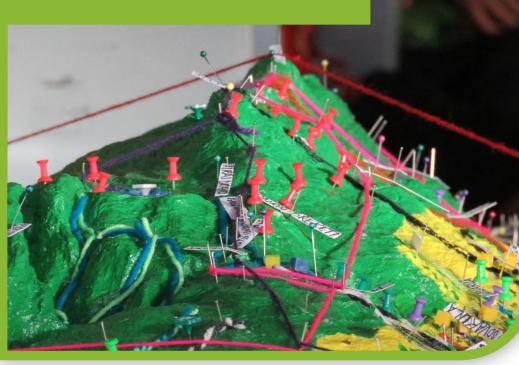
# Taveuni Island Participatory 3D Modelling Exercise

19-27 October 2016 Somosomo, Fiji





## **Acknowledgements**

Participatory 3-Dimensional Modelling (P3DM) exercises are often borne of a collaborative vision for the future of a community. The Taveuni Island P3DM exercise was no different and would not have been possible without the hard work of many. Therefore, a heartfelt thank you to...

Ms. Filo Serenia from SPREP who ably co-facilitated this exercise with me, organized all the logistics both prior and during and managed always to keep cool under pressure!

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The co-facilitators for your participation, leadership and engagement in the process and keeping the Taveuni community engaged and motivated. Thank you Asaeli Turner, Eferemo Kubunavanua, Lex Bureilobau, Maria Bulivakarua and Paul Wagalati.

And, of course the Taveuni Island community participants. Chiefs, youth, headmen, men, women, without you there would be no P3DM. You came every day and embraced the process to make sure that this P3DM was going to work for your community. Well done.

Finally, for the ladies and men who prepared and served such beautiful food (and special treats for me) – vinaka vakalevu – we are too lucky.

## **Executive Summary**

The Taveuni Island Participatory 3-Dimensional Modelling (P3DM) exercise, supported by the Secretariat for the Pacific Regional Environment Program (SPREP), was held from 20-28<sup>th</sup> October 2016 in the village of Somosomo, Taveuni. The exercise forms a basis for Ecosystem and Socio-economic Resilience Analysis and Mapping (ESRAM) assessments which will inform and guide SPREP's Pacific Ecosystems-based Adaptation to Climate Change Project (PEBACC). Participants numbered approximately 56 and included men, women, chiefs and youth from across the island. The exercise culminated in a 3-dimensional model representing the entire Island and utilising local people's own knowledge about Taveuni land and seascapes.



The P3DM project was facilitated by a consultant facilitator

Ms. M'Lis Flynn in partnership with SRPEP's PEBACC Project Officer, Ms. Filo Serenia and Bouma Heritage's Tourism Officer, Mr Sipiriano Qeteqete. Several supporting facilitators were also in attendance from the National Trust of Fiji; Bua and Cakaudrove Provincial Councils; Taveuni tourism industry and the Food and Agricultural Organisation of the UN (FAO). The facilitators guided the Taveuni community through a participatory, staged process to construct the 3D model, to develop a map legend reflecting their own knowledge sets, and finally to utilize their map legend for the transfer of tacit knowledge to the model.

The project fulfilled its brief to produce a 3-dimensional model covering the entire Taveuni Island and surrounding *iQoliqoli* boundaries. The model demonstrates the breadth of Islanders knowledge about protected areas, agriculture, tourism, key species of flora and fauna, and the marine and terrestrial environments. Interesting inclusions were the locations of the *tagimaucia* flowering plant, several waterfalls and the Taveuni Forest Reserve – all key elements to be considered in the PEBACC process.

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## Acronyms

| Acronym | Description   |
|---------|---|
| ESRAM   | Ecosystem and Socio-economic Resilience Analysis and Mapping  |
| GIS     | Geographic Information System                                 |
| P3DM    | Participatory 3-Dimensional Modelling                         |
| PEBACC  | Pacific Ecosystems-based Adaptation to Climate Change Project |
| SPREP   | Secretariat of the Pacific Regional Environmental Programme   |
| WPN     | Watershed Professional Network Consultants                    |

# **Glossary of Local Words**

| Word       | Description  |
|------------|--|
| iQoliqoli  | A marine area where customary fishing rights are applicable          |
| Yaqona     | A root pounded and crushed to a powder, mixed with water and used in |
|            | traditional ceremonies. Also referred to as 'kava'.                  |
| Tikina vou | Fijian sub-district  |

## 1. Background

#### 1.1. Location

Taveuni Island is located in the north-east of the Fiji islands and is Fiji's 3<sup>rd</sup> largest island. It lies to the east of Vanua Levu and covers a terrestrial area of about 434 sq km. The island is part of the Cakaudrove Province which also includes areas on the island of Vanua Levu.

