



List of Innovation Projects & Roadmap

Deliverable 4.2

Sociedade Portuguesa de Inovação - SPI

**Pacific-Europe Network
For Science, Technology and Innovation**



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Executive Summary

Introduction

The main objective of this task is to identify potential industrial innovation projects within the thematic fields of WP1, WP2 and WP3. Moreover, it aims at improving coordination and cooperation in areas where EU knowledge and technology transfer can be adapted to local conditions, and vice versa, while having the highest economic impact.

In order to accomplish this goal, the following chapter presents two specific objectives:

- Describe the short listed selected projects for seed funding;
- Analyze the specificities and outcomes of these projects and propose a roadmap to guide future projects' implementation.

Methodology

The methodology adopted in this task follows four main steps:

- Map the potential industrial innovation areas;
- Seek domestic and international technical expert advice to identify most promising innovation areas;
- Select a small number of economically profitable and environmental sustainable innovation;
- Build a roadmap of the forthcoming efforts required to implement selected projects.

Mapping and identification of the potential industrial innovation by thematic area

Concerning the mapping and identification of the thematic areas and following the mentioned list of criteria, 66 proposals were submitted for seed funding agreement inside PACE-Net Plus Work Packages.

These projects are scanned in order to have an overview of the major potential industrial innovation by thematic areas. In this section, the main projects and thematic areas are identified, including the cross challenge projects that encompass a transversal approach to the three thematic areas that are:

- Health, demographic change and wellbeing;
- Food security, sustainable agriculture, marine and maritime research and the bioeconomy;
- Climate action, resource use and efficiency and raw materials;
- Cross challenge.

Selection of economically profitable and environmentally sustainable innovation projects

The two selected projects are described in detail:

- IDEA Consortium workshop: Social-Ecological modelling of innovative genetic control approaches to mosquito-borne disease;
- Food security and biosecurity in Melanesia: Land snails as pest agents of decline in self-sufficiency in healthy food production and potential for utilizing edible native snails.

Roadmap of the forthcoming efforts required to implement selected projects

The analysis of selected seed funding projects is relevant to understand and map the efforts required to implement future projects. For that matter, key strengths and weakness points are identified in order to optimise the implementation of future projects and to better profit from seed funding and EU-Pacific connections. The roadmap is built in three-folds:

- Identification of general recommendations;
- Identification of specific thematic areas recommendations;
- Roadmap to the development of future innovation projects.

Conclusion

This report presents a review of the seed funding selected projects concerning industrial innovation within the thematic fields of PACE-Net Plus project that are: Health, demographic change and well-being; Food security, sustainable agriculture, marine and maritime research and the bio economy; and Climate action, resource use and efficiency and raw materials.

The themes and issues addressed by the countries are of great relevance especially for local practical issues such as Non Communicable Diseases (NCDs), infectious diseases, oncology, mental health, e-learning, omics research, sustainable agriculture, marine sustainability, fisheries, integrated sustainable management, traditional knowledge, biodiversity studies, natural resources, impacts of sustainable practices, climate action, clean energy production, and transitions to sustainability.

Moreover, the implemented projects also present in-depth knowledge to understand and develop roadmap for forthcoming efforts required to implement future projects. The roadmap involves questions such as the strengthening of research networks and public-private partnerships, knowledge transfer, schedule and geographical specificities are relevant to be address in implementing forthcoming projects of this type.

1. Introduction

PACE-Net Plus aims to support the EU-Pacific policy dialogue in ST&I, including dialogue on innovation issues. It plans to reinforce the EU-Pacific ST&I cooperation, focusing on three major societal challenges that are:

- Health, demographic change and well-being
- Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the bio economy
- Climate action, environment, resource efficiency and raw materials.

This report is the main outcome of Task 4.2 *Identifying areas and niches for potential industrial innovation within the thematic fields of WP1, WP2 and WP3.*

The main objective of this task is to identify potential industrial innovation projects within the thematic fields of WP1, WP2 and WP3. Moreover, it aims at improving coordination and cooperation in areas where EU knowledge and technology transfer can be adapted to local conditions, and vice versa, while having the highest economic impact.

In order to accomplish this goal, the following chapter presents two specific objectives:

- Describe the short listed selected projects for seed funding;
- Analyze the specificities and outcomes of these projects and propose a roadmap to guide future projects' implementation.

Industrial innovation in the Pacific Countries suffers influence of different contextual characteristics that may affect positively or negatively the development of innovations. Some of these factors were previously identified in PACE-Net Plus reports (Di Maio, 2016), and are described as follows:

- Geographic isolation;
- Small domestic markets;
- Reliance on industries based on natural resources;
- Shortage of resources/skills such as infrastructure, and business or financial skills;
- Long term political ties based on previous colonial relationships;
- Current relationships with Australia, New Zealand, the United States, Europe and Asia as a result of donor/aid programmes, political agreements and business connections;
- In some smaller countries, there is a lack of social or political will to foster innovative activities due to cultural influences or competing priorities, e.g. the struggle to boost economic growth because of insularity, isolation and socio-political issues, e.g. civil wars;
- The larger countries on the other hand often have significant enthusiasm, both culturally and politically, for innovation;
- Legislation affecting innovation is highly heterogeneous across the countries in the Pacific. Important bodies of legislation in those countries with larger economies, whereas legislation for the more isolated countries is almost non-existent;

- The scope of innovation can be strongly determined by the main economic drivers for that country, many of which are focused on increasing economic revenue for the country in the face of market access and resource challenges;
- Pacific researchers and businesses can also experience challenges in developing contacts with their neighbours;
- Many of the businesses are SMEs or sole traders, which have a low capacity for engaging in R&D and mixed engagement in innovative activities. A few counties are promoting the development of “Innovation Clusters” to overcome this issue.

Thus in order to identify areas and niches for potential industrial innovation, a methodological chapter is proposed as follows.

2. Methodology

This section provides the detailed information regarding the methodology for mapping and identifying the potential industrial innovation and the selection of sustainable innovation projects. The

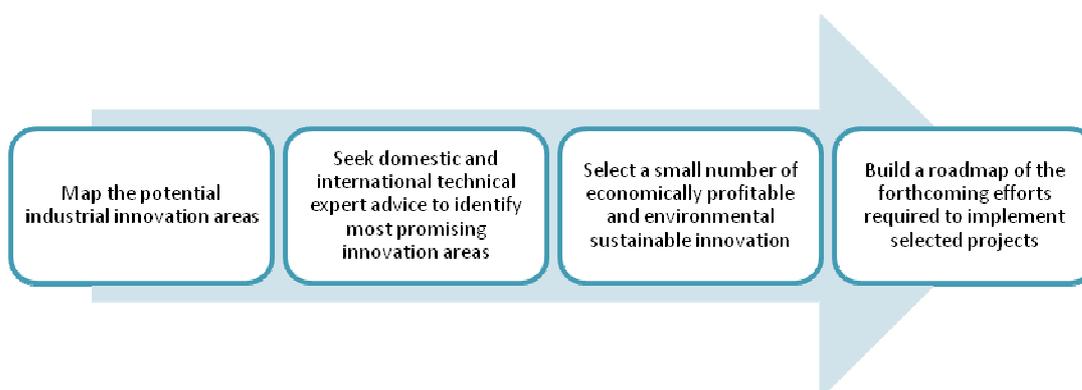


Figure 1: Methodology

methodology adopted in this task follows four main steps described as follows.

The first step concerns map the potential innovation areas based on the competencies and best practices identified in Task 4.1 and what could be the EU contribution to these areas. In order to map the best practices previously identified, a few criteria were selected:

- General innovation objectives;
 - Has the company filed any patent?
 - Is the company launching any new product/service within the next 6-12 months?
 - Does the company have its own R&D team?
 - Has the company experienced continuous growth over the past 3 years?
 - The innovation has been successful?
- Contribution to PACE-Net Plus goals;
- Network achievements (proposed network effects);
- Expected results (range and applicability of the outcomes);
- Bilateral activities (promotion and development of bilateral thematic cooperation);
- National and International relevance (concern the relevance for both EU and Pacific contexts).

The second step concerns the search for domestic and international expert advice to identify the most promising areas for innovation by the Pacific countries. Thus, according to the proposals sent to seed funding analysis, Pace-Net Plus main experts developed a cross-cutting analysis concerning the different thematic areas submitted according to the list of criteria above mentioned, thus giving advice on which are the most prominent areas to be selected as potential sustainable innovation projects.

Moreover, the third step of this section involves the selection of a small number of economically profitable and environmentally sustainable innovation projects and this selection followed a very short list resulting from the above mentioned steps (1 and 2). The selected projects are:

- IDEA Consortium Workshop: Social-ecological modelling of innovative genetic control approaches to mosquito-borne disease;
- Food security and biosecurity in Melanesia: Land snails as pest agents of decline in self-sufficiency in health food production & potential for utilizing edible native snails.
- Joint Pacific-Europe Development of an Unmanned Aerial System (UAS) for Environmental Monitoring and Surveillance in the Pacific Island Countries (PICs).

The third selected project could not be executed because the team leader of the project did not have the availability to implement the project at the moment.

Finally the preparation of a roadmap of the forthcoming efforts required to implement selected projects consists of a very relevant step because of the practical implications. This step is developed in three major phases:

- Identification of general recommendations (based on successes and failures features during the development of the projects) common to all the selected projects;
- Specific thematic areas recommendations (based on successes and failures features during the development of the projects);
- Roadmap to the development of future innovation projects.

3. Mapping and identification of the potential industrial innovation by thematic area

A mapping and identification of the potential industrial innovation is developed according to the selected projects for the seed funding call organised inside Pace-Net Plus Work Packages. For that matter, 66 applications were received and 21 projects were selected.

