IUCN and the government conservation body, the Congolese Institute for Nature Conservation (ICCN). It had a powerful effect in establishing the indigenous community’s centuries’ long claim.

“The idea of the 3D mapping exercise was to support the Bambuti-Batwa people by communicating the powerful connection between

them and their ancestral lands and demonstrating their knowledge,” said Justin Kenrick, Africa policy advisor for FPP.

“The 3D mapping exercise was a crucial part of the jigsaw.” Added Kipalu: “The P3DM mapping exercise has helped communities and conservation actors to come to an agreement about where the Bambuti-Batwa people were carrying out their daily activities on their lands prior to the creation of the park. It has also helped communities to prove to conservation actors and the government that they really know their lands well and that the lands of the PNKB belong to them, because they were able to show where they – or their ancestors – used to farm, hunt, carry out their traditional rituals, prior to the creation of the park.”

Isumbisho, Executive Director of local NGO CAMV, works closely with the Bambuti-Batwa people and has seen the changes for himself:

“The Whakatane process has stimulated self-confidence in the Batwa people and the hope of a better future, based on the assurance that their social, economic, cultural and civil rights will be protected, as will their natural resources and their environment in general,” he said. “In opening up dialogue between the Batwa people, the political and administrative authorities and the management of the Kahuzi Biega National Park, the 3D model has served as an advocacy tool, as support for convincing the various actors and promoting the Batwa culture.” ■

**In opening up dialogue between the Batwa people, the political and administrative authorities and the management of the Kahuzi Biega National Park, the 3D model has served as an advocacy tool, as support for convincing the various actors and promoting the Batwa culture**

A three-stage process, the Whakatane Mechanism has involved bringing players to the table, leading to the development of a road map with short, medium and long-term objectives. Relationships between the Bambuti-Batwa, ICCN, the provincial government and park managers are now much more positive. As a result of the talks, the government has pledged funding to improve living conditions for the pygmy community, as have conservation organisations and partners. At the second round table session, discussions were held on giving the Bambuti-Batwa people access to forest areas on the edge of the park as an interim step.

The objective of regaining formal recognition for the indigenous community’s rights inside the existing boundaries of the PKNB remains a long-term goal. In the meantime, the 3D mapping exercise has benefited the indigenous community in a number of ways. Pacifique Mukamba

# The Saramaccan experience

In February 2016, Saramaccan community representatives met in Paramaribo, the capital city of Suriname, with key stakeholders and policy-makers. The purpose of the meeting was to announce to the world that the Saramaccan people had completed a two-year process that led to the mapping of resources and environmental services within their traditional territories located in the upper Suriname River basin. Interestingly, the community spokespeople stated that selected data sets could be shared with parties interested in engaging in sustainable and culturally acceptable activities within the Saramaccan territories. This selection of annotated images summarises the fascinating process that gave an authoritative voice to the Saramaccan community.



© Lisa Best/Tropenbos International Suriname

Foam boards and other materials needed for assembling the 3D model are loaded on a boat for transport to the mapping venue in Jaw Jaw village upstream the Suriname River.



© Lisa Best/Tropenbos International Suriname

Materials needed for the manufacturing of the 3D model are ferried to destination as no road reaches the desired destination.





© Giacomo Rambaldi/CTA

View of the Suriname River flowing in front of Jaw Jaw village.



© Giacomo Rambaldi/CTA

Buildings in Jaw Jaw village are made mainly using local materials including wood and canes.



© Giacomo Rambaldi/CTA

Students played an active role in the construction of the 3D model. A girl is tracing a contour line on a foamboard which will be cut to the desired shape later on.



© Giacomo Rambaldi/CTA

Layers of foamboard are superimposed to assemble a geo-referenced and scaled representation of the local landscape.



Elders start analysing the blank 3D model and pin-point reference landmarks.



© Giacomo Rambaldi/CTA

Saramaccan women and men contribute their knowledge to the 3D map.



© Giacomo Rambaldi/CTA

The mapped area includes a large artificial water body resulting from the construction of a dam which flooded the lands previously occupied by some of the Saramaccan people, who were forced to resettle along the shore of the lake and Suriname River.



© Giacomo Rambaldi/CTA

The entire process was duly documented and a video documentary was produced in English, French and Saramaccan versions.



© Giacomo Rambaldi/CTA

The completion of the 3D model is celebrated. Representatives from Government, development agencies, non-governmental organisations and private sector operators based in the capital city Paramaribo attend the event.



© Ivan Karnadi/Tropenbos International Suriname

Saramaccan delegates present the outputs of their mapping exercise and their intended uses to an audience including government officials and representatives from aid agencies and civil society organisations.



© Ivan Karnadi/Tropenbos International Suriname

A view of the audience composed of Saramaccan people and key stakeholders from the capital Paramaribo.



Ms Lientje Landveld, a Saramaccan person, hands over the first map to the District Commissioner of Brokopondo, Mrs. Yvonne Pinas.

## STORY 6

## Helping to shape disaster risk reduction plans in Tobago

In Tobago, a Caribbean island that has suffered a series of extreme climate events in recent years, P3DM has been used to guide community-driven disaster risk reduction strategies. This, the first participatory 3D modelling exercise to be conducted anywhere in the region, has proved a valuable tool in the process.

The experience is something that no one is likely to forget any time soon. Torrential rains pounded rooftops on the Caribbean island of Tobago for more than 6 hours in November 2004. The storm caused two deaths and six serious injuries, as well as widespread damage. Soil on the steep terrain of the eastern end of the island quickly became saturated, causing a series of landslides. This was not the only extreme weather event to have hit the island in recent years. Feeder bands – spiralling lines of heavy thunderstorms that extend outward from a hurricane’s centre – swept through Tobago in September 2004 and October 2010.

In 2012, convinced that participatory 3D modelling (P3DM) could provide sound information to manage the impacts of climate change and extreme climatic events, CTA and partners selected Tobago to pilot the first ever P3DM exercise in the Caribbean. Over a 12-day period, more than 100 people came together to build a 1:10,000 scaled three-dimensional model of Tobago. The model represented the island’s land area of 1,152 km<sup>2</sup> and its surrounding waters, to a depth of 100 m. Taking part in the exercise were community members and decision-makers drawn from key sectors in Tobago. With technical and financial support from CTA, the project was implemented by the Caribbean Natural Resources Institute (CANARI) and the University of the West Indies (UWI). Additional funding was provided by UNDP’s Global Environment Facility Small Grants Programme (UNDP GEF SGP) and The Nature Conservancy (TNC).

Communities in Tobago – one of two main islands in the archipelagic State of the Republic of Trinidad and Tobago – were enthusiastic about the participatory approach to managing responses to extreme climate events.

“The 3D mapping was a piece of work for the people, by the people and of the people,” said Lyris Walker, a villager who took part in the exercise. As a result of the model, people in Tobago said they had a better understanding of the spatial distribution of the island’s natural and man-made resources, as well as a clearer picture of the impact of climate change and extreme climate events on their livelihoods.

Most importantly, the 3D mapping initiative helped islanders to understand the link between natural resource management and resilience to climate change and catastrophic climate events. Blending local knowledge with scientific data and using the results to guide planning for climate change adaptation and to address risks related to extreme climate events, has proved a powerful mix in the case of Tobago; this is an island where the impacts of climate change are exacerbating problems caused by human development, such as inappropriate land use, poorly planned physical development and inappropriate agricultural practices. Using P3DM has helped to address the lack of detailed location-specific data to inform development of community disaster risk reduction plans.



In October 2012, following the model-building exercise, 27 people took part in a 2-day workshop designed to analyse the island's approach to the impacts of climate change and extreme climate events and to draft plans to manage effective collective responses. The workshop was supported by funding from the Embassy of the Federal Republic of Germany in nearby Trinidad.

One concrete impact from the P3DM exercise and the subsequent workshop was the drawing up of a civil society agenda to address the impacts of climate change in Tobago [<http://bit.ly/1SZ9Kpc>]. The agenda, prepared by CANARI and using the 3D model as its basis, urged that "human induced negative environmental impacts be curtailed to reduce our existing and natural vulnerabilities." It drew up a detailed plan for better natural resource management, identifying priority areas as food security, tourism, infrastructure and utilities, water and forest resources and wetlands issues.

The Tobago Emergency Management Agency [<http://www.tema365.com/web/>] (TEMA) – mandated by the Tobago Government to *'co-ordinate a network of agencies and individuals within the island of Tobago to direct their efforts to the maximum preservation of life and the protection of property in times of disaster'* – was quick to acknowledge the 3D model as a valuable tool for effectively planning how best to deal with climate-related disasters. TEMA officials say the model has helped to improve islanders' understanding of their island and its natural resources and especially to locate the areas prone to hazards and the ideal distribution of shelters and critical equipment such as community disaster preparedness kits. These kits, which are made available at strategic locations, contain tools to be used in emergencies, such as shovels, axes, water, first aid equipment, torches and batteries.

In 2012, TEMA was in the process of mapping inundation zones at vulnerable coastal communities around Tobago when the 3D model of the island was made. Impressed by the results, the agency partnered with UWI 10 months later

to build a 3D model of the village of Roxborough on the eastern part of the island. The aim was to use P3DM to develop community-driven disaster management and mitigation strategies for this vulnerable area.

"The approach updated the repository of information on hazard-prone areas for the village, identified critical infrastructure exposure and guided the organisation to focus on the categorisation of special needs, on a house by house basis," said TEMA Director, Allan Stewart.

The P3DM approach to the development of community-driven disaster risk reduction strategies on the island of Tobago has been at the core of the development of TEMA's Strategic Plan Framework, which identifies 13 short to medium-term goals. P3DM practice has proved crucial in engaging stakeholders in strategies for comprehensive disaster management on the island of Tobago, says Stewart. Goal 3 of TEMA's Strategic Plan Framework is to "identify and engage all stakeholders on the island who have a major role in the effective planning strategies for comprehensive disaster management for Tobago."