The last census for the island in 1996 indicated that approximately 9000 people reside on Taveuni Island, living in a number of settlements mainly on the western, more protected side of the island. Settlements include Somosomo, Wairiki, Waiyevo, Matei, Navakawau, Lavena, Vuna and several others.



The project area included the entire island of Taveuni, portions of Qamea and Matagi Islands and approx. 250sq km of marine zone (including traditional *iQoliqoli* fishing areas). The highest point on Taveuni Island is Uluigalau at 1242m ASL, which is also Fiji's 2<sup>nd</sup> highest mountain.

#### 1.2. Environment

Taveuni Island is often referred to as the 'garden island', and is thought to contain examples of nearly all the flora and fauna which is Indigenous to Fiji. A volcanic structure, Taveuni experienced eruptions as recent as 500 years ago. The island is home to 2 key and endemic specie – the Fijian monkey-faced bat and the rare, Fijian flowering plant, Tagimaucia, which only grows at 600m ASL on Taveuni and is Fiji's national emblem.

The terrestrial environment of Taveuni is dominated by thick forests, particularly on the eastern slopes, and is increasingly under pressure to yield to increased coconut, yaqona (kava) and cassava and other plantations.

#### 2. Taveuni Island P3DM

## 2.1. Project Context

The Taveuni Island P3DM was developed under SPREP's Pacific Ecosystems-based Adaptation to Climate Change Project (PEBACC) in Fiji. The PEBACC Project focusses on the exploration and promotion of Ecosystems-based Adaptation (EbA) to climate change with an intention to ensure that EbA is integrated into development, climate change and natural resource management policy and planning across Fiji, the Solomon Islands and Vanuatu.

In order to develop locally relevant and adaptive EbA options in Fiji, SPREP are conducting Ecosystem and Socio-economic Resilience Analysis and Mapping (ESRAM) in Taveuni (and other locations). The P3DM activity feeds directly into the ESRAM process by providing a non-threatening opportunity for local people to provide information they consider relevant. This rich local information will value add and localise baseline data gathered by SPREP for ESRAM through other means.

## 2.2. Base Map and Materials Preparation

A key early step in P3DM projects is to establish clear and agreed boundaries for the project area. Theses boundaries assist in determining the scale of the model, the size of the base table, and the geospatial data requirements. The Taveuni P3DM geographic boundaries were an outcome of discussions between SPREP staff, Taveuni leaders and key informants, and the consultant.

Once decided, the consultant collaborated with the Watershed Professional Network (WPN) GIS officer to develop a series of base maps which included labelled contour lines, *iQoliqoli* boundaries, the coastline and labelling. The model was produced at a horizontal scale of

1:20,000, with a vertical exaggeration of 4.5 and covering an area of approximately 1300 sq km. The base maps used 20m contour intervals and were designed to fit a base table covering the entire project area of 2.6m length x 1.2m width and 0.65m height.

In preparation, the SPREP and National Trust of Fiji community engagement staff completed several pre-workshop tasks. These tasks included:



- Procurement of all workshop materials
- Facilitation of the involvement of community participants, youth and stakeholders
- Logistical preparations including accommodation, transport, food and hall hire

## 2.3. Participants, facilitators and observers

There were approximately 56 participants involved in the development of the Taveuni Island P3DM. Of these, 19 were unemployed youth from Somosomo and Vuna villages, and 37 were

male and female community members from across the 3 *tikina vou* of Cakaudrove, Vuna and Wainikeli.

The proportion of men to women for the exercise was approximately 70% to 30%. In participatory exercises, it is ideal to have equal representations of men and women, however the reality is usually more complex as women can find it difficult to withdraw from essential duties such as caring for children or parents, household management and income generation. Although women were underrepresented in the Taveuni P3DM, those in attendance were active and meaningfully involved in every stage of the P3DM. Each *tikina vou* representative group included women, and there were girls in the youth working on the model construction.