The selected projects were scanned in order to have an overview of the major potential industrial innovation for 3 major societal challenges defined within PACE-Net Plus scope. In addition to the three societal challenges that are identified bellow, it was also possible to apply to a category named cross challenges that encompass a transversal approach to the following areas:

- Health, demographic change and wellbeing;
- Food security, sustainable agriculture, marine and maritime research and the bioeconomy;
- Climate action, resource use and efficiency and raw materials.

The total amount of seed funding applications for PACE-Net Plus is 66, and the division per societal challenge are described as follows.

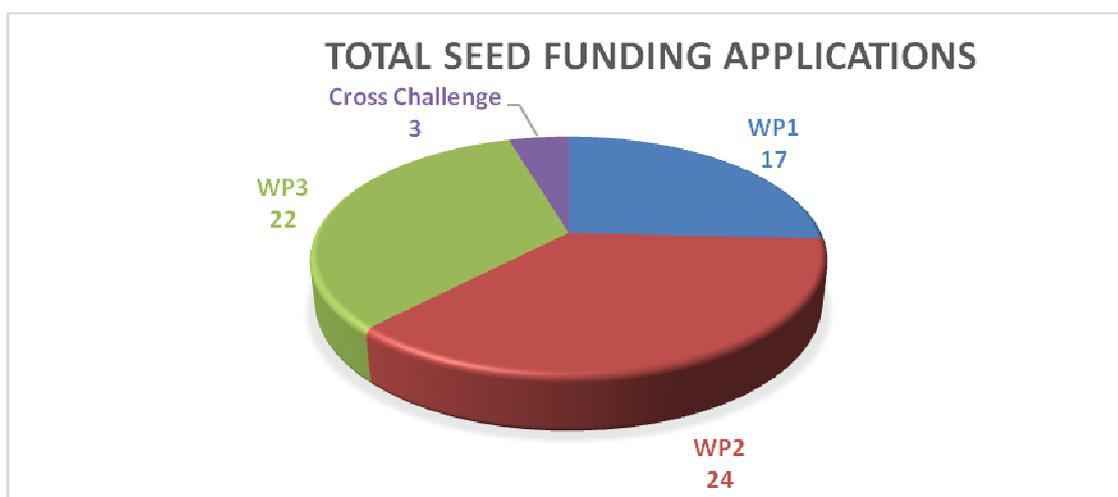


Figure 2: Total Seed funding applications per area

The eligibility criteria of the selection process was defined as follows:

- Proposals must address one of the 3 societal challenges or it could be considered as a cross-challenge project;
- Applicants could be both from EU countries (including OCTs), Australia, New Zealand and Pacific Island Countries and Territories;
- Applicants from Australia and New Zealand must involve a societal challenge faced in at least one PIC;
- Applications must be developed with at least one partner from EU and one from PICs;

- Proposals may involve joint calls, summer schools, twinning and networking of (private or public) labs or organisations (including regional ones) etc.;
- Each individual applicant (e.g. researcher, innovator, policy-maker) may only contribute to one single application either as the main applicant or as a partner. Multiple applications are not permitted;
- Funds may cover consumables, travel funds and other project-related costs of up to 10,000€ per project
- Funds may not be used to cover personnel costs.

Thus concerning these eligibility criteria, the selection process had two phases, the first one was to identify the eligible and non-eligible projects, and the second was to effectively select the winning projects, according to figure 3.

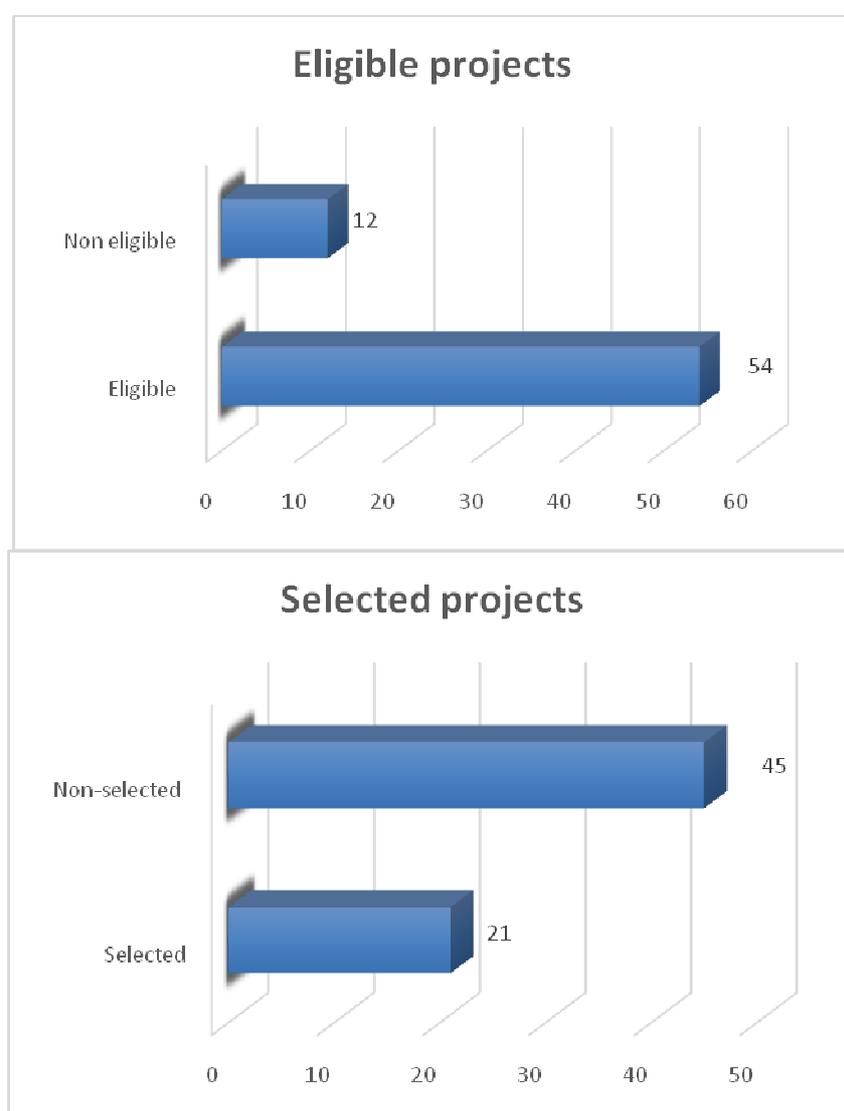


Figure 3: Seed funding applications statistics

The selected projects for each societal challenge are described in the following sections.

3.1. Health, demographic change and wellbeing

The Work Package 1 is about the social challenge of health, demographic change and wellbeing. PACE-Net Plus aims at tackling issues such as changes in life styles, population scale, youth health and prevention and also non-communicable diseases or infectious diseases because of the difficulty to measure and map.

Figure 4 shows the total number of 17 eligible seed funding projects and the different thematic areas inside this challenge they applied, such as non-communicable diseases, omics research, mental health, e-learning, oncology, and infectious diseases. In addition, 5 more projects that applied were considered non-eligible by the Evaluation Commission.

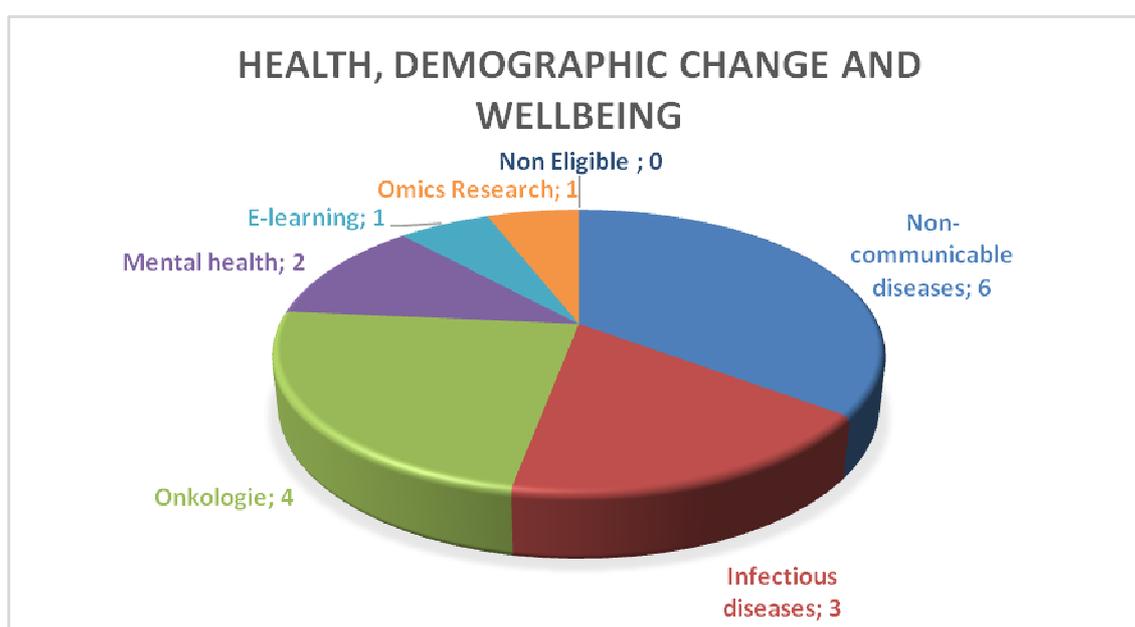


Figure 4: Major thematic areas of seed funding projects for WP1

Eligible projects that applied to seed funding:

1. **The Pacific MANA (Monitoring Alliance for NCD Action) Hub;**
2. **Alcohol and the Pacific Island workplace: causes, cultures, costs and consequences;**
3. **Food-related policies to prevent non-communicable diseases in the Pacific: Impact assessment;**
4. **Physical activity for today's Oceanian youth;**
5. **Monitoring non-communicable disease (NCD) mortality in Pacific Island States;**
6. **Computational studies of a disease-related enzyme: Building Samoa's computational expertise and collaborations to control non-communicable disease;**
7. **IDEA Consortium Workshop: Social-Ecological Modelling of Innovative Genetic Control Approaches to Mosquito-borne Diseases;**
8. **MICRO-SI: Microbiology and infection resource optimisation in Solomon Islands;**
9. **Nano-bio surfacing & Diagnosis of infectious diseases;**

10. **Fit air pollution: Detecting lung cancer before it hits;**
11. **The Walking lab: a mobile testing facility to reduce the incidence of cervical cancer in Samoa;**
12. **Community mental-health services and suicide rate: Relevance for local eHealth and transfer to the Pacific Region.**

Non-eligible projects that applied to seed funding:

13. **Professional Development and Public Health Training in NZ and the Pacific: A Programme of E-learning short courses;**
14. **Loss of CDKN2A and TP53 in liver progenitor cells as a prognostic indicator of susceptibility to liver cancer;**
15. **Next generation ultrahigh sensitivity photodetectors for biosensing applications;**
16. **Promoting well-being, resilience and positive mental health over the life span;**
17. **Research Summer School in Statistical Omics: Training a new generation of statistical omics scientists who understand the biology and technology behind large datasets, and can apply the data-mining methods to analyse omics data.**

Selected projects:

Details	Monitoring non-communicable disease (NCD) Mortality in Pacific Island States
Duration	10 months
Thematic area	Non-communicable diseases
Organisations	<ul style="list-style-type: none"> • University of New South Wales, Sydney • INSERM. IPLESP, UPMC, EPAR: Epidémiologie des maladies Allergiques et Respiratoires • Ministry of Health, Government of Fiji (Suva) • University of New Caledonia, Noumea • Secretariat of the Pacific Community (SPC).
Short Description	<p>Many Pacific Island states are affected by excessive premature adult mortality with consequent decrease in life expectancy from non-communicable diseases (NCD). NCD is defined by the World Health Organization (WHO) as: cardiovascular disease (CVD) i.e. heart disease and stroke, diabetes mellitus (adult onset) (DM), cancer, and chronic lung disease (CLD) consequent upon changing diet and nutrition (increases in animal fat, salt, and energy), tobacco and alcohol consumption, and less physical activity. Monitoring of trends in NCD in populations is important to document the magnitude of the problem so as to stimulate preventive and control activities, and to assess effectiveness of interventions at a population level. The main work plan involves the following steps:</p> <ul style="list-style-type: none"> • Development of a framework for implementation involving partners; • Discussions on the proposed project with a meeting; • Design and pilot testing of customized spreadsheet for analysis from 2-3 Pacific Island states through networking of partners; • Training for personnel from 2-3 Pacific Island states in application of tabulation, analysis, reporting and dissemination of coded NCD cause of death data; • Tabulation, analysis and reporting of coded cause of death data from 2-3 Pacific Island states through networking of partners.
Expected outcomes	<p>The evaluation of successes and challenges of pilot data analysis from 2-3 Pacific Island countries. To provide training to those territories in order to disseminate information and set up prevention plans.</p>
Contributions to PACE-Net Plus	<ul style="list-style-type: none"> • Addressing the societal challenge 'health, demographic change and well-being' by targeting NCDs ('health and well-being');

	<ul style="list-style-type: none"> • Fostering EU-Pacific cooperation through collaboration, networking and joint activities; • Benefiting EU member countries by capacity supplementation in collaborative research involving innovative methods of spreadsheet analysis of cause of death data using IRIS software currently under development by France, Germany and others, which would be suitable for other developing country contexts; • Benefiting Pacific Island states (especially Fiji, Tonga, Samoa) by provision of accurate information on contribution of NCD to premature adult mortality and effects of preventive activities, and through augmentation of science, technology and innovation capability.
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Details	Physical activities for today's Oceanian Youth
Duration	10 months
Thematic area	Non-communicable diseases
Organisations	<ul style="list-style-type: none"> • University of New Caledonia • MPT Innovation Group Australia • University of Sydney • Matuaileoo Environment Trust Inc., Samoa • MSH Medical School Hamburg, Germany • Institut de Recherche pour le Développement, France.
Short Description	<p>Due to the potential influence of western lifestyle and that has led to the dominance of commercialization and consumerism, which in turn have had significant impacts on Pacific population health, this project was developed to identify the impact of different lifestyles with a special focus on physical activity and food intake. Moreover it aims at focusing on the consequences of physical (obesity, cardiovascular system, respiratory system, hypertension), mental (self-esteem) and social health (social relations and education improvement) in adolescents from the Pacific islands, i.e. Polynesians and Melanesians. This project uses a combination of technologies as well as face-to-face interaction to address the question of physical activity engagement in the youth and it also brings together 6 countries (New Caledonia, Vanuatu, Samoa, Germany, France and Australia) to tackle NCDs in the Pacific islands. The aim of the project is to assess physical activities levels in the youth from local communities and to use physical activity to improve the well-being of young Oceanians through connected bracelets, face to-face interactions and a free mobile applications including. Pilot studies and workshops are also included in the work plan of this project.</p>
Expected outcomes	The evaluation of successes and challenges of the pilot field study and analysis of the well-being (physical, mental and social) in Oceania in 2015.
Contributions to PACE-Net Plus	This proposal addresses the Societal Challenge 'Health, demographic change and well-being' with a pilot study in physical activity research to contribute to leveraging further funding, initiating further collaboration, and/or generating innovation. This is an interdisciplinary and international project including researchers from the European Union, the Pacific island countries, and Australia.

Details	The Pacific MANA (Monitor Analysis for NCD action) Hub
Duration	10 months
Thematic area	Non-communicable diseases
Organisations	<ul style="list-style-type: none"> • Secretariat of the Pacific Community • Pacific Research Centre for the Prevention of Obesity and Non-communicable Diseases (C-POND), Fiji • University of Sussex, Institute of Development Studies Global Open Knowledge Hub, UK

	<ul style="list-style-type: none"> World Health Organisation, Division of Pacific Technical Support Western Pacific Regional Office (WHO WPRO), Fiji.
Short Description	<p>The Pacific Monitoring Alliance for NCD Action (MANA) – a collaboration of Pacific Islands and their partners concerned with NCD monitoring and surveillance – was established in 2013 in response to high-level political calls for stronger links between evidence and action, more accountability for action, and more coordinated sharing of NCD surveillance data between countries. Underpinning these calls is the need for good quality NCD monitoring systems involving: accurate and timely data collection and management, appropriate analyses, and clear and concise translation of findings to inform policy and practice. It is acknowledged that considerable challenges exist across the region in all of these areas and the central aim of MANA partners is to create a change in the overall quality of NCD monitoring and surveillance mechanisms nationally and regionally. The MANA Hub would provide an easy access point for relevant data, linking data from various existing domains/sources. The aim is to interactively generate comparative tables by domains, countries, etc., multiple source analysis for trends and forecasting, track progress towards national/regional targets and generate accountability dashboards, powerful messages for policy makers/leaders based on data analyses.</p> <p>The proposed work have the following structure:</p> <ul style="list-style-type: none"> Initial scoping exercise to map existing resources, strategies, databases, sources of relevant content and identify potential needs and gaps in preparation for a technical workshop; A large proportion of the team, along with additional staff will attend a one-week technical workshop to determine technical feasibility and content strategies to construct a prototype hub and agree on a plan of action.
Expected outcomes	Formation of a Pacific-EU coalition to prepare a proposal for long term Horizon 2020 support to develop the Pacific MANA Hub and the Pacific MANA Hub Feasibility report and action plan.
Contributions to PACE-Net Plus	The collaboration aims at strengthen EU-Pacific dialogue and innovation through the development of a shared open data platform focused on tackling the NCD crisis, by drawing partners' technical skills in developing innovative approaches to knowledge broking and intermediation.

Details	How novel Nano-biosurfacing constructs can Improve the Diagnosis of Infectious diseases in the PACific region? NIDI-PAC
Duration	10 months
Thematic area	Infectious diseases
Organisations	<ul style="list-style-type: none"> Institut Pasteur de Nouvelle-Calédonie (IPNC) Auckland University of Technology (AUT) DIAGRON, La Réunion, France Papua New Guinea Institute of Medical Research (PNG-IMR).
Short Description	<p>This proposal is based on the implementation and use of KODE Technology, which consists of nano-biosurfacing constructs. The Pacific region is experiencing many infectious diseases issues. The number of outbreaks due to non-communicable diseases has increased in the past years. These diseases are important causes of acute febrile illnesses and deaths in the Pacific region. The diagnosis of these diseases, frequently based on clinical signs, can be confusing as most of them can be classified in the so-called "acute fever of unknown origin". However, it is important, for example to clearly discriminate leptospirosis from dengue infection, in order to adapt the medical treatment (use of antibiotics against leptospirosis). Clinicians need rapid confirmation of their diagnosis. The objectives of this proposal are:</p> <ul style="list-style-type: none"> Improve early diagnosis of infectious disease by implementing new easy-to-use and rapid bedside diagnostic tests using either serum or

	<p>urine;</p> <ul style="list-style-type: none"> • Improve the early detection of cases (travellers or household investigations) or allow field survey targeting vectors, animals or other reservoirs.
Expected outcomes	<p>Within the diagnostic tool that will be implemented, it may allow the development of a surveillance program for these diseases in areas at-risk. As this technology is highly and rapidly adjustable, this can also be applied to study the emergence of new pathogens in the region.</p>
Contributions to PACE-Net Plus	<p>Collaboration between EU, New Zealand and PICTs is in process.</p>

3.2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy

Due to the high dependence of Pacific Islands Countries (PICs) on marine resources and agriculture, it is specifically important to address this societal challenge in order to focus on research and innovation development for optimizing and improving the productive systems, the concern with food security and bioeconomy, including local traditional knowledge and support to local production. Figure 5 shows the total number of 24 projects that applied to the Food security, sustainable agriculture, marine and maritime research and the bioeconomy societal challenge. However, 1 of the 24 projects was considered non-eligible by the Evaluation Commission. The projects that applied are from different thematic areas such as biodiversity studies, traditional knowledge, sustainable agriculture, integrated sustainable management, lagoon health, and aquaculture innovation.