The 3D model of Tobago is currently housed at the Department of Environment in the Tobago House of Assembly. It has been displayed in villages around the island and at events commemorating United Nations' designated days. Plans are in hand to use the model in the environmental impact assessment process on the island. ■



## STORY 7

# A voice for the Ogiek people in Kenya

Three-dimensional mapping has helped a hunter-gatherer tribe in Kenya to document its ancestral land rights and knowledge systems. The advocacy process that resulted has had some far-reaching impacts, including influencing government policy – and helping to bring about a change in the constitution.

At the time, few people outside Kenya had heard of the Ogiek and within their own country they were widely dismissed as second-class citizens. Then in 2006, a three-dimensional modelling (P3DM) exercise to map the Ogiek's ancestral land helped propel this minority ethnic group into the international spotlight and gain recognition from the Kenyan Government. As a result, these once marginalised indigenous peoples (IPs) are increasingly consulted by the government and development agencies on plans for the rehabilitation and conservation of the Mau Forest, their traditional home. They are also consulted in dialogues over the future of other indigenous peoples in Kenya and elsewhere, such as Tanzania and Uganda.

For centuries, the Ogiek lived as hunter-gatherers in the hilly Mau forest of Kenya, hunting antelope and other wild animals, collecting honey, wild fruits and medicinal plants. In recent decades, their ancestral lands have changed beyond recognition, due to widespread deforestation, leading to the destruction of the Ogiek natural and cultural landscapes. Large numbers of Ogiek were evicted and gradually their traditional lifestyles and belief systems began disintegrating.

The future looked bleak for this ancient tribe. But the elders refused to accept their removal from their ancestral lands and the erosion of their rich cultural heritage. Supported by CTA, the Environmental Research Mapping and Information Systems in Africa (ERMIS-Africa) [<http://www.ermisafrica.org/>], the Indigenous Peoples of Africa Coordinating Committee [<http://www.ipacc.org>]

[<http://www.gaiafoundation.org/>], they decided to tell their story through a participatory 3D model. The idea was to revive their knowledge of the past and share their cultural heritage with the younger generation.

With input from the elders, who used their memory to populate the blank model, the 3D map represented the eastern part of the Mau complex in the 1920s, the point up until which their landscape and way of life had remained largely untouched.

Subsequent decades led to dramatic changes. In the 1990s, in a bid to conserve the rare indigenous forest, the government embarked on a mission to evict the Ogiek from their ancestral lands. The plan, which is documented in a Government Task Force Report, involved setting aside a small portion of the forest through a degazetting process and settling the Ogiek there. However, instead of following the due process, the execution of the plan was politicised and commercialised. Despite protests by environmentalists, the forest was degazetted and the resulting land was allocated to communities from other parts of the country. Efforts to evict the Ogiek community had started in colonial times. Under British rule, the Ogiek lost their legal status as an ethnic group with any rights to land or identity. They were referred to as *dorobo*, a derogatory Maasai term meaning 'hunters; the ones without cattle'. Successive Kenyan Governments continued to deny recognition to the Ogiek as a culturally distinct community with their own ancestral land, language and traditional governance system.



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Ogiek elders in Nessuit, Kenya discuss issues related to their traditional territory using the 3D model as a visual and tangible reference.

In spite of their poverty, the Ogiek launched a series of court cases to challenge the allocation of land and the mass deforestation. In what was once the largest single block of closed-canopy forest in Eastern Africa, providing the upper catchments of a wide range of major watercourses, the Mau Forest Complex suffered a dramatic loss of forest cover and the destruction of forest ecosystems.

Covering 528 km<sup>2</sup>, the P3DM process, conducted over a period of 12 months on the fringes of the Mau Forest Complex, marked the first important step in a change of fortunes for the Ogiek. Guided by facilitators from CTA, ERMIS and IPACC, representatives from the 21 clans built a 1:10,000 scale model that reflected their former landscape and rich traditional knowledge. The elders reached deep into their memories to show how the forest had looked before logging and other activities

had changed the landscape. A sophisticated legend depicted no fewer than 64 data layers, many of which involved traditional knowledge linked to the landscape, such as sacred trees, swamps and how to taste honey.

“These communities have so much knowledge, so much information, not only about their territorial boundaries, but about the plants and the animals that they were surprised by the extent of their knowledge systems and by the fact that what they know is also valuable, not only to them, but also to the outside world,” said Ogiek representative Kanyinke Sena, who was involved in the P3DM process.

The participatory model-building, the first to be carried out anywhere in Africa, also served as a training exercise for representatives from NGO’s

and indigenous peoples' community-based organisations drawn from 10 African countries. In 2007 the model was expanded to include an additional 290 km<sup>2</sup>. An atlas – the Ogiek Peoples' Ancestral Territories Atlas – developed from the 3D model funded by CTA and aerial photography, was produced with funding from ESAPP-Switzerland [<http://bit.ly/1qJtDYt>], to document the rights and interests of the Ogiek community.

As well as recording the Ogiek's traditional knowledge and territory for future generations, the 3D map soon emerged as a powerful tool in bolstering the cause of the disempowered community, helping to tell their story to the outside world.

"I learned that we are lost and need to unite ourselves," said one elder, after helping to fill the blank model from his memory.

"I learned that indigenous knowledge is powerful," said another.

More than just a model-making exercise, the 3D mapping became part of a sustained approach for advocacy, says Julius Muchemi, Executive Director of ERMIS-Africa and a P3DM facilitator trained by CTA. Muchemi has spearheaded follow-up activities to gain recognition for the Ogiek.

"Making 3D models helps communities to engage the government," he said. "The Ogiek community was greatly motivated by their P3DM experience since they were able to clearly identify the ancestral land, as well as their revered cultural sites, which still are of importance to them, despite not being able to access them."

The model has helped to document the community's land claims and connections with their ancestral territory, serving as a basis for campaigns aimed at influencing policy change. The results have been impressive. Armed with greater knowledge, the Ogiek have been able to pursue their rights in local and international forums and courts, to assert their rights over the

Mau Forest. In 2012, the African Court on Human and Peoples' Rights ruled that the Kenyan Government must refrain from taking any action that would jeopardise the case, until it had reached a decision.

"The African Court reached this decision out of concern that the government's current actions violate the Ogiek's right to enjoyment of their cultural and traditional values, their right to property, as well as their right to economic, social and cultural development, all of which are enshrined in the African Charter on Human and Peoples Rights," said Muchemi. Kenya is a signatory to the Charter.

### **The model has helped to document the community's land claims and connections with their ancestral territory, serving as a basis for campaigns aimed at influencing policy change**

In 2008, marking a dramatic change of heart from a government that had once refused to recognise the Ogiek, Kenya set up the Mau Rehabilitation Task Force and invited the Ogiek to be part of it. The initiative was aimed at halting deforestation, which was causing serious water shortages in rivers and lakes that are dependent on the water catchment area. Evictions of illegal settlers were part of the Task Force plan. And while the Ogiek – whose remaining communities were ordered out of the Mau Forest complex in 2010 – have not been allowed back, negotiations are underway between the government and the Ogiek Council of Elders to give the former occupants community rights to access forest resources for food, medicinal plants and traditional ceremonies.

Working together with other Kenyan IPs, the Ogiek have contributed to applying pressure for a change to the Kenyan Constitution. In 2010, Chapter 4, Article 56 of the Kenyan Constitution was introduced, pledging that "the State shall put in place affirmative action programmes" for "minorities and marginalised groups" in the fields

of representation in governance, educational, economic and employment opportunities, as well as space to develop cultural values, languages and practices and reasonable access to water and health services. Communal land tenure was also recognised by the constitution.

“The Ogiek community is now actively engaged in politics and the people are more educated,” said Ogiek member Francis Kakwetin Lesingo. “They are more vocal since they now know their rights and are able to interact between State and non-State actors.”

**The P3DM brought cohesiveness between members of the different clans of the Ogiek community. Generally, the community has now become united in matters concerning their rights and often meets to discuss on issues pertaining to land and their rights in the constitution**

“In 2013 The Traditional Ogiek Cultural Group (TOCUG) was invited by the Ministry of Sports Culture and Arts to share its perspective on the draft *Languages of Kenya Bill 2015*. If passed the Bill would “promote and protect the diversity of languages of the people of Kenya” and “develop and promote community languages for use as media of instruction in early childhood and lower primary education,” said Lesingo.

Added Muchemi: “We provided the OPAT Atlas to the Chair of the Commission. Indeed, the approval of the Bill would be a landmark achievement for the Ogiek as ‘a Peoples’ in Kenya and would contribute towards preserving their cultural identity.”

The P3DM exercise has provided a springboard for the Ogiek to join up with other marginalised communities and assert their presence. The Ogiek are now active members of a number of forums, such as the Hunter-Gatherer Forum, set up by various Kenyan IPs to create a platform for dialogue with the government.

A secondary result of the 3D mapping has been the way in which it has brought the Ogiek people together to work for a common goal.

“The P3DM brought cohesiveness between members of the different clans of the Ogiek community,” said Muchemi. “Generally, the community has now become united in matters concerning their rights and often meets to discuss on issues pertaining to land and their rights in the constitution.”

As a result of the successes achieved by the Ogiek, a number of other minority groups have been prompted to undertake similar P3DM exercises in Kenya and neighbouring countries.