The P3DM exercise was facilitated by the consultant P3DM facilitator, M'Lis Flynn together with SPREP Project Officer, Ms Filo Serenia and National Trust of Fiji, Bouma Project Officer, Mr Sipiriano Qeteqete. In addition, 7 Fiji Nationals (listed below) operated as P3DM co-facilitators during the 10 day exercise.

| Name                | Organisation  | Gender |
|---------------------|---|--------|
| Eferemo Kubunavanua | Bua Provincial Council                              | M      |
| Asaeli Tomanitoakul | Cakaudrove Provincial Council                       | M      |
| Lekima Bureilobau   | National Trust of Fiji – Waisali Rainforest Reserve | M      |
| Maika Deveta        | Food and Agriculture Organisation (FAO) – Fiji      | M      |
| Maria Bulivakarua   | Department of Fisheries                             | F      |
| Paul Waqalati       | Taveuni Island Tourism Officer                      | М      |

A number of officials attended the last days of the exercise and participated in the P3DM handover. These were:

- Mr Herman Timmermans Pacific Ecosystem-based Adaptation to Climate Change (PEBACC) Project Manager – Secretariat of the Pacific Regional Environment Program (SPREP)
- Mr Eliki Senivasa Fiji Conservator of Forests (Fiji Ministry of Fisheries and Forests)
- Mr George Madden Fiji Director of Fisheries



## 2.4. P3DM Program

The P3DM exercise began on Thursday 20<sup>th</sup> October 2016 and was held at the Somosomo Provincial Office hall.

## 2.4.1. Day 1 and 2: 20 – 21<sup>st</sup> October – Orientation and Construction

After an official welcome given by Waiseli Mataitoga, local chiefs and SPREP Coordinator Herman Timmermans, facilitators oriented community members and youth to the process, the techniques and the schedule for the P3DM exercise. By mid-afternoon the youth of Taveuni began the process of joining base maps and tracing contours.





The youth, supported by facilitators, continued to trace, and began to cut and glue layers of cardboard for each contour value. There were 53 layers to be assembled and the youth were divided into 3 working groups. Group 1 collated contours numbered 0 - 200 and 1010 - 1242m; group 2 collated contours numbered 210 - 400 and 810 - 1000m; and group 3 collated contours 410 - 600 and 610 - 800m.









Due to the small scale (1:20,000) and the hilly landscape the layers were intricate and detailed. The youth workers met this challenge and laboured studiously each day to construct an accurate and complete model. By the end of Day 3 all layers had been cut and assembled and youth were keen to return the following day to complete construction.

## 2.4.2. Day 3: 22<sup>nd</sup> October – Legend making and construction completion

Representatives from all 3 *tikina vou* attended on Day 4 to participate in a series of linked exercises that led to the creation of the legend. Community members were grouped according



to tikina vou and supported by facilitators, developed lists of features they believed should be depicted on the model. This included features such as rivers, names of mountains and village names. Discussion between some representatives had taken place over previous days which assisted them in organizing and translating their knowledge into lists of 'map

ready' features.

Key facilitators gathered the participants listed 'features' and collated them on a large wall space, whereby they guided the



community through a 2<sup>nd</sup> process. This step involved the collective categorization of the information given by the community into 'points', 'lines', 'areas' (polygons) and labels. This is a crucial stage in the P3DM process as it gently helps people to understand how they might transfer their own traditional knowledge into a format or language which can be mapped on the model and later using scientific methods (GIS).



During a break the facilitators grouped all responses according to their point, line, area, or label category, and community members were then invited to view, discuss and decide upon the inclusion or exclusion of each 'item' in the legend. Duplicates and approx. 15 – 20 features were removed during this process.

Finally collectively, community members were assisted through a process to choose and allocate symbols for each item (map

feature) to be included in the legend. By the close of day 5 all features had been allocated a symbol, and community members were ready to begin transferring their knowledge to the model.





The final legend resulted in approximately 61 different feature types comprising 20 polygon symbols, 10 polyline symbols and 31 point symbols. These symbols may be added to or change over time as a P3DM can be seen and used as a living document. See Appendix 1 for draft legend.

While community representatives were developing the legend, the youth completed construction of the model, and using papier mache of toilet paper and PVA glue, to create a white (blank) model suitable for knowledge depiction.





2.4.3. Day 4, 5 and 6: 24 – 26th October – Depiction of knowledge

It was arranged that representatives from each of the 3 tikina vou would attend on separate days allowing them the space to work on their portion of the model as well as an opportunity to

openly discuss any local issues. On Day 4 representatives from the Wainikeli tikina vou were the first participants to transfer their knowledge to the model using the legend. In the beginning, community members oriented themselves, discussing and interpreting the scale in terms of their own knowledge and landmarks. Considerable time was taken on this first day of knowledge transfer as the representatives grappled with the issue of how to translate their own knowledge to the model's scale. This is an important step in P3DM and representatives were given time to realise this translation in their own manner.