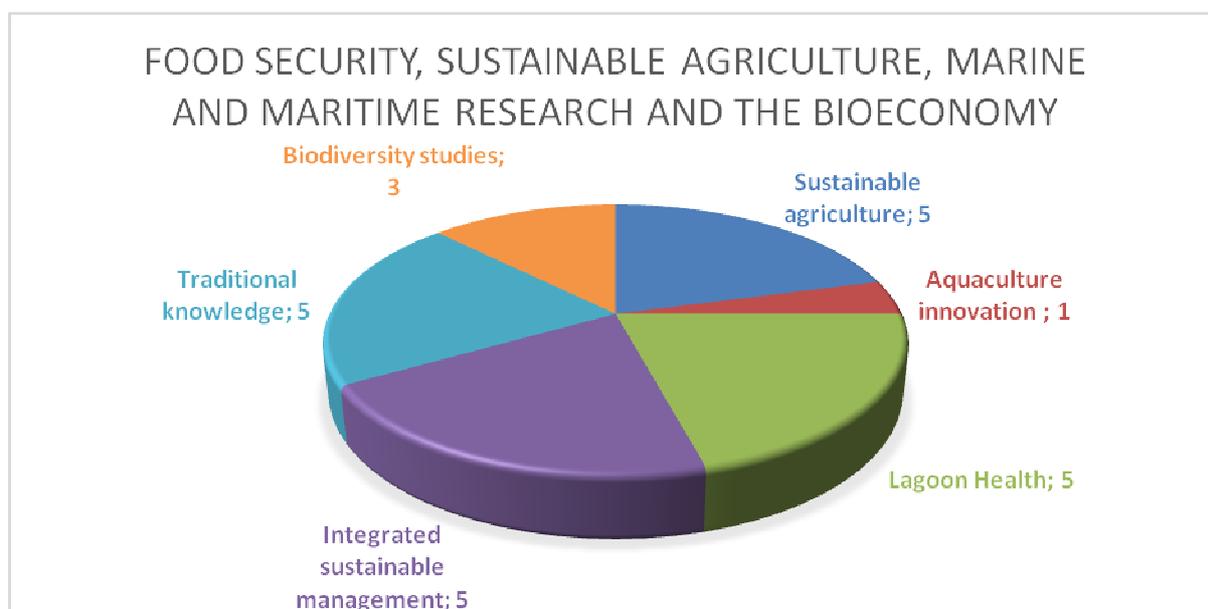


Figure 5: Major thematic areas of seed funding projects for WP2

Eligible projects that applied to seed funding:

1. **Animal feeds and bio-fertilisers from marine pest species for sustainable agriculture and food security in Pacific Island Countries;**
2. **Optimizing land use patterns in Sigatoka Valley (Fiji);**
3. **Pacific Food Matters: converging traditional knowledge solutions with ecological science for climate resilient local and global food security;**
4. **What the archaeology of traditional Pacific Islander approaches to agriculture can contribute to the generation of sustainable food production strategies in Oceania;**
5. **Joint Pacific-Europe Development of an Unmanned Aerial System (UAS) for Environmental Monitoring and Surveillance in the Pacific Island Countries (PICs);**
6. **Evaluating the sustainability of deepwater snapper fisheries in the Pacific region;**
7. **Development of a business-case for the development of a Centre for Tropical Fisheries and Aquaculture, in partnership with EU and other;**
8. **SEACU (workshop on research and capacity development for sea cucumber fisheries);**
9. **Food-security and bio-security in Melanesia: land snails as pest agents of decline of self-sufficiency in healthy food production and potential for utilizing edible native snails;**
10. **Research and Development of Indigenous Food crops to address community well-being, food security and climate change;**
11. **Food Security, Agriculture and Well-being in the Pacific: Implication of WTO Regulations;**
12. **Coastal land vulnerability to wave-driven inundation in the Pacific Islands;**
13. **Integrating Management Of Pitcairn Islands Sustainability, Conservation And Research (IMOPISCAR);**
14. **The Role of Geospatial Information for Assessing Environmental Livelihood Security in the South Pacific;**
15. **Pilot inventory of traditional knowledge of ciguatera fish poisoning and its treatment in the Pacific Island region; Fiji and PNG;**
16. **Increasing food security and human health by enabling local assessment of ciguatera fish poisoning risk;**
17. **Evaluating the risk of ciguatera fish poisoning from reef fish in Fiji: Development and validation of a rapid cell-based assay for the detection of ciguatoxin;**
18. **Improving the knowledge base for ciguatera monitoring and protection of public health and local economies in OCTs, Pacific Island Countries and Territories, Australia and New Zealand;**
19. **Pharmaceutical chemicals from freshwater to coral reefs – a case study from Fiji (Marine and inland water research);**
20. **Evaluation of Harmful Algae Bloom (HAB) and non-HAB sites to identify possible drivers (physical, biological, chemical) for onset of HAB incidences;**
21. **Comprehensive microbial assessment of Fanga'uta Lagoon, Kingdom of Tonga;**
22. **Developing GIS Model for District Profile in Papua New Guinea (for monitoring the**

changes in agriculture, environment and economic activities);

23. Comparative study of tropical (New Caledonia) and temperate (New Zealand) mangrove ecosystem biodiversity.

Non-eligible projects that applied to seed funding:

24. Genetic diversity and conservation: Case study of *Enhalus acoroides* beds in Malaysia and Vietnam.

Selected projects:

Details	Improving the knowledge base for ciguatera monitoring and protection of public health and local economies in OCTs, Pacific Island Countries and Territories, Australia and New Zealand
Duration	10 months
Thematic area	Lagoon health
Organisations	<ul style="list-style-type: none"> • University of Copenhagen, Department of Biology, Marine Biological Section (UCPH) Denmark • Institute Louis Malardé (ILM) (French Polynesia) • Institut de Recherche pour le Développement (IRD) - Nouvelle-Calédonie • Marshall Islands Marine Resources Authority • IRD- Tahiti.
Short Description	<p>Ciguatera Fish Poisoning (CFP) is a non-bacterial seafood intoxication which results from the consumption of fish that have accumulated lipid soluble toxins known as ciguatoxins, yet other marine organisms may also be involved. Ciguatera is characterized by gastrointestinal, neurological, cutaneous, cardiovascular and respiratory disorders of variable intensity, often complicated by chronic symptoms lasting months to years. There is no effective treatment. Fortunately, mortality is rare (<0.1%), but the high morbidity of this debilitating and sometimes long-lasting illness makes it a prominent problem for recreational and subsistence fisheries worldwide, since marine products are the nutritional basis of many island populations globally and represent added value in the minds of consumers from “developed” countries. The proposed work have the following structure:</p> <ul style="list-style-type: none"> • Identification of national focal points and cosponsors; • Organize of a workshop with all network members to develop and agree on terms of reference for regional framework for CFP and toxic algae sharing; • Develop and outline of a full proposal and write final report.
Expected outcomes	An agreed regional (OCTs, Pacific Island Countries and Territories, Australia and New Zealand) framework of national focal points for on-line compilation and sharing of CFP and toxic algae data to facilitate cooperation, knowledge sharing and enhanced protection of public health and local economies against ciguatera.
Contributions to PACE-Net Plus	Compilation and sharing of data which facilitate cooperation, knowledge sharing and enhanced protection of public health and local economies against ciguatera, is a key element in addressing this societal challenge which is directly impacting health, livelihood and may accelerate demographic change or may increase with demographic change. Ciguatera also has socio-economic implications as it strongly impacts food security, consumer patterns of those living in areas affected by CFP and toxic algae and may thus contribute to undesirable nutrition habits. Even worse, this issue is expected to increase in a warming climate context and/or be enhanced by coastal ecosystem disturbances.