The Ogiek P3DM experience – the first in Africa – has transcended national boundaries and triggered replication in Eastern and Central Africa. It has also been acknowledged by many international organisations, including UNESCO, which highlighted the case of the Ogiek as an example of local empowerment in the *2009 UNESCO World Report on Cultural Diversity*. ■

## STORY 8

# Community advocacy triggers green light for environmental restoration

A P3DM exercise on Union Island and a campaign built around the model has been instrumental in reviving a stalled plan to rehabilitate a badly degraded lagoon area. The long campaign finally won government approval after NGO SusGren and the local community on the Caribbean island saw the need for sustainable development and remained steadfast in pressing for the lagoon's restoration.

The scene is one of utter desolation. Ashton Lagoon, located on Union Island – the southernmost of the five inhabited smaller islands of mainland St. Vincent – was once one of the largest mangrove ecosystems in the whole of St. Vincent and the Grenadines. Today, it is the site of an abandoned marina structure, dying mangroves and stagnated water.

The mud and the metal are remnants of an abandoned attempt to turn this once vibrant ecosystem into a huge marina complex. In 1994, a foreign developer gained permission to build a 300-berth marina in the central section of Ashton Lagoon. The plans included a causeway connecting Frigate Island to Union Island, a recreation centre on Frigate Island, a large condominium complex built on the outer reefs and a 50-acre golf course to be laid over the mangrove.

What the plans failed to take into account was the destruction that would be caused to the landscape. Before the building started, Ashton Lagoon had been the last remaining pristine lagoon in St. Vincent and the Grenadines. Located on the south coast of Union Island, the site was unique: it contained all the primary components of a lagoon and coral reef ecosystem, including a long stretch of outer reefs, a shallow, protected inner lagoon, abundant sea grass beds and the

largest area of mangrove forest in the country. All four species of mangrove present in the region were found here until the construction vehicles moved in to start tearing them down.

The lagoon had harboured a variety of important fauna including lobster, conch and several rare or endangered marine organisms. The mangroves, sea grass beds and coral reefs served as nursery habitats for commercially important fish and invertebrates. The Ashton Lagoon complex, together with nearby Frigate Island, provided habitats for a number of wintering and migrating populations of seabirds, water birds, shorebirds and land birds and there were salt ponds along the shore. In recognition of the area's rich biodiversity and ecological importance for the entire southeast coast of Union Island, it had been designated a marine conservation area, protected under The Fisheries Act (1986) of St. Vincent and the Grenadines and had been declared an Important Bird Area by BirdLife International, a global partnership of conservation organisations.

The marina complex was never finished. In mid-1995, the construction company declared bankruptcy and the project was abandoned. But the damage already done was incalculable. During construction, the lagoon was dredged and a road was built around the mangrove. A causeway built

between Union Island and Frigate Island prevented water from circulating into the western half of the bay and the remaining water became stagnant and turbid. The sea grass beds, lobster, conch and many fish disappeared and corals died or became overgrown with algae. The restricted flow of seawater caused the mangroves to become severely stunted and the salt ponds almost dried out.

**The model really improved people’s understanding of the value of the different ecosystems on the island and it is an excellent means of communicating concerns and issues on environmental management**

Appalled by the level of devastation and the state of abandon, a small local NGO resolved to garner support for action. Since 2004, Sustainable Grenadines Incorporated (SusGren) and BirdsCaribbean have been involved in a variety of initiatives to restore Ashton Lagoon. These have included building skills and expertise in avian ecology among local residents and participatory planning and sustainable use of resources in the lagoon. SusGren succeeded in attracting funding from various international donors for restoration of the lagoon area. But the NGO came up against a major hurdle. Without official government approval for works to begin in the State-owned area, nothing could be done. After waiting for several years for the impasse to be resolved, the donors lost interest and withdrew their promises of funding.

The situation could have remained unchanged if it had not been for a decision to build a participatory 3-Dimensional Model (P3DM) of Union Island, plotting the extent of the damage done to the Ashton Lagoon area and the scope for regeneration. In February 2013, with support from CTA, The Nature Conservancy (TNC) and the Grenada Fund for Conservation (GFC), SusGren facilitated a P3DM exercise. The process, which spanned 9 days and involved the participation of 103 residents, highlighted the challenges posed by

the abandoned marina complex and the importance of the ecosystem it had so badly damaged. It also brought people together, fuelling a determination to develop a plan of action for sustainable development on their island, with reclamation of the degraded lagoon area as their starting point.

“People were willing to talk. The model-building promoted the issues we were fighting for the government to take notice of and created an atmosphere of excitement on the island,” said Katrina Collins-Coy, President of Union Island Environmental Attackers and a member of SusGren. “The model really improved people’s understanding of the value of the different ecosystems on the island and it is an excellent means of communicating concerns and issues on environmental management,” added Kenneth Williams, Manager of the Tobago Keys Marine Park.

SusGren piloted a number of initiatives, as part of its advocacy campaign. These included carrying out water quality and bird monitoring in Ashton Lagoon and sending regular reports to the government. They also invited government officials to meetings and presented their vision for the area to them.

“The model served to help the government visualise what is possible and promoted the vision with the people,” said Orisha Joseph, Programme Administration Officer at SusGren. “We used the momentum gained to contribute to driving the process forward.”

Victory finally came on 7 January 2015, when the Government of St. Vincent and the Grenadines gave approval for restoration work to begin in Ashton Lagoon. The decision was issued through Cabinet Note ARTFF, a document that now holds the key to SusGren’s dogged campaign. There is still much to be done. The NGO is busy soliciting funding to cover the restoration work and is making use of the momentum stimulated by the model and the subsequent government approval to attract



donor support. The restoration plan will cost at least US\$500,000 (€450,000).

Expected ecosystem benefits will include overall improved ecosystem health. “Specifically, that will be increased species diversity, for example birds and marine species, rejuvenation of stressed mangrove areas and the recolonisation of barren sites, a decrease in turbidity and improved water quality,” said Susgren’s Orisha Joseph. “Livelihood benefits should include increased revenue to fishers due to increased fish stock, as the area is a nursery for juvenile commercial species and increased opportunities for ecotourism activities, such as kayaking and bird watching.”

The model is currently housed at the island’s Revenue Office in the capital of Clifton and is often visited by both residents and outsiders. Sherma Adams, District Officer for the Southern Grenadines, believes strongly in the continued importance that the model will have for any development on Union Island.

“It is pertinent that the model be looked at if any serious development is being considered for the island,” she said. “The model is crucial!”

But even more important than the model is the way it focused the islanders’ attention on the value of their natural resources and the evidence of hasty development decisions. After taking part in the P3DM process, many islanders now see that they allowed what seemed like a quick fix to unemployment problems to blind them to the potential impact on their coastal area, which provides them with food and incomes.

Another abandoned tourism project pinpointed by the 3D model – this time a hotel, whose construction involved ripping out the coastal mangroves along Big Sands Bay – has also taken its toll on the ecosystem. As well as hosting fish and other marine life, mangroves serve as one of the island’s most effective natural defences against storm surge and erosion.

“It makes me sad that we the locals of Union Island and the Ministry of the Environment didn’t see what they were doing to the land,” said local entrepreneur Lekesha Adams, after the P3DM model was completed.

The P3DM exercise has helped the people of Union Island to understand that the most important players in protecting the island’s coastal resources are the islanders themselves.

**Many islanders now see that they allowed what seemed like a quick fix to unemployment problems to blind them to the potential impact on their coastal area, which provides them with food and incomes**

“That’s partly because they have the best knowledge of their resources. And they know some of the solutions available,” said Martin Barriteau, Executive Director of SusGren. “We want them to understand what they are doing, to respect their island and protect it. And the only way that can be done will be if they have a right as part of the process, that it belongs to them and benefits their livelihoods and sustenance in the long run.” ■

# Building on skills and reputation

## Mastering Participatory 3D Modelling: an empowering asset

**E**ngaging in P3DM can be a valuable experience. Skills acquired for its facilitation have proved to be sought after assets for those who develop them. And the 3D models, complemented by distinctive participatory data sets and supported by a well-documented process, have proved to be highly effective in attracting interest from government authorities and development agencies, generating consensus and funding in the process.

CTA has invested resources in training individuals and strengthening institutions, in so doing nurturing the emergence of regional P3DM resource hubs in African, Caribbean and Pacific countries. Networking has played an important role in the development of P3DM, while providing support in establishing an online reputation for the process, the product and the facilitators. The 2007 World Summit Award, given in recognition of the P3DM exercise in Fiji, conveyed a seal of approval for the practice as a whole. Video and textual documentation of the P3DM process, its outcomes and impacts has helped to provide badly needed evidence of the changes it can bring. The adoption and endorsement of P3DM by a growing number of international development organisations has helped to strengthen its reputation. Individuals who have learned how to organise and facilitate demand-driven P3DM processes, following guidelines for good and ethical practice, are in increasingly strong demand.

The stories that follow document cases in ACP countries where both individuals and institutions have benefited from acquiring skills in running P3DM initiatives. In several cases, they have used lessons learned to solicit interest in high-level international forums on the extraordinary and often underestimated value of local knowledge. In some instances, a welcome side effect has been

the leveraging of funding to implement activities resulting from the P3DM process.

The way in which P3DM can benefit those who become involved in it are many and varied. A development practitioner from Papua New Guinea who received training in 2005 has seen his conservation NGO become a regional hub of excellence for the practice. He has launched a Training of Trainers approach whose momentum is helping to spread P3DM throughout the Pacific. This story recounts how from small beginnings, a network has grown to provide new skills for a number of trainees and helped to attract new international partners for the organisation. An Australian project officer who was trained at the same P3DM exercise in Fiji has succeeded in using the technique to facilitate knowledge mapping for an Aboriginal community and is now hoping to repeat the process in Tanzania. In Chad, Gabon and Kenya, P3DM has been used to help indigenous peoples bring their tacit knowledge to the fore and negotiate their rights in national and international forums. Meanwhile, in Grenada, a participatory 3D model has had a direct impact on the community that created it, by mobilising donor funding for climate change adaptation on a stretch of the coastline badly affected by hurricane damage. ■



© Kenn Mondral

Blank scaled and geo-referenced 3D model constructed by students in the Pacific.