The first features placed on the model included key sites such as mountain tops and villages, creeks and rivers.

While it appeared that the Wainikeli *tikina vou* representatives had only filled a small area of the model by the end of Day 4, they had actually depicted knowledge relevant and important to the whole of Taveuni, such as the Taveuni Forest Reserve boundary. This assisted the process of knowledge transfer for representatives from the other *tikina vou*.

On Day 5, representatives from the Cakaudrove tikina vou began depicting their knowledge on

to the model. During the day, it was decided that any representative from any *tikina* could place knowledge on to the model at any time, rather than segregating each *tikina* to separate days. In planning P3DM exercises it is appropriate to encourage each village/tikina/province/tribe etc to depict their knowledge on separate days. This not only gives freedom to participants to sit comfortably around the entire model (rather than just near their own area), it allows space for the discussion of sensitive issues





relevant to each group without outside pressure. Many participating groups, such as the Taveuni community, decide of their own accord during the P3DM activity that they would like to depict their knowledge in the presence of others. Facilitators then have the responsibility of ensuring that no particular group (or individual) dominates or controls the input of others.

Day 6 was focused on the input of Vuna *tikina vou* representatives, however all representatives were present and working on different aspects of the model. Facilitators assisted participants to cross check the legend against the model and ensure that there were no features missing from the legend, or no extra features added to the legend that without being placed on the model. By mid-afternoon the model was complete and participants were elated at their achievement.







#### 2.4.4. Day 7: 27th October – Aerial photography and closing ceremony

If a P3DM exercise is well facilitated and the purpose for the work has been primarily community-defined, communities are much more likely to take responsibility for, and ownership of, the process and the outputs (the model and its information). In turn, that community ownership helps contribute to the maximization of uses and benefits from the model, such as for environmental and land use planning or climate change adaptation activities.

Ensuring the model is as accurate and complete as possible also assists communities to be able to interpret and apply the model for a variety of purposes. On day 7, facilitators supported community members to finalise paint touch-ups and check that all coloured yarn had been secured onto the model. A 10cm grid was added to the model and 4 'runs' of aerial photos (45 photos in total) were taken of the model. These photo 'runs' are in order to create an orthorectified photo mosaic and extract layers of information depicted on the model into a GIS. The transfer of P3DM outputs to a GIS means that hardcopy (and softcopy) maps can be created, further supporting the implementation of community aspirations.



The handover ceremony at the end of a P3DM exercise is an important avenue to further embed the relationship between the participating community and the model which they have built and populated. It is also an opportunity to demonstrate to the wider community, including Government officials, sponsoring partners and neighbouring districts, the ability of the local people to collaborate, plan and vision future scenarios for a community-based benefit.

The Somosomo Provincial Hall was decorated, food was prepared, the model was respectfully covered and at 3.30pm the official handover ceremony for the P3DM began. In attendance were:

- chiefs and headmen from across all 3 Taveuni tikina vou Wainikeli, Cakaudrove and Vuna
- Pacific Ecosystem-based Adaptation to Climate Change (PEBACC) Project Manager for SPREP
- Mr Eliki Senivasa Fiji Conservator of Forests (Fiji Ministry of Fisheries and Forests)
- Mr George Madden Director of Fisheries
- *tinika vou* representatives
- youth participants
- other community members (who were not participants) and
- facilitators

The ceremony was chaired by Waiseli Mataitoga and began with a traditional Fijian iTatau ceremony following by the unveiling of the model by the Taveuni chiefs present. SPREP Project Manager, Mr Herman Timmermans congratulated the community on the development of a P3DM which would support the ESRAM process and outcomes. Chief Guest - Conservator of



Forests Mr Eliki Senivasa - provided a motivating speech about the crucial role that local people have in environmental management and ensuring Taveuni's future. The ceremony also included speeches by the consultant and SPREP facilitators, M'Lis Flynn and Filo Serenia and concluded with heartfelt Fijian singing, and dances performed by local youth. All guests joined together for a sumptuous evening meal.