Details	Pacific Food Matters: Converging traditional knowledge solutions with ecological science for climate resilient local and global food security
Duration	10 months
Thematic area	Agri-aquaculture
Organisations	<ul style="list-style-type: none"> • New Zealand Council for Educational Research (NZCER) • Pacific Organic and Ethical Trade Community (POETCom), Secretariat of the Pacific Community (SPC), Fiji • New Caledonian Agronomic Institute (IAC) • Chambre d’Agriculture, New Caledonia

	<ul style="list-style-type: none"> • Alfred-Wegener Institut, Germany • Ministry of Environment, Lands and Agricultural Development, Kiribati • Victoria University Wellington, New Zealand.
Short Description	<p>Food security includes access to sufficient, safe and nutritious food to maintain active and healthy lifestyles. Food security, within a traditional knowledge framework, connects with other dimensions of social life, best expressed in the links between people, land and sea. Accelerated climate change coupled with globalized food systems impact on Pacific Island food security and traditional food knowledge systems and practices. The project aims to create opportunities for furthering multi-regional science, technology and innovation (ST&I) cooperation between the South Pacific island nations, New Zealand and the European Union. Traditional knowledge and farming practices are closely aligned with organic food production. The project will produce new and innovative collaborations between traditional communities, experts, researchers and scientists that will build solutions to local and global food security issues. This project takes a social ecological systems perspective and will look at the cultural values prevalent in the EU with regard to organic food and the connection with Pacific organics and ethical trade pathways. In addition the team will explore the social and economic feasibility of organic trade pathways between the Pacific, NZ and the EU. The proposed work have the following structure:</p> <ul style="list-style-type: none"> • To hold a research symposium between Pacific, EU and New Zealand partners to understand the strategic research thematic and opportunities with regard to ethical trade pathways and organic food security; • To hold a partner workshop with EU, Pacific and New Zealand partners in Fiji to build a high impact collaborative research project.
Expected outcomes	<p>The outcomes assessment for this project is based in a detailed collaborative and multi-partner research strategy in the area of 'Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the bio-economy' and in a range of media outputs that share the activities of this project on line with existing Pace-net partners, relevant stakeholders and organisations.</p>
Contributions to PACE-Net Plus	<p>The project will strengthen cooperation and future opportunities through the proposed symposium and partner workshop to be held in the Pacific.</p>

Details	Evaluating the sustainability of deepwater snapper fisheries in the Pacific Region
Duration	9 months
Thematic area	Agri-aquaculture
Organisations	<ul style="list-style-type: none"> • Secretariat of the Pacific Community (SPC) • Institut de Recherche pour le Développement (IRD), New Caledonia • National Institute of Water and Atmospheric Research (NIWA), New Zealand • James Cook University (JCU), Australia.
Short Description	<p>Deepwater fisheries are becoming increasingly important for food security globally as populations expand and alternative fisheries decline. In tropical and sub-tropical regions, snappers are important components of deepwater demersal fisheries and provide an important source of income and protein to Pacific Islanders who are highly dependent on fish for food security. However, stock assessments of deepwater snapper in the South Pacific have been limited to simple production models conducted more than 25 years ago. As such, there is substantial uncertainty in the sustainability and status of contemporary deepwater snapper fisheries in the region. The relatively recent development of novel approaches for assessing data-poor fisheries provides an opportunity to evaluate the applicability of these approaches for deepwater snapper. The main objective of the project is to evaluate the applicability of data-poor</p>

	fisheries assessment methods for deepwater snapper fisheries in the Pacific region. To achieve this, it will compare outputs from data-poor methods with traditional surplus production and per-recruit models.
Expected outcomes	<ul style="list-style-type: none"> • Improved knowledge on the sustainability of deepwater snapper fisheries in the Pacific region; • Guidelines for applying appropriate assessment approaches for data-poor fisheries in the Pacific region; • Identification of appropriate indicators for monitoring and assessing deepwater snapper stocks in the Pacific region; • Strengthened collaboration and partnerships among agencies and Pacific Islands Countries and Territories (PICTs) for the development of monitoring and assessment approaches for data-poor fisheries.
Contributions to PACE-Net Plus	This project fits within the PACE-Net Plus project goals for addressing the major societal challenge of food security and sustainable marine resources in an area where annual per capita fish consumption is among the highest in the world. This project will also initiate and strengthen Pacific-EU research collaboration and partnerships through the implementation of joint research activities among partners from New Caledonia, New Zealand and Australia.

Details	Feasibility of biogas for sanitation and fuel in Kiribati
Duration	12 months
Thematic area	Climate-change efforts
Organisations	<ul style="list-style-type: none"> • School of Medicine, University of Western Sydney • KiriCAN - Kiribati Climate Action Network • Islands and Small States Institute, University of Malta • Kopin, Malta.
Short Description	Kiribati is a least developed Pacific Island Country made up of 34 low lying coral atolls and islands. There is no sanitation, and the highly polluted lagoon is used for toileting. Management of animal waste is also a problem due to household pig ownership in particular. Piped water, where it is available, is not safe for drinking. Food sources are limited. The project aims at conducting a feasibility assessment for implementing biogas in two villages in Kiribati. The next step would be to seek subsequent funding to build biogas facilities and undertake a cluster randomized trial, enabling the anticipated benefits of biogas to public health and livelihoods to be quantified in this especially challenging context. A biogas facility provides sanitation while producing fuel and organic slurry that can be used as fertiliser. While the direct health benefits of biogas in sanitation provision are well known, little is known about the potential for biogas to forge broader health, economic, social and environmental resilience in the world's poorest and most vulnerable communities.
Expected outcomes	<ul style="list-style-type: none"> • Comprehensive analysis of biogas feasibility and local requirements in Kiribati with regard to the physical, social and cultural environment; • At least two academic papers in international peer-reviewed journals; • Report making policy recommendations; • Conference presentation; • Subsequent major funding application to implement and evaluate biogas in Kiribati within a cluster randomised trial.
Contributions to PACE-Net Plus	With its focus on improving health and environment in a changing climate, the project addresses aspects of all three of the major societal challenges: health and wellbeing; food security and sustainable agriculture; and climate action and resource efficiency, by investigating an innovative approach – biogas – to sanitation and waste management, clean (and free) fuel provision, and sustainable farming practices in a country challenged by poverty, overcrowding, infectious disease and poor nutrition, and with a unique physical environment of low-lying coral atolls. The project also forges strong new relationships between European and

	Pacific partners (academic and NGO) in working to solve complex problems in a least developed country.
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Details	Animal feeds and bio-fertilisers from marine pest species for sustainable agriculture and food security in Pacific Island Countries
Duration	10 months
Thematic area	Sustainable agriculture
Organisations	<ul style="list-style-type: none"> • The University of the South Pacific (USP) • Ocean Harvest Technology (OHT), Ireland • Secretariat for the Pacific Community (SPC).
Short Description	The increasing effects of global warming and human-induced pollution are rapidly changing the states of marine ecosystems, turning coral-dominated reefs in many places to seaweed-dominated reefs, and also promoting the proliferation of coral-eating crown-of-thorn starfish. These issues have profound effects on the livelihoods of local communities, as well as the tourism sector of Pacific Island Countries or PICs. The huge potential of marine plant biomass as agricultural additives being often overlooked, this project aims to demonstrate the immediate feasibility of converting the excess biomass abundantly available in PIC coastal areas into useful products that farmers can use to fertilize their crops and feed their livestock such as cattle, poultry, swine and shrimps. Fiji recently began growing the Western White Shrimp (<i>Penaeus occidentalis</i>) through Government grant-in aid to farmers, and seaweed-based feeds are ideal for this species. The project aims at implementing a milling plant and to trial and test feed additives and fertilisers.
Expected outcomes	The outcome of this project is to empower coastal PICs communities to produce their own low cost marine plant fertilisers and animal feeds for both subsistence use and commercial development locally and regionally, which will immediately improve their food security, economic situation and livelihoods.
Contributions to PACE-Net Plus	This projects nests the PACE-Net Plus priority area WP2: Food Security, Sustainable Agriculture and Forestry, Marine and Maritime and Inland Water Research, and the Bio-economy. Through the production of cheap and sustainable biofertilisers from marine species it will contribute to sustainable agriculture and food security while the local commercialisation of animal feeds made for renewable local marine sources will improve the green bio-economy of Fiji and reduce expensive imports of feeds and fertilisers. Moreover it will allow the creation of local jobs and a green supply chain for the tourism industry. The expertise and lessons learned from the pilot project can also be exported to other Pacific countries, benefiting their own bio-economies and reducing their carbon footprint.

Details	Research and Development of Indigenous Food crops to address community well-being, food security and climate change
Duration	More than 1 year
Thematic area	Sustainable agriculture
Organisations	<ul style="list-style-type: none"> • Centre for Natural Resource Research and Development (CNRRD), The University of Goroka, Papua New Guinea • Research School of Chemistry, The Australian National University, Australia • Leibniz - Centre for Agricultural Landscape Research (ZALF), Germany • University of Northumbria, UK.

Short Description	<p>Papua New Guinea (PNG) is the largest island country in the Pacific. Over 75% of the population are rural based and very much rely on subsistence form of agriculture for their sustenance. At times, they also rely on the forests ecosystems for supplementary food and health care products. These traditional rural settings comprise of kinship system where people belonging to a certain tribal affiliation and language group come together to build villages and hamlets that are scattered across the island. Through this system, traditional communities have over the many years of interaction with their forest environment, developed a good sense of knowledge and understanding to be able to identify food, medicinal and other products from their forests for their survival. The aim of the project is to connect with as many rural communities as possible to understand their way of life in terms of the use of their forests for food and health care needs. It will be able to identify food crops that were tolerant to the different communities under different weather conditions. Such feedback will allow the mapping of what traditional crops are suitable for cultivation. Further nutritional analysis of the different traditional food crops will help the development of suitable database on the traditional food crops and their nutritional profiles to help the people formulate appropriate and informed choice on their choice of food to eat.</p> <p>The overall aims of the project are:</p> <ul style="list-style-type: none"> • Identify food crops that are suitable for cultivation under different climatic conditions based on experiences and knowledge embedded in the traditional knowledge systems in many of the rural communities; • Establish nutritional profiles of the food crops that are identified to compliment the traditional knowledge systems on the identified species; • Promote research and development of these food crops for use in communities that are affected by the extreme weather patterns as well as other parts of the country that might need to cultivate these food crops; • Identify plants and fungi that are used in traditional societies to address different disease states and develop these further for use under the extreme conditions imposed by climate change.
Expected outcomes	It is expected that the workshop to be conducted in the 7th month will bring the team together to see first-hand the situation on the ground and discuss how the issue can be addressed through and development.
Contributions to PACE-Net Plus	The proposed project contributes to the PACE-Net Plus project goals by addressing sustainable agriculture issues and especially by valuing and validating traditional community knowledge.