## STORY 9

## The ripple effect in the Pacific – when Training of Trainers really works

Training in participatory 3D modelling received by Kenn Mondiai a decade ago has led to many changes for this development practitioner and for the NGO he heads in Papua New Guinea. His organisation has since become a hub of excellence, supervising P3DM exercises for other development agencies in the Pacific – and passing on the valuable skills.

Few people could have imagined that a small conservation NGO in Papua New Guinea (PNG) could become the engine for participatory 3D Modelling (P3DM) in the Pacific. Since being trained by CTA as a P3DM facilitator during a mapping exercise in Fiji in 2005, Kenn Mondiai, Executive Director of Partners with Melanesians, Inc. [<http://bit.ly/1SJdKYa>] (PwM), has directly or indirectly contributed to no fewer than 18 P3DM initiatives in the Pacific. And requests for help with 3D mapping continue to pour in from around the region.

The Training of Trainers approach adopted and promoted by CTA has been key to spreading P3DM. When organising a P3DM workshop, it is good practice to invite representatives from a range of institutions interested in the methodology. The idea is that these newly trained facilitators subsequently take up P3DM in their own settings, helping to spread the art and scale out its use.

When Mondiai first encountered P3DM, he was managing a conservation project in the Managalas Plateau in PNG. Mapping was a key requirement for application of a proposed conservation area, but the process was proving fraught with difficulties, due to hostile terrain and boundary conflicts between neighbouring tribes.

“That led to me thinking of an alternative way of mapping the 360,000 ha of the proposed

conservation area and at the same time getting the various clans to resolve their land disputes and identify land boundaries using a physical model,” recalls Mondiai. “That’s how I got interested in P3DM.”

Mondiai was one of 20 trainees learning about P3DM during the 2-week workshop in Ovalau, Fiji. Others in the group included staff from government ministries, international NGOs, local community-based organisations, universities and other national and regional institutions.

Following this learning experience, the NGO leader facilitated a number of 3D modelling exercises, including four in PNG, two in Solomon Islands, one in Samoa and one in the Caribbean, where Mondiai supervised the building of a model of the island of Tobago as part of a CTA-supported project. Increasingly convinced of the power of participatory 3D mapping, he built up a team at PwM and started adopting the Training of Trainers approach. To date, the PwM team has provided capacity building for a number of trainees and has seen its standing as an organisation grow, as well as a sharp rise in the number of organisations wanting to work with it. Prior to the Fiji experience, PwM had only a handful of partners. That number has since soared and PwM has forged links with organisations from around the world.

“P3DM has lifted our image and standing as a serious NGO in PNG and the Pacific,” says Mondiai. “Our name and our reputation are becoming more widely known and people are now looking at us as the NGO which has the skills and knowledge in 3D modelling and will facilitate P3DM.”

A stronger partnership with The Nature Conservancy (TNC) is just one of the relationships that have been bolstered by PwM’s experience with P3DM. This leading international NGO was keen to introduce P3DM into projects that it was running in the Pacific region and has since worked with PwM on several of them.

More recently, UNDP has engaged PwM to make a 3D model of a large area that is being considered as a World Heritage Site in East and West New Britain, PNG. The 3D mapping is due to be carried out in 2015 at two locations. A further four P3DM exercises are scheduled for PNG alone, all to be facilitated by PwM. The NGO is also planning to develop a manual aimed at organisations interested in using P3DM for community development.

Kenn Mondiai has received further exposure in the international development community by taking part in international conferences. He attended the CTA-supported Mapping for Change Conference in Kenya in 2005, the 7th ACP Rural Development Briefing in Mauritius in 2011 and the Sixth IUCN World Parks Congress in Sydney, Australia in 2014. He has since added web 2.0 and social media to his skills, using them to raise visibility about P3DM. A CTA-supported course on these ICT tools, held in Port Moresby, PNG in 2014, gave Mondiai the idea of creating a Facebook page to share P3DM stories and answer questions.

As well as recognition from the development sector, there is growing interest in P3DM from policy-makers in PNG. For the past 2 years, PwM has been invited by the Consultative Implementation and Monitoring Council

(CIMC) to present on P3DM at different regional development forums. CIMC brings together civil society, private sector and government partners to develop policy and directly influence and monitor government decision-making for the long-term development of PNG. The Department of National Planning has shown interest in using P3DM for rural development and tourism planning and the Minister for National Planning now follows PwM’s P3DM on its Facebook page.

### **P3DM is becoming an important tool in the Pacific and is gaining momentum for NGOs and local communities, with demand for their own model of their land area**

The extent of the interest in the 3D mapping methodology and in PwM’s skill in facilitating it still comes as a surprise to Mondiai, as does the scope of the 3D modelling approach.

“After coming back from the 2005 Training in Fiji, I never imagined that P3DM would be a big thing in the Pacific, or how it would impact on climate change-related issues and be useful to help in mitigating and adaptation activities and for natural resource development issues,” says Mondiai. “P3DM is becoming an important tool in the Pacific and is gaining momentum for NGOs and local communities, with demand for their own model of their land area.”

Mondiai is the first to admit that he made mistakes, especially with the Managalas model exercise, which was disrupted by a cyclone and took 2 years to complete.

“That was the first model that I did. I had to train my staff. For me it was the first after the training and I made a lot of mistakes, but the mistakes helped me to improve,” he says. Pitfalls he has learned to avoid over the years include not having sufficient supplies of materials. He remembers how during one model-making project, the team ran out of glue. During another one, the model makers found themselves without enough pins,



© Giacomo Rambaldini/CTA

The 1:5000 scale model of Naro in the Solomon Islands is used to explain issues related to resource management to children and youth.

while at yet another, they ran out of green paint. The problem was caused by poor planning, so Mondiai now makes a point of ensuring that the pre-planning scoping exercise is handled by one of his team. He also takes a few extra materials and donates them to local schools at the end of the workshop if there is anything left over.

Satisfaction for all the hard work comes in the form of seeing tangible impacts from many of the 3D mapping projects. When the Managalas mapping exercise was finally completed, the 1:12,000 model contributed to the application for the landscape to be declared a conservation area. The Ona Keto model, made in the Eastern Highland province of PNG in 2014, helped with planning for community reforestation and disaster management and preparedness. After it was completed, the community was able to identify excess land not used for farming and allocate it for reforestation purposes. The 3D mapping also enabled local people to pinpoint areas prone to soil erosion and landslides. In several cases, residents later decided to relocate their villages away from high-risk zones. Many also planted trees to anchor the soil and help prevent landslides.

A third PNG exercise, at Almami in Madang Province, marked the first time a P3DM model had been used to conduct participatory carbon stock assessment on the ground.

In Solomon Islands, a 3D model made in Mboemboe with support from PwM, provided the basis for discussions with the government after local communities made a submission to have a mining lease withdrawn. The model revealed that the waste disposal plans would directly affect the water system and highlighted the fact that it is the sea that provides most of the marine resources for local livelihoods. The government's decision is still pending.

“Whatever their focus, features that all P3DM exercises have in common include the power of visualisation, analysis and understanding that the models offer to often uneducated and

illiterate people, as well as the value that this process gives them as custodians of the land and resources”, believes Mondiai.

“P3DM shows that the mental maps and information stored in the minds of local people for many years can only be unlocked provided there is an equal and level playing field, where there is a win-win for all parties,” he says. “That knowledge has to be respected and credited with appreciation and must be acknowledged publicly to give credit as the knowledge holders.

**Whatever their focus, features that all P3DM exercises have in common include the power of visualisation, analysis and understanding that the models offer to often uneducated and illiterate people, as well as the value that this process gives them as custodians of the land and resources**

The other challenge P3DM seeks to address is that, in any planning or project, local knowledge is something one cannot buy with money, but only through developing a cohesive and collaborative partnership with the local people, so that their knowledge and years of experience can be passed on to help in development, management and implementation. ■

## STORY 10

## From Fiji to Australia – a personal quest

A project officer working with Aboriginal people in the rain forests of Queensland has spent years trying to attract interest for using P3DM to map community knowledge in her native Australia. The experience exceeded expectations and she is now hoping to repeat the participatory 3D modelling process in Tanzania.

It was a simple Google search that led M'Lis Flynn to participatory 3D modelling (P3DM) and its scope for mapping the knowledge of indigenous peoples. As part of her job as a Project Officer for the State-run Wet Tropics Management Authority (WTMA), Flynn offers support to Aboriginal communities in Queensland, Australia, engaging, consulting and collaborating with tribal groups living in the World Heritage Area. One of these is the Mandingalbay Yidinji people, an Aboriginal clan from the Wet Tropics rainforests of far northern Queensland.

In common with many Aboriginal communities, the Mandingalbay Yidinji face challenges of high levels of unemployment, high birth rates and low life expectancies. As in the case of other Aboriginal groups, a key factor hindering the transfer of traditional knowledge has been the pursuance of social policies by the Australian Government in the 1970s. These involved removing Aboriginal children from their families and re-educating them according to Western culture.

Flynn was experienced in the use of GIS mapping, but had found that this approach to mapping, which relies heavily on technology, did not always translate well into indigenous scenarios.

"I've been using GIS for years, but it's not interactive at all, so I found that disappointing. You can print out a map, but not everyone knows how to read a map and it can be alienating instead

of inclusive," said Flynn. "I knew that there had to be a way of using mapping more effectively with indigenous people, so I did a Google search and that's how I came across P3DM."