2.4.5. Day 8: GIS data development

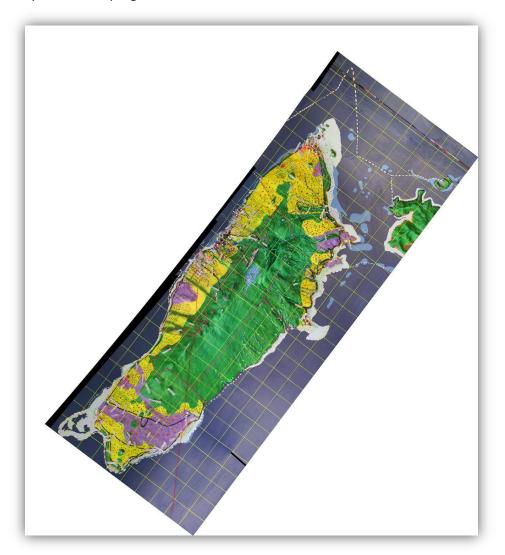


Completing the model at the site is often not the final step in the P3DM process, indeed it may even be a first step in a community's path to empowerment. Many communities, including those of Taveuni Island, opt for their depicted knowledge to be transferred to a Geographic Information System (GIS). This allows the information to be displayed on maps alongside other scientific, social or environmental data,

and thereby raising the profile of local people's knowledge. Maps are readily used in lobbying and as a tool when in negotiations with 'outsiders' about land management.

The consultants employed to undertake the ESRAM mapping study, WPN, also led the transfer of modelled information to the GIS. After importing the 'aerial' photographs of the model into ArcGIS 10.2 and registering them to the WGS 84 coordinate reference system, WPN staff stitched the photos together to create a rectified mosaic with real world coordinates (see image below).

From this mosaic, information was digitized to create a series of separate ArcGIS shapefiles (layers) for polyline, polygon (shape) and point features. At the time of writing development of the GIS layers is still in progress.



## 3. Outcomes and impact

#### Participation, collaboration and shared knowledge

The Taveuni Island P3DM was a very successful exercise for the community. A variety of local people from across the entire island participated fully, all of whom attended and remained well engaged each day of the exercise. This level of participation reflected the community's trust in the process, and their belief that partaking could lead to meaningful outcomes for Taveuni. One participant commented '…I learned the important role I play in protecting our live natural resources on land and in our oceans on my Taveuni Island', another said '….I learnt that we i-Taukei people are supposed to protect our natural resources'.

Taveuni's P3DM process exposed participants to the breadth of knowledge that the islanders hold, creating deeper relationships and promoting understanding on how different communities across the island could work together in the future. Perhaps there was also surprise amongst some regarding others' depth of knowledge about particular places and activities on Taveuni. Collaborating on the construction and development of the model helped participants to forge new relationships amongst themselves and to begin envisioning how best to collaborate for the future. In turn, this allowed community participants to lay a solid foundation for the ESRAM resource mapping which was planned for the following weeks.

#### Laying the foundation for the ESRAM mapping

The Taveuni P3DM forms the basis for SPREP's ecosystem and socio-economic resilience analysis and mapping (ESRAM) under the Pacific Ecosystems-based Adaptation to Climate Change Project (PEBACC). Key inclusions to the model were those areas under cultivation or plantation – both for subsistence and commercial uses, including crops such as coconut, kava, and cassava. Mapping the extent of plantations on to the model greatly assisted participants to understand the current impact of those plantations, as well as to examine the areas where new plantations are planned and discuss implications and potential impact. The model gives local people a 'birds eye' vision of the island where they can look at the same 'map' (model) many times for collaborative planning and use the ESRAM process and the PEBACC project to discuss and plan according to ecosystem.

The P3DM process emerged knowledge about historical sites dotted across the island, roosting sites of the Fijian monkey-faced bat, as well as the location of several instances of the rare, and endemic to Tavenuni, the *tagimaucia* flowering plant. Also of note were the sites and infrastructure at the heart of Taveuni's tourism industry - waterfalls, roads, hotels, Bouma Falls and Lake Tagimaucia. Taveuni Islanders are very proud of the existence of the Taveuni Forest Reserve and were keen to ensure that its boundary was correctly situated on the model. A late inclusion to the model was the International Date Line, which crosses the southern end of the island diagonally north from the south-east corner. Interestingly, although technically the International Date Line no longer crosses Taveuni Island it is still an important marker to local people and part of Taveuni tourism.

Like most Fijian coastal communities, fishing is key to the livelihoods of Taveuni Islanders. The P3DM includes the location of the iQoliqoli (traditional fishing area boundaries), both submerged and exposed reefs and fish traps. It could be suggested that if there were more participants whose livelihood was in the fishing industry, more detailed marine information may have been included in the model.