3.3. Climate action, resource use and efficiency and raw materials

The Work Package 3 on Climate action, resource use and efficiency and raw materials is because most of Pacific countries are impacted by climate change and natural hazards, which results in important costs for their often weak economies. Figure 6 shows the total number of 22 projects that applied to this challenge and the different thematic areas addressed such as transitions to sustainable models, natural resources, clean energy production, climate action, and impacts of sustainable practices. However, 5 of the 22 projects that applied were considered non-eligible by the Evaluation Commission.

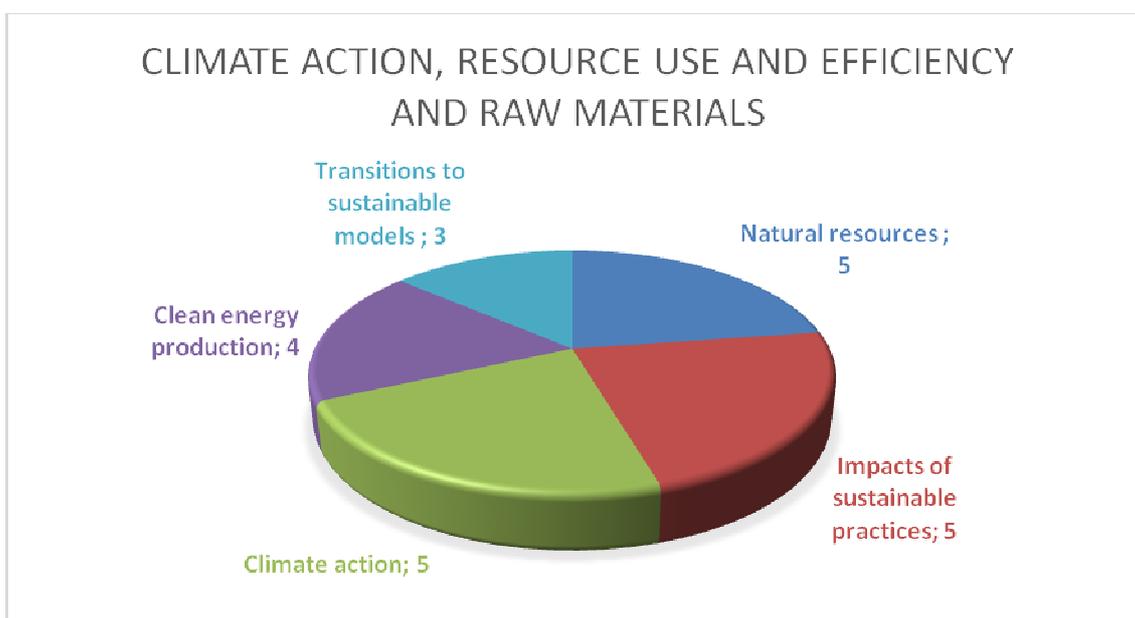


Figure 6: Major thematic areas of seed funding projects for WP3

Eligible projects that applied to seed funding:

1. **TPOS2020: Tropical Pacific Observing system for 2020: first workshop for the backbone task team;**
2. **Impact of Reverse Logistics Operations on Environmental Sustainability;**
3. **Before, During and After Cyclones in the South Pacific (tropical cyclone forecasting);**
4. **Climate resilience and social science in the Pacific (to guide adaptation measures);**
5. **Consultations for a Pacific Network for Social Responsibility and Natural (Mineral and other) Resources;**
6. **Geothermal energy in the South Pacific: a collaboration with landowners, government and the mining industry;**
7. **Low cost, Sustainable Solar Energy Conversion systems for Fiji tourist sites or remote communities (LOSSEC-FIJI);**
8. **Feasibility of biogas for sanitation and fuel in Kiribati;**
9. **Turning the Tide: Charting a Transition to Sustainable Inter and Intra-Atoll Sea Transport for the Republic of the Marshall Islands;**
10. **Pre-feasibility study for methane recovery at Naboro landfill, Suva, Fiji;**
11. **Enhancing Community Resilience: Managing Environment, Water and Wastes under a Changing Climate;**
12. **Communication, communities and climate change: Designing a leadership program for community-based climate change practitioners in the Pacific region;**
13. **Urbanisation and Climate Change: Examining Options and Scenarios for Sustainable Water Use in the Pacific Region;**
14. **Kuchua Community Project: Indigenous Youth Responses to Water and Waste Management;**
15. **An Entrée into an Environmental Science Research Programme in Tonga;**
16. **Identifying risk assessment tools and approaches for deep sea mining activities to support communities, government and developing industries;**
17. **First International South Pacific Conference on Complex Systems.**

Non-eligible projects that applied to seed funding:

18. **From Data to Models for an adaptation to different scales in climate change context: form macro to micro;**
19. **Human Underwater Society Summer School;**
20. **Implementation of an Australian Bioenergy Village;**
21. **Scientific background for the application of coir fiber geotextiles in the framework of the TWIN-SEA project (Expert network & twinning institute on climate & societal change for South-East Asia);**
22. **Robots of the Deep: Increasing the Understanding of Technological, Geological; Environmental Aspects of Deep Seabed Mineral Activities in the Pacific.**

Selected projects:

Details	Communication, communities and climate change: Designing a leadership program for community based climate change practitioners in the Pacific Region
Duration	10 months
Thematic area	Climate action
Organisations	<ul style="list-style-type: none"> • Pacific Center for Environment and Sustainable Development (PaCE-SD), • University of South Pacific Suva, Fiji • School of Media and Communication, RMIT University Melbourne, Australia • Foundation of the Peoples of the South Pacific Islands FSPI, (Fiji) and their partners, Kiribati, PNG, Solomon Islands, Tonga, Tuvalu • Faculty of Communication, Universitat Autònoma Barcelona.
Short Description	<p>This project aims to design, implement and evaluate a training program for local level climate change practitioners in the Pacific to increase capacity in leadership, dialogue and cooperation, strategic thinking and media advocacy. During the one-week intensive training program participants will engage in learning new skills and approaches for working collaboratively with local, national and regional stakeholders and model effective media and communication practices to contribute to collective knowledge building, development of best practices, and sustainability in climate change adaptation programs. The project builds upon the combined expertise of three universities and a leading community based organisation in the Pacific.</p> <p>The proposed work involves the following activities:</p> <ul style="list-style-type: none"> • Formative research; • Design and implementation; • Evaluative research.
Expected outcomes	<ul style="list-style-type: none"> • Capacity building training modules to enhance communication and media outputs related to climate change activities in their communities; • Dissemination of project progress and outcomes to support regional information and knowledge exchange; • Research findings will be disseminated by publishing at least four journal articles in relevant high impact peer reviewed journals; • Findings will be disseminated at key international and national conferences including The International Communication Association (2016) and the European Climate Change Adaptation Conference (2017).
Contributions to PACE-Net Plus	<ul style="list-style-type: none"> • Connecting research and an innovative leadership program to develop climate change leaders in the Pacific; • Supporting regional information and knowledge exchange in technology and innovation by disseminating project outcomes; • Reinforcing the EU-Pacific STI cooperation by focusing on the following societal challenge: Climate action, resource use and efficiency, and raw materials; • This project contributes to the Global Climate Change Alliance goal by combining scientific expertise, research and training to build leadership capacity in the Pacific region.

Details	Consultations for a Pacific Network for Social Responsibility and Natural Resources
Duration	12 months
Thematic area	Natural resources
Organisations	<ul style="list-style-type: none"> • Secretariat of the Pacific Community, Applied Geoscience and

	<p>Technology Division, Mead Road, Suva, Fiji</p> <ul style="list-style-type: none"> • Institut de recherche pour le développement (IRD), France and New Caledonia • Pacific Social Mapping Pty Ltd, Canberra, Australia.
Short Description	<p>The Pacific Island region needs a more robust and resilient institutional framework to deal with questions relating to the social responsibility to achieve sustainable development outcomes from the exploitation of mineral resources (including oil and gas) and other natural resources (such as fish and forests). A Pacific Network for Social Responsibility in Natural Resources is envisaged as a network of organisations in the member states and associate member states of the Pacific Islands Forum (hence including New Caledonia and Timor-Leste) that can work together to achieve outcomes that are beyond the reach of anyone of them working alone. The functions for the network are to be refined at the proposed inception workshop:</p> <ul style="list-style-type: none"> • Policy function: to provide a forum for policy dialogue between (1) government Officials; (2) scientists/academics; (3) private sector; (4) civil society; • Evaluation function: to provide expert advice to national or sub-national governments in the evaluation of specific development proposals, e.g. environmental or socioeconomic impact statements; • Educational function: provide relevant case study material for courses taught in regional universities and other tertiary institutions (in economics, public policy, anthropology and sociology, geography, environmental science); • Training function: to provide short-course training in relevant subjects for people already in the formal sector workforce; • Research function: to act as a vehicle for the coordination and evaluation of applied research in the region; • Documentation function: to compile a digital library of published and unpublished literature on social responsibility and sustainable development outcomes from the exploitation of mineral resources, focusing on the Pacific Islands region; • Communication function: to share information with policy makers, researchers and civil society in general relating to all the other activities and functions.
Contributions to PACE-Net Plus	<p>To provide an analysis of the policy goals and implementation strategies of the development agency/government institutes/universities currently playing a role in applied research and policy development in resource sustainability, with a focus on potential areas of collaboration.</p> <p>The second expected outcome is how the proposed Network would interact with national ministries dealing with resources.</p> <p>The third expected outcome of the activity is the formation of an inter-institution working group to convert the outcome of the needs analysis into a design for the proposed Network, to promote further collaboration, and to work on attracting further funding.</p>
Contributions to PACE-Net Plus	<p>This proposed activity addresses the PACE-Net Plus theme of Climate action, resource use and efficiency and raw materials.</p>

Details	TPOS2020: Tropical Pacific Observing system for 2020: first workshop for the backbone task team
Duration	5 years
Thematic area	Climate action
Organisations	<ul style="list-style-type: none"> • CSIRO Australia • IRD New Caledonia and France • PI-GOOS/SPREP, Samoa.