Her search led her to Giacomo Rambaldi, Senior Programme Coordinator ICT at CTA and the person behind the spread of the participatory 3D Modelling practice worldwide. The contact resulted in an invitation to attend a P3DM exercise as a self-funded participant on the island of Ovalau in Fiji, so she could see the potential of the technique for herself and learn how to put it into practice.

"I was really excited when I saw P3DM in action for the first time," recalls Flynn. "I could see the massive potential for indigenous people and rural communities at large. P3DM is quite different from GIS, because it's so tactile. Everyone knows how to find him or herself on a P3DM map."

The Fiji exercise was back in 2005. And it was to be another 9 years before Flynn was able to realise her ambition of using participatory 3D Modelling to facilitate knowledge mapping with one of the Aboriginal communities that she works with. Her determination paid off. In 2014 came an offer for WTMA to do a 3D modelling demonstration on the occasion of the 6th IUCN World Parks Congress, due to be held in November that year in Sydney, Australia and where CTA was spearheading the organisation of a display and several sessions in partnership with IUCN, UNDP, IPACC and WTMA.



The opportunity was too good to be missed and WTMA selected the Mandingalbay Yidinji people for the participatory 3D mapping initiative. It would be the first P3DM initiative solely with Aboriginal people to be held in Australia.

With funding from IUCN and technical support from CTA, Flynn and WTMA facilitated a 3D modelling exercise with key members of the 300-strong Aboriginal clan. Part of the Yidinji tribal nation, their territory spans two World Heritage Areas – the Wet Tropics World Heritage Area listed as a UNESCO World Heritage site in 1988 and the Great Barrier Reef Marine Park World Heritage Area, listed in 1981.

Initially guarded about the participatory 3D mapping exercise – possibly due to suspicion about government-run initiatives for Aboriginal communities – the Mandingalbay Yidinji people agreed to take part and make P3DM useful for their community. Any hesitation they had dissolved rapidly when the community members began building the model and realised that they had ownership of everything they were producing.

“Once people saw how participatory it was, that’s when they really started to come on board,” said Flynn. “If they hadn’t been interested, they would just have walked away. Nobody did that and they got more and more involved as they took ownership of the model. They realised it was theirs – not something a government department had built and was going to take away from them.”

It took more than 7 weeks to complete the entire exercise, which involved explaining the process, building the scaled model of a 200 km<sup>2</sup> area and making a smaller blank model to be taken to the World Parks Congress in Sydney and populating it as a demonstration in front of conference delegates. Everyone – men and women, younger and older community members – took part in the 3D mapping process, including people who were generally reluctant to speak out in public. Quieter community members emerged as leaders, steering the project towards decisions about how the map should develop.

Since its completion, Mandingalbay Yidinji members have used the model extensively. They take it to schools to educate young people about their cultural heritage and they have presented it to a government minister. The 3D map is always in pride of place when the clan holds community events or has tourist or university groups visiting.

More recently, community members have started using the model to help plan their tourism enterprise. Much of their country – the name they give to their landscape, seascape and the stories and culture within that area – falls within protected areas, making other forms of commercial enterprise almost impossible. The Mandingalbay Yidinji community is now planning to welcome visitors and is using the 3D map to plot walking trails and other activities, such as showing tourists their cultural heritage places or taking them to watch crocodiles in the mangroves.

**Any hesitation they had dissolved rapidly when the community members began building the model and realised that they had ownership of everything they were producing. Once people saw how participatory it was, that’s when they really started to come on board**

For Flynn, it has been a valuable learning process too. She has realised that the best way to ensure that a P3DM exercise is successful is to keep out of the limelight and allow the community members to take centre stage.

“It’s all about facilitation,” she says. “It would be very easy to be overbearing in building a 3D model, but I made sure I kept as external possible, even though that was hard at times. I believe that’s partly why it worked so well. They made all the decisions.”

One example of the decisions reached by all those involved was a resolve not to include sacred information on the map at this stage, such as the location of ‘men’s places’ or ‘women’s places’ – details that are so sensitive that not all members of the community are allowed access



© Wet Tropics Management Authority

Djunbunji Rangers explain the significance of the Mandingalbay Yidinji P3DM during the celebration of its completion in Cairns, Australia.

to them. Conversely, the experience led community members to talk about some parts of their cultural knowledge that had remained buried for decades. It also brought together families who may have quarrelled over the years.

“Building this map together brought us closer as a community and also propelled us into the future,” said Vince Mundraby, a member of the Mandingalbay Yidinji people. “The map was not the main outcome of this project. The main outcome was the process of discussion the community went through in order to get there.”

The next phase will be to map 150 km<sup>2</sup> in the southern half of the clan’s territory and the Mandingalbay Yidinji people have decided to invite members of other tribal groups to join them, so that they can learn from the experience.

“This time around the Mandingalbay Yidinji people will be the facilitators, while I guide,” said Flynn. “It will be a case of Aboriginal people teaching other Aboriginal people.”

Several Aboriginal communities in the Wet Tropics rain forests have expressed an interest in developing a 3D map for their own country. Another group in Cape York, further north in Queensland, is also keen to learn more about participatory 3D mapping and Flynn will be going there later in 2015, taking a member of the Mandingalbay Yidinji with her to explain the process.

The Australian project officer has strong ties with East Africa and is keen to lead participatory 3D mapping in Tanzania. She visits the country on a regular basis and has a special interest in the



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**M'Lis Flynn interacting with the Hon Henry Puna, Prime Minister of Cook Islands, in front of the 3D model during the IUCN World Parks Congress in Sydney, Australia.**

Hadzabe, a tribe of hunter-gatherers living to the west of the Ngorongoro crater. If she can secure some collaborators, it will be the first P3DM exercise to be conducted in Tanzania. Flynn has also worked as a volunteer with the Luo tribe in western Kenya on behalf of local NGO the Ugunja Community Resource Centre. Here, her work also involved community mapping, though on this occasion she was using GIS. She has a postgraduate diploma in GIS from the University of Queensland and is currently doing an MA in international community development at Deakin University in Australia.

Flynn believes that a strong part of the attraction of P3DM for rural and marginalised communities is the fact that it allows them to be in control. She describes it as giving them an opportunity to express their knowledge “in a safe way.”

“P3DM reconnects people with their knowledge. In Australia, a lot of indigenous people have lost their knowledge because the older members have died, or it’s been buried because many Aboriginal people were prevented from speaking their languages or passing on their culture,” she says. “The style of participatory 3D mapping is especially suited to Aboriginal people because it’s not top-down. These communities have become deeply suspicious about sharing their knowledge and what will be done with it. But with this P3DM exercise the people felt empowered. They stayed involved because they could see the benefit.” ■

## STORY 11

## Indigenous peoples invited to the negotiating table

Mapping exercises conducted with African indigenous peoples (IP) have given visibility to highly sophisticated knowledge systems related to landscapes and ecosystems. The process has boosted the credibility of these often marginalised people and strengthened their self-confidence and position in negotiations.

In some of the most remote corners of Africa, participatory 3D mapping has given concrete form to an obvious, but often poorly acknowledged fact – that indigenous peoples (IPs) have valuable knowledge of their own landscapes and ecosystems and of how climate change, biodiversity loss and other factors have affected their environments. In many cases, IPs are already practising strategies for adapting to these changes.

Gaining recognition for the contribution to be made by these neglected knowledge-holders is one of the most exciting developments to emerge from Participatory 3D Modelling (P3DM) exercises conducted by the Indigenous Peoples of Africa Co-ordinating Committee (IPACC), say those involved in the initiatives.

**The methodology brought to the surface some of the most intricate and complex systems of indigenous thought, that would have been well-nigh impossible with any other approach. There is something about this methodology that allows a depth of complexity to emerge in an orderly manner, where holders of knowledge are able to express something that is extremely sophisticated**

As a result of CTA support, P3DM is now widely used by the Indigenous Peoples of Africa Coordinating Committee (IPACC) network as a process for knowledge building and

communication and for compiling evidence for IPs' arguments in national and international negotiations. To date, IPACC has been directly involved in P3DM exercises in Chad, Gabon and Kenya and is committed to pursuing this approach as a way of enabling IPs to bring their tacit knowledge into the public domain as a basis for negotiating their rights.

Aside from the visible outcome of the 3D map, the process has had a profound impact on the IPs themselves, giving these often illiterate people new self-confidence and opening the way to a shift in power, with IPs invited to the negotiating table.

"P3DM creates a very interesting representation that is visual and easy to understand, of highly complex systems, of the relationship between man and nature. And it creates this in a manner so that different actors can come around the same story. And figure out where they are in that story," said IPACC Director Nigel Crawhall. "It brings in the voices of the majority on the planet. The greatest number of knowledge-holders is able to re-enter the discussion. P3DM allows this massive base of human knowledge, the lower end of the pyramid in all its complexity, to come into the decision-making and dialogue process."

IPACC, a network of 150 indigenous peoples' organisations in 20 African countries, is widely acknowledged as the champion of indigenous peoples in Africa, promoting their participation



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**Representatives from the Babongo and Mitsogo communities presenting the 3D map to local authorities.**

in the United Nations and other international forums. The partnership with CTA began in 2005, when Crawhall was introduced to the idea of participatory mapping by CTA P3DM expert Giacomo Rambaldi and given training as a facilitator. Crawhall has since become fascinated by the P3DM process and is one of its strongest advocates for use in Africa.

“I was blown away. I had never seen a methodology like this,” said Crawhall. “It brought to the surface some of the most intricate and complex systems of indigenous thought, that would have been well-nigh impossible with any other approach. There is something about this methodology that allows a depth of complexity to emerge in an orderly manner, where holders of knowledge are able to express something that is extremely sophisticated.”