#### Professional capacity building

A foundational element of P3DM is to create an opportunity for local professionals to develop skills in P3DM process and facilitation so they may envision how it might be used to effect in the communities in which they are working, and then apply their knowledge. This opportunity was deepened for 2 former P3DM trainees – Ms Filo Serenia and Mr Sipiriano Qeteqete – as key/lead facilitators for the Taveuni P3DM. As facilitators Ms Serenia and Mr Qeteqete were attuned to local and regional nuances, understood cultural cues, had a deep understanding of the environmental, social, economic and institutional context and were able to readily communicate in local language. Mr Qeteqete was also local to Taveuni, allowing him to take a lead when negotiations or delicate issues were to be addressed. All key facilitators were substantially supported by 3 former trainees from the Bua P3DM exercise.

#### Diversifying the applications of P3DM

The Taveuni P3DM exercise was also attended by Mr Maika Daveta from the Food and Agriculture Organisation (FAO). The FAO are undertaking projects across 8 ACP nations to improve the condition and productivity of agro-silvo-pastoral landscapes affected by desertification, land degradation and drought. This assists in their quest to contribute to poverty alleviation, ending hunger and improving resilience to climate change in fragile ecosystems. As an outcome of the Taveuni Island exercise the FAO are planning to implement P3DM in early 2017 as tool for this project in Fiji.

#### 4. Issues and recommendations

There are few projects that do not experience issues, in particular those which are participatory in nature, are focused on community engagement and have teams spread across countries. The Taveuni Island P3DM had very few issues all of which were minor in nature and should be simply noted for future reference.

The Taveuni Island P3DM was planned in period of about 4 weeks, substantially shorter than the typical 8 - 12 weeks for a P3DM. A strong team on the ground in Fiji, and a recent series of meetings with community leaders, resulted in well executed logistics and effective and rapid community engagement. Participatory processes executed well create space and opportunity for all voices to be heard, to facilitate an outcome that is as representative of a broad cross section of a community, as possible. With a ratio of about 70% men to 30% women the P3DM may have had further outcomes with a more equal representation of women amongst the participants. Women bring a different perspective to such mapping because of the unique way they understand and utilize the resources and landscape around them. Without the proper and ongoing involvement of women in P3DM and future related activities then effectively only 50% of the population has a voice. This could result in future plans which primarily reflect the perspectives of men.

#### **Recommendation:**

A longer lead time in planning would allow greater opportunity to bring women together in small groups per *tikina vou* to engender understanding, interest and capacity to participate. If it is difficult to have more than a couple of women attend a workshop, for example because of family commitments, small group sessions facilitated by a female, can create spaces for sharing and planning which information is important to the women of that region.

A second and final minor issue relates to the scale to size ratio of the model. A 1:20,000 scale model of such a large area – almost 1300 km sq – on a relatively small table, resulted in a rather extreme vertical exaggeration. This meant that the islands mountains looked disproportionally higher and steeper compared to the model's horizontal dimensions. Although it assists in making the model look dramatic and eye catching, it is in effect not a true representation of the way the island appears in reality.

#### **Recommendation:**

Again a longer lead time may have allowed for deeper thought and discussion about the effect of the scale to size ratio, and an opportunity for the key facilitator to recommend a different scale, or a larger table. Allocating enough time for proper consideration of the technical aspects of the P3DM, allows for such potential misnomers to emerge and be righted.

#### 5. Conclusion

The Taveuni Island P3DM was the 3<sup>rd</sup> P3DM exercise to be completed in Fiji, 11 years after the Ovalau exercise that led the project to a World Summit Award and just one month post UNDP's Vanua Raviravi P3DM. It was a fulfilling achievement for Taveuni Islanders and SPREP and it has been neatly embedded in the ESRAM and PEBACC broader project contexts.

The P3DM bought representatives from across the entire island of Taveuni together to begin the process of addressing climate change, environmental management and future development in a unified and collaborative manner while laying a foundation to undertake the ESRAM work. The process unearthed knowledge and information about many aspects of Taveuni – from the location of rare and endemic species to the spread of tourist accommodation across the island.

Over the course of the process in Taveuni, at least 56 community members participated, shared and learned about Taveuni's strengths and future challenges, while 6 co-facilitators experienced the usefulness of P3DM and contributed to the empowerment of local people. As a result of involvement in the process also, FAO are now planning to facilitate similar workshops in Bua Province and potentially other sites across the Pacific.

## 6. Appendix 1 - Draft Legend