Short Description	<p>The TPOS 2020 Project aims at evaluate and provide guidance to change all elements that contribute to the Tropical Pacific Observing System (TPOS) based on a modern scientific understanding of the tropical Pacific ocean and atmosphere. The scientific objectives are:</p> <ul style="list-style-type: none"> • To redesign and refine the TPOS to observe El Niño Southern Oscillation (ENSO) and advance scientific understanding of its causes; • To determine the most efficient and effective observational solutions to support prediction systems for ocean, weather and climate services; • To advance understanding of tropical Pacific physical and biogeochemical variability and predictability.
Expected outcomes	<ul style="list-style-type: none"> • A more effective design for the Tropical Pacific Observing system, promoting sustainability; • Greater cooperation and coordination among the international contributors; • Guiding improvements in climate prediction and associated applications; • Integration of biogeochemical and biological sampling; • Fuller assessment of climate change signatures and the impacts in the tropical Pacific, and in the Pacific Island countries.
Contributions to PACE-Net Plus	Address a major societal challenge, which is observing the ocean and atmosphere, to help understanding and predicting the El Niño phenomenon and climate variability, ranging from extreme events to climate change in the tropical Pacific. Strengthen Pacific-EU research cooperation and partnerships.

Details	Initiating a Science, Technology and Innovation Policy Development Process in the Kingdom of Tonga
Duration	9 months
Thematic area	Transitions to sustainable models
Organisations	<ul style="list-style-type: none"> • Australian National University (ANU) • Ministry of Lands, Environment, Climate Change and Natural Resources (MLECCNR), Kingdom of Tonga • German Aerospace Center (DLR), Project Management Agency, European and International Cooperation.
Short Description	<p>Science, Technology and Innovation (ST&I) underpin development and provide the basis for addressing many societal challenges. In the Pacific, these are particularly associated with the management and use of land, agricultural, marine and freshwater resources under changing climates and economies. Despite the fundamental importance of ST&I to development and management of the environment, there is almost a complete absence of national ST&I policies in Pacific Island Countries (PICs). The Kingdom of Tonga has a very long and proud history of public education, with a more recent emphasis on ST&I training. The vision of the Tongan National Strategic Planning Framework is to achieve a high standard of living and quality of life for all Tongans and to ensure that development is economically, environmentally, culturally and politically sustainable. The first aim of the project is to initiate the ST&I policy development process in the Kingdom of Tonga, document the process and make the achievements transparent to relevant stakeholders in the Pacific and Europe. The second aim of this project is to use this project as a pilot project for other PICs to enhance ST&I policy development across the Pacific Region.</p>

Expected outcomes	<ul style="list-style-type: none"> • A map of relevant stakeholders to be involved in the ST&I policy process in the Kingdom of Tonga; • A robust process with a roadmap on activities and stakeholders to develop ST&I policy in the Kingdom of Tonga and other relevant small island states; • Increased awareness of the importance of ST&I policy in development of small island states; • A stakeholder platform to develop the ST&I policy and connect the relevant stakeholders during the process; • Increased knowledge-sharing and awareness building of EU and Tonga ST&I policy-making, constraints and opportunities for cooperation (including in Horizon2020); • A proposal for follow-up activities and funding for different national and international donors.
Contributions to PACE-Net Plus	<ul style="list-style-type: none"> • Directly support EU-Pacific policy dialogue in Science, Technology and Innovation issues by building ST&I policy capacity in a key PIC; • Reinforce EU-Pacific ST&I cooperation, by focusing policy development in major; • Societal challenges relevant to the Kingdom of Tonga, particularly in management and use of the environment and natural resources and in adapting to climate change; • Directly encourage the coordination of European actions and policies targeting the Pacific by promoting the implementation of joint action to develop ST&I policy; • Enhance cooperation on innovation issues, by helping to bridge the gap between public and private sectors in the policy development process in Tonga; • Strengthen Pacific-EU research cooperation partnerships, by assisting in using EU experience in ST&I policy development and will communicate Pacific opportunities to European researchers through the identification of clear policy goals and objectives; • Document the ST&I policy process that could serve as guideline for ST&I processes in similar environments in the Pacific or elsewhere, and the basis for collaborative science-policy research.

Details	Pre-feasibility study for methane recovery at Naboro landfill, Suva, Fiji Islands
Duration	8 months
Thematic area	Climate action
Organisations	<ul style="list-style-type: none"> • University of the South Pacific (USP), Fiji • NV Alfvolzorg, Netherlands • National Institute of Water and Atmospheric Research, New Zealand.
Short Description	<p>Landfill produces landfill gas (LFG) due to anaerobic decomposition of organic matter, thus producing greenhouse gases (GHG) contributing to global warming. In the absence of LFG methane recovery technology, the methane produced can escape the landfill and add to the atmospheric burden, thus contributing to global warming. The use of landfill methane gas also contributes indirectly to the reduction of greenhouse effect by decreasing the usage of fossil fuels in electricity production. In addition to GHG emission reduction benefits, LFG has some potential to improve the local air quality through the destruction of hazardous air pollutants. The Naboro landfill in Suva is a sanitary engineered landfill. USP has developed the capacity to monitor greenhouse gas and has established a long term measurement background in methane measurements. The work is proposed as follows:</p> <ul style="list-style-type: none"> • Preliminary landfill methane flux measurements using static chamber method; • Scoping meeting on feasibility study for landfill gas recovery and

	utilization at Naboro Landfill.
Expected outcomes	<ul style="list-style-type: none"> • The seeding grant will enable all the partners to meet and it will provide a platform for collaboration between EU experts and landfill gas utilization and climate change mitigation specialist at the counterparts from the PICTs; • Visual inspection of the landfill site by EU landfill expert engineer; • Pilot flux chamber measurements carried out will ascertain methane emissions from the landfill; • A presentation to local stakeholders; • Preliminary data for proposal development for a full scale feasibility study to be submitted to Horizons 2020 proposal call will be oriented.
Contributions to PACE-Net Plus	The proposal contributes to PACE-Net Plus project goals of encouraging and supporting the EU-Pacific ST&I cooperation, focusing on societal challenge of Climate Action, Environment Resource Efficiency and Raw Materials. The aim of the project supports the work programme of fighting and adapting to climate change under the societal challenge above mentioned. The proposal encourages the coordination of European actions on mitigating climate change in the Pacific by promoting the implementation of joint actions.

Details	Identifying risk assessment tools and approaches for deep sea mining activities to support communities, government and developing industries
Duration	10 months
Thematic area	Climate action
Organisations	<ul style="list-style-type: none"> • Southern Cross University, Australia • Seabed Minerals Authority, Cook Islands • Senckenberg am Meer, Germany • Chatham Rock Phosphate Ltd, New Zealand • NIWA, New Zealand • Griffith University, Australia.
Short Description	The project aims at identifying risk assessment tools for biodiversity, ecosystem services and functions, developing multiple lines of evidence approaches to predicting impacts and developing protocols and procedures for assessment. Through the proposed workshop it is expected to identify what values of deep-sea ecosystems are important to stakeholders and which ones of these are at threat. From the outcomes of the workshop we will then be able to target approaches to risk assessment and risk minimisation.
Expected outcomes	A report that highlights risks to the environment and communities due to deep sea mining activities through engagement with cases studies in the South Pacific. A main feature of the report will identify risk management strategies that will be built into a draft framework for risk assessment associated with mineral extraction in the deep sea of the South Pacific. This will be the first step in providing certainty for assessing proposals related to deep sea mining activities.

Contributions to PACE-Net Plus	This project contributes to two PACE-Net Plus project goals the main one being ‘the protection and sustainable management of natural resources and ecosystems’ which is part of the Climate Action, Environment, Resource Efficiency and Raw Materials goal. It also contributes to the goal of Food Security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy by providing information that will aid in the management and protection of the health of aquatic living resources which may be used for fisheries and aquaculture and contribute to food security.
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3.4. Cross-challenges

Seed funding projects addressed to the cross-challenge section are those that encompassed more than one of the above mentioned societal challenges. These projects are considered multi-disciplinary and multi-dimensional. Only 3 projects applied to this section, and only 2 were selected, because one of them was considered non eligible by the Evaluation Commission. The respective projects are named and described below.