In the locations where it has been practised, the P3DM approach has resulted in indigenous peoples being able to engage with national governments who had once ignored them. It has also led to a shift towards a new strategy aimed at influencing the UN Framework Convention on Climate Change (UNFCCC) Conference of Parties (COP) processes and national governments, so as to acknowledge the role that IPs can play in mitigation and adaptation strategies for climate change.

Previously, IPs in Africa had little visibility and negligible negotiating power and had enjoyed scant success in challenging governments on recognizing them and their rights. Using P3DM to document the often hidden knowledge of people who have lived in landscapes for generations has given a voice to IPs and made

them more visible to the outside world. The process has also helped to introduce the IPACC to new players, and many have become partners in bringing change for IPs.

The P3DM experience has led to IPs sharing their extensive knowledge about their environments and adaptation strategies with scientists and government officials and being included in climate change debates at international level. The presence of IPs at policymaking forums, where their contribution is seen as adding value to important climate change strategies, would have been unthinkable even a decade ago.

“When you look at these maps, you see that they understand sustainability to a much greater degree than anyone sitting in government or universities,” said the IPACC Director.

A P3DM initiative conducted in Chad in 2012 shows the potential of participatory mapping for solving problems affecting indigenous peoples and drawing them into public debate. The mapping exercise involved the M’bororo people in the southern district of Baïbokoum, an area wracked by water shortages, conflict and tensions, especially between nomadic herders and sedentary farmers. The P3DM event was preceded by a conference held in Ndjamena, which brought together herders, scientists and government officials for the first time. The mapping process enabled all players to have an overview of the contested area, pinpointing where the farmers had blocked off the herders’ transhumance routes that they used to take their cattle to water and identifying a way of resolving the problem to the satisfaction of both parties.

That experience opened a new chapter in the involvement of IPs at policy level on climate change, putting IPs in a position to influence decisions that would affect their futures. These days, IPACC is seen as an innovator in climate policy and attracts the interest of a wide range of donors, science-related players and organisations concerned with climate issues. The network is a regular participant at COP meetings and a number of IPs are now taken seriously by their national governments, who are

listening to them and bringing them into policy and decision-making processes.

“Now we have recognition. We are working with so many ministries and so many projects cannot do without us. People in administration in government are calling on us,” said Hindou Oumarou Ibrahim, Director of the Association des Femmes Peules Autochtones du Tchad (AFPAT) and IPACC’s Executive Committee representative for the Congo Basin region. Ibrahim is herself M’bororo by ethnicity.

“The mapping exercises have helped power relations for marginalised groups,” said Crawhall. “In Chad, the process has brought significant results and IPs have been included in climate change negotiations. There is a standing process of dialogue with the IPs in Chad around climate adaptation, with regular forums and meteorologists have committed to supporting the process. We now need a pan African approach to this.”

Other P3DM exercises have helped to restore indigenous peoples’ territorial and related rights. In Gabon, a participatory 3D map made of a mountain jungle landscape inhabited by pygmies succeeded in persuading the government that it should involve local people in decision-making about their ancestral lands if they were located close to or within protected areas. In this specific case, the pygmy communities had lost access to part of their hunting and fishing grounds when a national park was established.

Crawhall says P3DM has strong potential to engage IPs in the major challenge of repairing what he calls a fractured landscape system.

“The current situation on the planet is serious – biodiversity is dropping at an accelerated rate across all ecosystems. Obviously, climate change plays a role, but it is not the prime driver. The breaking up of the landscape is being caused by agriculture, building roads, mining, deforestation and nature is unable to do what it normally does to restore itself,” he said. “What we need is a larger scale understanding that to solve our current problems



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**Babongo women in Gabon paint their faces white with kaolin to symbolise purification.**

we need multiple knowledge systems to be available at the table and all the knowledge-holders to be around the table. P3DM creates a very specific system that allows this to happen.”

Participatory 3D mapping can be useful in developing equitable climate mitigation strategies, helping to show where IPs live and how they use land – information that can strengthen their hand in negotiating fair Reduced Emissions from Deforestation and Degradation (REDD) agreements in their areas. REDD allows rich countries to buy credits from less polluting countries and invest in forest protection in poorer countries. But this can have serious implications for forest dwellers if they are not protected.

P3DM is also proving valuable for showing how IPs are already dealing with climate instability

through adaptation measures that they have developed through their own intuitive systems.

“IPACC has emerged as a leader, first in climate change mitigation and now slowly in climate change adaptation. It is the collective, rather than the individual, picture that is the key to measuring the success,” said Kanyinke Sena, a former IPACC Executive Committee member for East Africa and IPACC’s focal point on REDD+ safeguards. Sena is a member of the Ogiek peoples of Kenya.

“This has led to IPACC activists sitting in very high tables – the UN REDD Policy Board, the Forest Carbon Partnership Facility participants committee, the Climate Community Biodiversity Alliance and advisory groups for Conservation International and WWF.” ■

## STORY 12

## Evidence of community involvement attracts external support

A participatory 3D model built on the Caribbean island of Grenada is helping to support community resilience to climate change. The P3DM exercise is directly credited with mobilising donor funding for climate change adaptation on a stretch of the coastline badly damaged by Hurricane Ivan.

The quiet of a humid January morning in Grenville Bay, Grenada is pierced by the sound of residents, divers, welders and scientists placing the last of wire baskets filled with concrete blocks into the water. Their mission is to dissipate the wave energy reaching the shore and reduce coastal erosion and flooding in the Telescope Beach area, while encouraging coral regrowth. Telescope Beach, part of Grenville Bay in the northeast of the island, is one of several coastal communities – including Grenville, Marquis, Soubise and Telescope – that were severely damaged by the massive force of Hurricane Ivan in September 2004.

### Ecosystem-based adaptation offers a cost-effective option to coping with the effects of climate variability and climate change

Work on the Telescope Beach stretch of shoreline has also involved planting mangrove seedlings to help attenuate the impact of wave energy. This is ecosystem-based adaptation in action, an approach that involves a wide range of ecosystem management activities to increase resilience and reduce the vulnerability of people and the environment to climate change.

Ecosystem-based adaptation offers a cost-effective option to coping with the effects of climate variability and climate change. In the case of this Caribbean island, a participatory 3D model (P3DM) built 9 years after Hurricane Ivan struck

has been instrumental in attracting funding to protect the coastal area.

“Because of the increased awareness of the vulnerability of the resident community – largely identified through the P3DM process – the Seacology Foundation, located in California, was enticed to provide funding for the establishment of the mangrove propagation nursery,” said Tyrone Buckmire, Executive Director of the Grenada Fund for Conservation (GFC).

As a result of this input, a plentiful supply of planting materials for restoration efforts has been guaranteed. Meanwhile, showcasing the P3DM as tangible evidence of community involvement and process ownership has resulted in the German Federal Foreign Ministry agreeing to provide financial support for initial reef restoration structures. In a similar move, German Development Corporation GIZ is supplying funding for a livelihoods and mangrove restoration project in the area around Telescope Beach.

With support from The Nature Conservancy (TNC), GFC has so far sourced nearly US\$200,000 (€179,000) to fund restoration of the entire coastline in the Grenville Bay area. A further US\$300,000 (€269,000) is needed to complete ecosystem-based adaptation works.

Ivan, the tenth most intense Atlantic hurricane ever recorded, hit Grenada on 6 September 2004,





© Grenada Fund for Conservation

**Knowledge holders in Grenada populating the 3D model with data out of memory.**

destroying 90% of homes on the island. It claimed 28 lives and caused significant damage to public infrastructure. The cost of the disaster was estimated at over US\$900 million (€805 million), more than twice the country's gross domestic product. Local eyewitness accounts in the coastal community of Soubise revealed that the storm surge and wave run-up was in excess of 3 m above mean sea level. Such was the force of the water that it pushed all the houses located on the seaward side of the coastal strip over to the landward side.

Local residents, many of whom took part in the building of a 3D model of the greater Telescope area in April 2013, recall that up until the 1990s, the area's coastline was completely sheltered by mangrove forests, with dense root systems that trapped sediment from the land, stabilised the coastline and prevented erosion from waves and

storms. Their removal, for fuelwood, charcoal production and construction purposes, was almost certainly a contributing factor to coastal devastation on the island during Hurricane Ivan.

The impetus behind the reef and mangrove restoration now underway in Grenville Bay can be traced to the P3DM initiative, say those involved in the project. CTA partnered with GFC and TNC to build the model over a 9-day period, with the close involvement of some 400 community members and key decision-makers. Older villagers, who helped to populate the blank model, remembered how the shoreline used to look before the mangroves were destroyed.

The purpose of the model-making was to identify risks from climate change and extreme climate events and to make recommendations to deal

with the threat. The model's construction built on the efforts of TNC's At the Water's Edge (AWE) climate change resilience initiative. Active since 2012, the project aims to demonstrate the effectiveness of community and nature-based approaches for climate change adaptation in small island States.

The full benefit of the coastal restoration efforts may not be realised for many years. But the building of the 3D model has already contributed to the creation of a network of professionals in the Caribbean, who are sharing valuable lessons and best practices. During the participatory 3D mapping exercise, GFC and TNC invited key change agents from the region to witness its construction.

generating momentum to implement follow-up initiatives." He is convinced that the community-based 3D mapping exercise and ensuing advocacy actions gave visibility to the climate-related challenges facing the island and helped to leverage donor support for activities to address them.

"We believe that the significant and documented involvement of the community in the P3DM process helped to influence donors to provide financial support to the project activities we are now carrying out in the Telescope area," he said. ■

### **The model-making gave organisations an opportunity to strengthen their professional networks by enabling them to share the model-building experience with people they may not have normally met**

Orisha Joseph, who assisted with facilitation during the model building in Telescope, was one of many participants who have found the experience valuable, long after the model was completed.

"The model-making gave organisations an opportunity to strengthen their professional networks by enabling them to share the model-building experience with people they may not have normally met," said Joseph, who is Programme Administration Officer at local NGO Sustainable Grenadines. "New relationships were created and old ones strengthened as the young and the old exchanged the history of the island and life experiences as they populated the model. These relationships will most likely endure over time and may very well contribute to conserving mangrove ecosystems on the island in the future."

According to GFC Executive Director, Tyrone Buckmire, the model "helped crystallise what was needed. It allowed us to define the work to be done in the area and contributed greatly to

## Further reading

### Handbook

Rambaldi, G. 2010. *Participatory Three-dimensional Modelling: Guiding Principles and Applications*. 2010 edn. CTA, Wageningen, The Netherlands; 85 pages; ISBN: 978-92-9081-448-1 <http://goo.gl/pbd3Fq>

Rambaldi, G. 2010. *Modélisation participative en 3D – Principes directeurs et applications*, édition 2010. CTA, Wageningen, Pays-Bas et le Programme de petites subventions du Fond pour l'environnement mondial (FEM); ISBN: 978-92-9081-449-8 <http://goo.gl/CNgSud>

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### Training kit

CTA. 2010. 'Training kit on participatory spatial information management and communication'. CTA, The Netherlands and IFAD, Italy (ISBN: 978-92-9081-446-7) <http://pgis-tk-en.cta.int>

### Other resources in various languages

Castella, JC et al., 2012. Handbook on Participatory Land Use Planning Methods and tools developed and tested in Viengkham district, Luang Prabang province, Lao PDR. National Agriculture and Forestry Research Institute (NAFRI), Institute of Research for Development (IRD) and Center for International Forestry Research (CIFOR), May 2012 <http://goo.gl/pZCe3l>

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Delerue, F. 2013. *Construction participative de maquettes en trois dimensions. Guide méthodologique*. Agronomes et Vétérinaires Sans Frontières (AVSF), Haïti. <http://goo.gl/BCs52i>

Gaillard, JC and Cadag, JRD. 2013. 'Participatory 3-Dimensional Mapping for disaster risk reduction: A field manual for practitioners'. Catholic Agency for Overseas Development (CAFOD) <http://goo.gl/NgmnzR>

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Rambaldi, G., Corbett, J., Olson, R., McCall, M., Muchemi, J, Kwaku Kyem, P., Weiner, D. and Chambers, R. (eds) 2006. 'Mapping for change: Practice, technologies and communication'. Participatory Learning and Action no 54: 150 pg. IIED (London, UK) and CTA (Wageningen, The Netherlands); London, 2006 <http://goo.gl/75XOBV>

Rambaldi, G., Corbett, J., Olson, R., McCall, M., Muchemi, J., Kwaku Kyem P., Weiner, D. and Chambers, R. (eds) 2006. 'Mapping for change: Practice, technologies and communication'. Participatory Learning and Action no 54: 150 pg. IIED (London, UK) and CTA (Wageningen, The Netherlands); London, 2006. Multilingual CD-ROM <http://goo.gl/Ju7Xek>

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## For more information

### 1. Increasing production through sustainable land and marine resource management

- Ovalau Island, Fiji Islands:  
<http://www.iapad.org/ovalau>
- Video: Mapping Land, Sea and Culture: an Award-winning Participatory 3D Modelling Process in Fiji: <https://vimeo.com/30723012>

### 2. An Ethiopian community takes its future into its own hands

- Looking Through a Mirror at our Past and Present: Account of a P3DM Exercise in Ethiopia:  
<http://goo.gl/e9fbLN>
- Video: Mapping for Change: The experience of farmers in rural Oromiya, Ethiopia: <https://vimeo.com/22123738>
- Video: Report back from Telecho - the pathway to environmental reclamation: <https://vimeo.com/90771778>

### 3. Mapping in Madagascar – from scepticism to ownership

- Project website: <http://ndao-hivoatra.com>
- Article: Participatory 3D modelling in Madagascar: a major first: <http://goo.gl/DaunV7>
- Video: 1st Participatory 3D Modelling in Madagascar: <https://goo.gl/E2SgaN>
- Photos of P3DM exercise: <https://goo.gl/cGNbZD>

### 4. Scaling up P3DM: A powerful community engagement tool

- Integration of climate change risk and resilience into forestry management in Samoa: <http://goo.gl/sCNAz6>
- Project Brief: Enhancing the resilience of tourism reliant communities to Climate Change:  
<http://goo.gl/zjyGf9>
- Video: Top UN officials Helen Clark and Naoko Ishii

praising outcome of P3DM activities in Samoa:  
<https://vimeo.com/111563555>

### 5. P3DM kick-starts dialogue for ousted indigenous people

- Article: 3D Mapping Starts to Bear Fruit:  
<http://goo.gl/g48cMd>
- Article: Ugandan Batwa complete 3-D Model of their Bwindi Forest ancestral area: <http://goo.gl/mMDjs>
- Website: The Whakatane Mechanism:  
<http://goo.gl/QUcyuB>
- Video: Participatory 3D Modelling - Bwindi Impenetrable and Mgahinga Gorilla National Parks, Uganda: <https://youtu.be/SHJndxWjJXs>

### 6. Helping to shape disaster risk reduction plans in Tobago

- Case study: Case study on the use of P3DM to facilitate effective contribution of civil society in the Caribbean islands in planning for action on climate change: <http://goo.gl/Ewtznx>
- Policy Brief: Policy brief on using traditional knowledge for decision-making on climate change in the Caribbean: <http://goo.gl/t7vVjN>
- Civil society agenda to address the impacts of climate change in Tobago: <http://goo.gl/iiVLeN>
- Video: She becomes more beautiful: Capturing the essence of Tobago Island for a better tomorrow:  
<https://vimeo.com/101721860>
- Video: My feelings in being part of a P3DM process:  
<https://vimeo.com/113842692>
- Video: Goldberg Job reports back on his participation in a participatory 3-dimensional modelling exercise in Tobago: <https://vimeo.com/113954566>
- Video: Participatory data generation: stunning results from the P3DM exercise in Tobago reports Adam Jehu:  
<https://vimeo.com/113866380>

## 7. A voice for the Ogiek people in Kenya

- Video: The voice of the Ogiek: <https://vimeo.com/32125776>
- Rambaldi G. et al. 2007. Through the Eyes of Hunter-Gatherers: participatory 3D modelling among Ogiek indigenous peoples in Kenya: <http://goo.gl/DFc4ZJ>
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- Ogiek People Ancestral Territory (OPAT) Atlas. Safeguarding Territories, Cultures and Natural Resources of Ogiek Indigenous People in Eastern Mau Forest Complex, Kenya: <http://goo.gl/jNLhRr>
- Blogpost: The UNESCO World Report on Cultural Diversity makes reference to P3DM done by Ogiek Peoples: <http://goo.gl/YRoXI>

## 8. Community advocacy triggers green light for environmental restoration

- Video: Beneath the Surface - Mapping Union Island - A P3DM exercise, 2013: <https://vimeo.com/72414917>

## 9. The ripple effect in the Pacific - when Training of Trainers really works

- Facebook page on PWM P3DM Projects: <https://goo.gl/ziBHpj>

## 10. From Fiji to Australia – a personal quest

- Video: Hands on Culture - Participatory 3D Modelling with Mandingalbay Yidinji People: <https://vimeo.com/126861205>
- Video: Experiencing P3DM through the eyes and heart of a Mandingalbay Yidinji traditional land owner: <https://vimeo.com/112616323>
- Video: Moments of recognition: Luvuyo Mandela

“receives” Mandingalbay Yidinji Traditional peoples’ Participatory 3D Model: <https://vimeo.com/113166775>

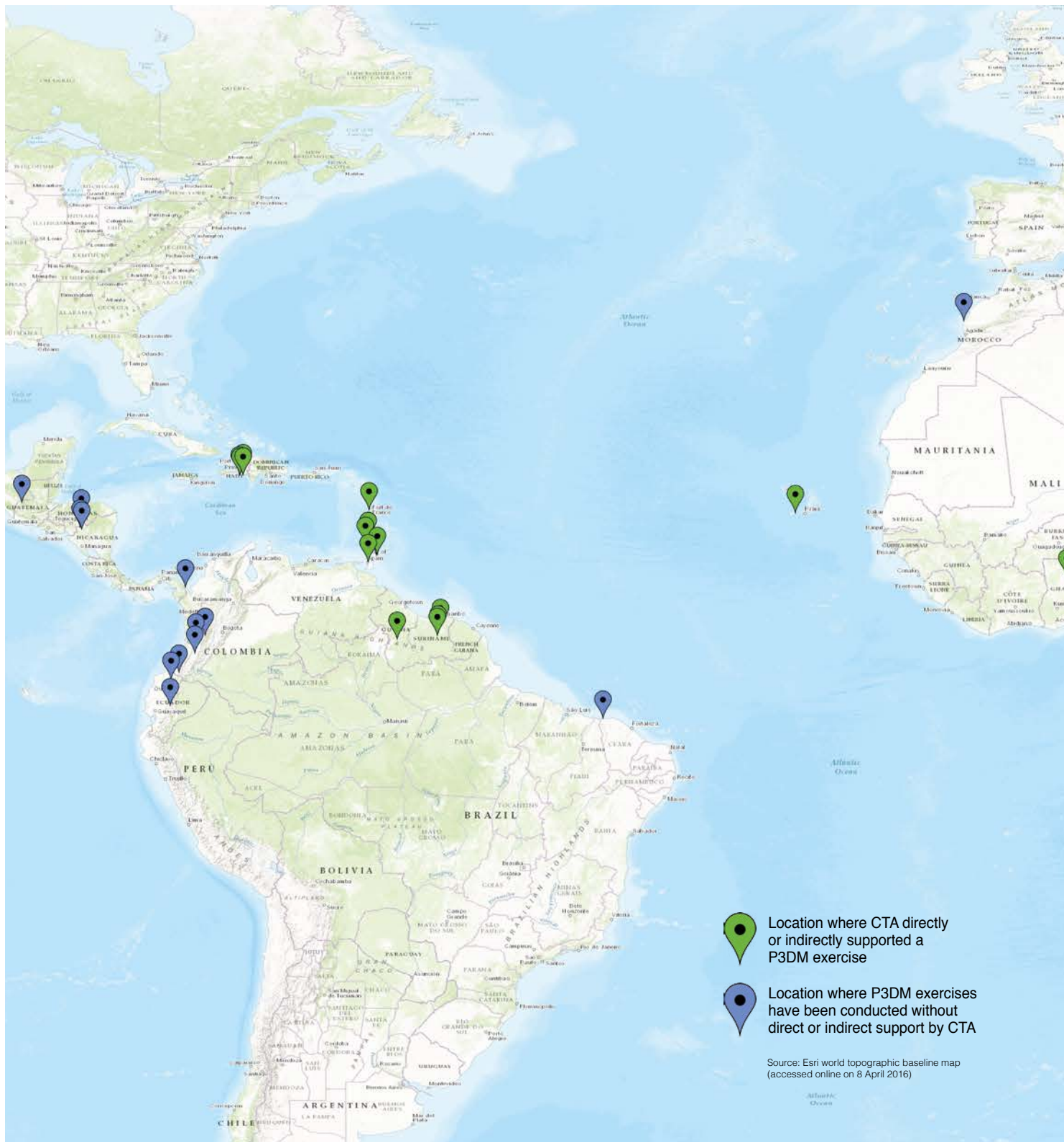
- Video: Empowering moments: P3DM brought us back together as a people: <https://vimeo.com/113224396>
- Video: Empowering moments: reconnecting to our history and people: <https://vimeo.com/112770066>

## 11. Indigenous peoples invited to the negotiating table

- Website: [www.ipacc.org.za](http://www.ipacc.org.za)
- Article: Through the Eyes of Hunter-Gatherers: participatory 3D modelling among Ogiek indigenous peoples in Kenya: <http://goo.gl/DFc4ZJ>
- Video: The voice of the Ogiek: <https://vimeo.com/32125776>
- Video: Close to our Ancestors: Gabon forest peoples map their land: <https://vimeo.com/22073697>
- Video: Three-way dialogue on climate change: <https://vimeo.com/90324348>

## 12. Evidence of community involvement attracts external support

- TNC brochure: At the Water’s Edge (AWE): Coastal Resilience in Grenada and St. Vincent and the Grenadines. An integrated approach to adaptation and disaster risk reduction: <http://goo.gl/nyMv8h>
- Ecosystem Management Programme. Ecosystem-based adaptation: <https://goo.gl/xfN0kv>



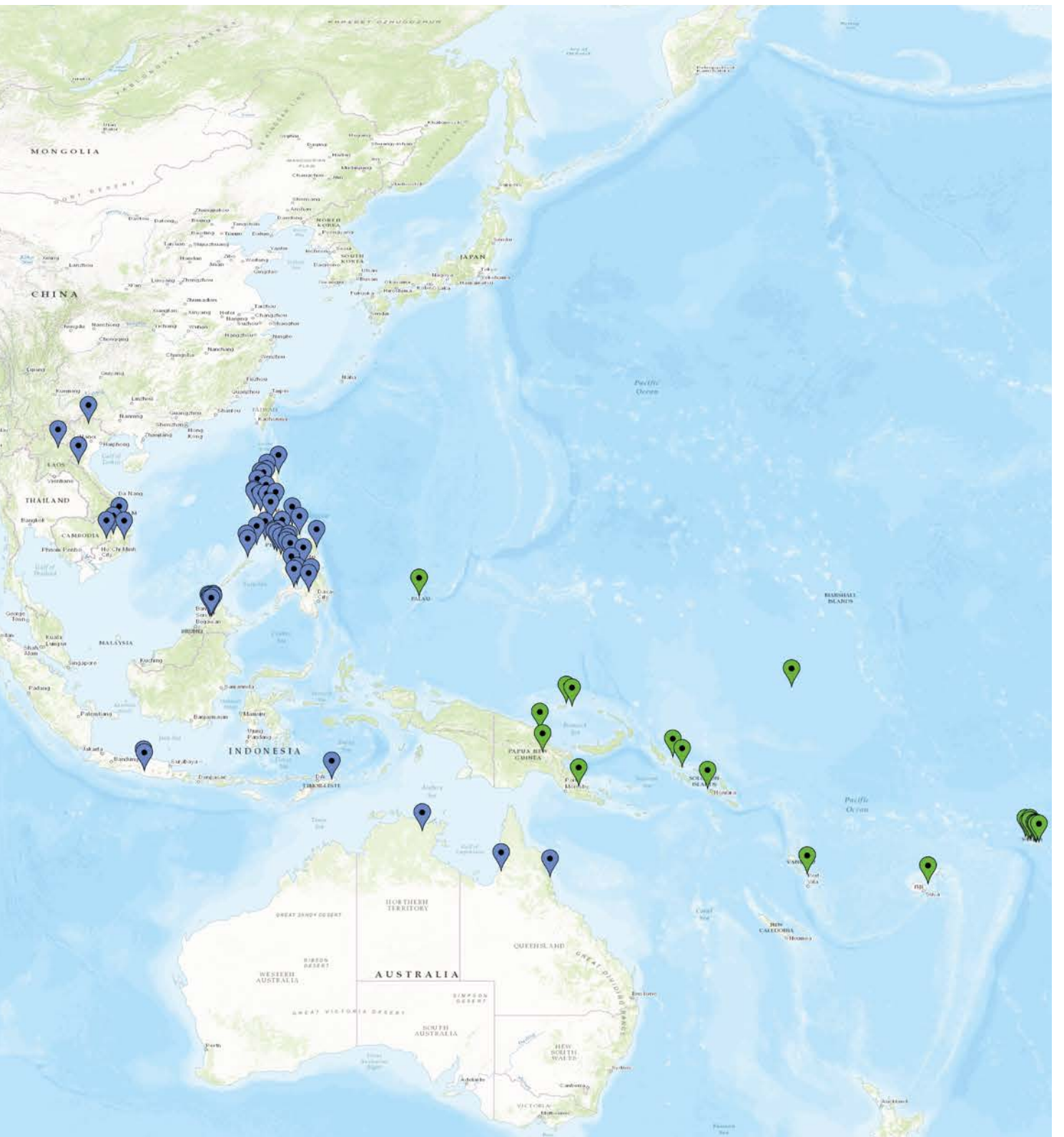
Location where CTA directly or indirectly supported a P3DM exercise



Location where P3DM exercises have been conducted without direct or indirect support by CTA

Source: Esri world topographic baseline map (accessed online on 8 April 2016)









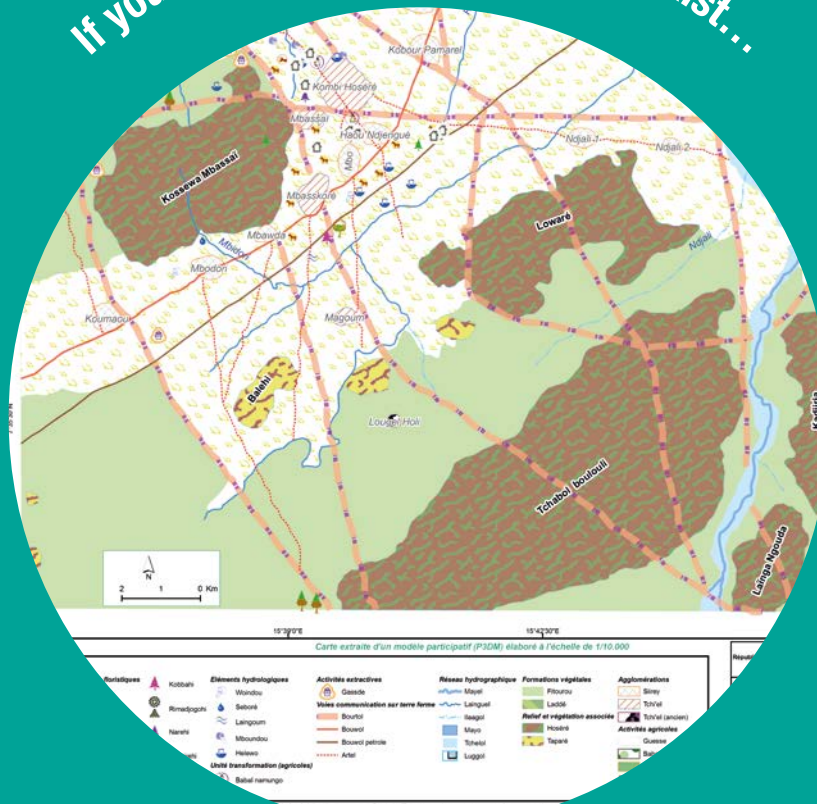
**The Technical Centre for Agricultural and Rural Cooperation (CTA)** is a joint international institution of the African, Caribbean and Pacific (ACP) Group of States and the European Union (EU). Its mission is to advance food and nutritional security, increase prosperity and encourage sound natural resource management in ACP countries. It provides access to information and knowledge, facilitates policy dialogue and strengthens the capacity of agricultural and rural development institutions and communities. CTA operates under the framework of the Cotonou Agreement and is funded by the EU.



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If you aren't on a map, you don't exist...



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