Eligible projects that applied to seed funding:

1. **Initiating a Science, Technology and Innovation Policy Development Process in the Kingdom of Tonga;**
2. **Climate and its Impacts on Marine Ecosystems (CIME).**

Non-eligible project that applied to seed funding:

3. **Weaving the Mat: Linking Communities on Health, Water and Climate Change Issues and Solutions.**

Selected projects:

Details	Initiating a Science, Technology and Innovation Policy Development Process in the Kingdom of Tonga
Duration	9 months
Thematic area	Cross-challenge
Organisations	<ul style="list-style-type: none"> • Australian National University (ANU) • Ministry of Lands, Environment, Climate Change and Natural Resources (MLECCNR) • German Aerospace Center (DLR), Project Management Agency, European and International Cooperation.
Short Description	<p>Science, Technology and Innovation (ST&I) underpin development and provide the basis for addressing many societal challenges. In the Pacific, these are particularly associated with the management and use of land, agricultural, marine and freshwater resources under changing climates and economies. Despite the fundamental importance of ST&I to development and management of the environment, there is almost a complete absence of national ST&I policies in Pacific Island Countries (PICs). The absence of a national ST&I policy means that key ST&I challenges in meeting this vision are largely unaddressed. Such an absence of ST&I policy also constrains regional and international cooperation with European, Australian and New Zealand researchers and SMEs and funding from respective bodies. The first aim of this project is to initiate the ST&I policy development process in the Kingdom of Tonga, document the process and make the achievements transparent to relevant stakeholders in the Pacific and Europe. The second aim of this project is to use this it as a pilot for other PICs to enhance ST&I policy development across the Pacific Region.</p>
Expected outcomes	<ul style="list-style-type: none"> • A map of relevant stakeholders to be involved in the ST&I policy process in the Kingdom of Tonga;

	<ul style="list-style-type: none"> • A robust process with a roadmap on activities and stakeholders to develop ST&I policy in the Kingdom of Tonga and other relevant small island states; • Increased awareness of the importance of ST&I policy in development of small island states; • A stakeholder platform to develop the ST&I policy and connect the relevant; • stakeholders during the process; • Increased knowledge-sharing and awareness building of EU and Tonga ST&I; • policy-making, constraints and opportunities for cooperation (including in Horizon2020); • A proposal for follow-up activities and funding for different national and international donors.
Contributions to PACE-Net Plus	<ul style="list-style-type: none"> • Directly support EU-Pacific policy dialogue in Science, Technology and Innovation issues by building ST&I policy capacity in a key PIC; • Reinforce EU-Pacific ST&I cooperation, by focusing policy development in major societal challenges relevant to the Kingdom of Tonga, particularly in management and use of the environment and natural resources and in adapting to climate change; • Directly encourage the coordination of European actions and policies targeting the Pacific by promoting the implementation of joint action to develop ST&I policy; • Enhance cooperation on innovation issues, by helping to bridge the gap between public and private sectors in the policy development process in Tonga; • Strengthen Pacific-EU research cooperation partnerships, by assisting in using EU experience in ST&I policy development and will communicate Pacific opportunities to European researchers through the identification of clear policy goals and objectives. • Document the ST&I policy process that could serve as guideline for ST&I processes in similar environments in the Pacific or elsewhere, and the basis for collaborative science-policy research.

Details	Climate and its Impacts on Marine Ecosystems (CIME)
Duration	1 year
Thematic area	Cross-challenge
Organisations	<ul style="list-style-type: none"> • Institut de Recherche pour le Développement (IRD) New Caledonia • METEO-FRANCE NC • Institut de Recherche pour le Développement (IRD) French Polynesia • University of French Polynesia (UPF) • METEO-FRANCE FP • University of South Pacific (USP) • Secretariat of the Pacific Community (SPC) • Direction des Ressources Marines et Minières, French Polynesia.
Short Description	<p>New Caledonia and part of French Polynesia are strongly influenced by the major convective area of the planet, the South Pacific Convergence Zone (SPCZ) that determines the atmospheric envelope of the region, in particular cyclones and other extremes. The SPCZ is strongly coupled to the ocean, characterized by high sea-surface temperatures in the western Pacific cooling progressively toward the eastern Pacific. In turn, the ocean current climate affects, not only the ocean climate, but also the ecosystems to the highest trophic levels with, for instance, highly migrant species such as Tuna which preferential habitats will depend on the hydrodynamics. From west (New Caledonia) to east (French Polynesia), the South Pacific must be viewed as a continuous, single climate machine with basin-wide impacts and this project is a step to enhancing and setting long-lasting network of scientific collaborations dealing with</p>

	climate and marine ecosystems.
Expected outcomes	The objective of the workshop is to provide a forum for dialogue between representatives of the PICTs to build joint research programs in the Pacific on climate, ocean and ecosystem dynamics. This dialogue intends to strengthen the bi-regional cooperation and integration of Pacific countries in the activities of the PACE-Net Plus project and to support the renewed EU Pacific development partnership.
Contributions to PACE-Net Plus	The project fits within the PACE-Net Plus goals for addressing the following three major societal challenges: i) marine and ii) climate research in a key driver area for regional and global climate, iii) resource efficiency in an area which hosts huge quantities of Oceania’s and South Asia’s marine resources and livestock. The project also intends to initiate and strengthen Pacific-EU research collaboration and partnerships through the implementation of joint research activities between a large, but complementary, panel of partners from French Polynesia, New Caledonia and Fiji.

4. Selection of economically profitable and environmentally sustainable innovation projects

The projects that applied to seed funding were evaluated by a team of experts in each thematic area with good knowledge on the Pacific Region and assigned by the PACE-Net Plus project consortium. The selection process of the seed funding projects considered a few criteria, although the most important is that they must represent a unique innovation dimension alongside the specific societal challenge it was addressed. In addition, the other selection criteria were related to: the project must be new and not a part of another ongoing project, the projects must be aligned with PACE-Net Plus goals and represent great contributions for the development of it, and the projects must be completed respecting all the criteria defined for applications.

The total amount of selected projects was 3, although only 2 were implemented. The third selected project could not be executed because the team leader of the project did not have the availability to implement the project at the moment.

The 2 implemented projects are thus described in detail in chapters 4.1 and 4.2 because of their relevance concerning the degree of economic profitability and environmental sustainability. Both are structured in the following sections: Background, project activities and outcomes, photographs and contributions to PACE-Net Plus goals. The comments on the strengths and failures of the projects' implementation are described in the following section, named the Roadmap of the forthcoming efforts required to implement selected projects.

4.1. IDEA Consortium Workshop: Social-Ecological modelling of innovative genetic control approaches to mosquito-borne disease

Background

The rapid emergence and expansion of Zika and other arboviruses (e.g., dengue, chikungunya) in the last decade have become public health concerns of international magnitude. The situation is currently critical in Latin America and in several European overseas territories and island countries in the Caribbean and the Pacific. Two species of mosquito: *Aedes aegypti* and, to a lesser extent, *Ae. albopictus* have been linked with most known arbovirus outbreaks but the ecology of transmission in the Pacific may prove uniquely diverse.

Overall, no less than 12 potential dengue vectors were identified in the Pacific region. This diversity of mosquitoes and environments makes it the ideal site to study the diverse risks of transmission associated with different virus / mosquito populations and the environments that they inhabit.

Collection of such critical knowledge would allow making informed preparations for outbreak control, target existing vector control interventions and most importantly evaluate new ones.

Project activities and outcomes

Meeting Summary

The workshop organized by Institut Louis Malardé was held from February 1-5, 2016 at University of California's Richard Gump South Pacific Research Station on the island of Moorea. The workshop was designed to deepen existing collaborations between labs in France, French Polynesia, Switzerland, the United Kingdom and the United States while bringing in additional European (Belgium, Austria) and Pacific (Australia) partners to tackle the major societal challenge of emerging vector-borne diseases. This workshop is part of an emerging international collaboration - "IDEA Consortium" - that involves institutions from both regions to develop the Pacific Islands, particularly French Polynesia, as a model system for sustainability science.

It takes advantage of the opportunities provided through breakthroughs in molecular and evolutionary biology and a new generation of genetic technologies for insect control. Applying these new technologies effectively and safely, however, requires government oversight and evaluation (cost-benefit and risk analysis). The workshop stimulated cooperation among researchers and institutions in Europe and the Pacific on mosquito-borne infectious diseases, an issue that requires international coordination and scientific knowledge to improve the health and well-being of communities.

The meeting addressed critical information gaps that hinder the ability to efficiently control mosquito vectors and the spread of mosquito-borne infectious diseases. Moreover, research priorities critical to the advancement of sustainable strategies to combat mosquito-borne infectious diseases were identified and developed collaborative research projects on priorities identified in the Pacific.

Meeting outcomes

Meeting participants were able to:

- Identify a set of research priorities critical to the advancement of sustainable strategies to combat mosquito-borne infectious diseases;
- Develop an integrated program of collaborative research on priorities identified in the Pacific.

The proposed program consists in three collaborative, 'use inspired' projects formulated to advance operational research in vector surveillance and control in the Pacific context.

For researchers, these projects will highlight data needs and help generate hypotheses. For SMEs, they will help them translate scientific discoveries and technological advances into products and services. For decision-makers, they will help assess costs, outcomes, and risks of innovative vector control approaches, thus accelerating the innovation cycle and the regulatory approval for pilot deployment under operational conditions. Three pilot islands were selected within the Society archipelago to conduct the proposed projects based on their increasing scales of complexity, the small atoll of Tetiaroa, Moorea and Tahiti.

Innovative Genetic Control Approaches

Genetic control techniques were used in this case. These techniques are designed to reduce mosquito abundance and/or prevent the transmission of pathogens by the mosquito. Neither approach have yet been fully evaluated regarding their general applicability or long term sustainability. Implementation of novel tools, including with the existing arsenal will require adaptation and validation of selected strategy combinations to the local context. The use of novel technologies in the field also raises challenges on regulation and community authorization. Programs involving emerging technologies will need to engage stakeholders and develop credible methods to gain community acceptance if they are to be successfully deployed at a large scale.

Photographs



Figure 7: Project Team members with USP research office staff and regional colleagues, Fiji (2015)

Contribution to PACE-Net Plus project goals

The project has contributed to the PACE-Net Plus goal of enhancing collaboration. It created long-term research partnerships and expanded research collaboration to include support to, and cooperation with, civic society and therefore potential initiatives for policy change via cooperative dialogue. In addition, the project has initiated innovative research in the areas of (1) molecular tool use, and associated development of fast and cost effective identification of disease causing parasites; (2) risk management analysis to aid priority setting and (3) documentation and exploration of traditional knowledge in native terrestrial mollusc use.

The workshop addressed the PACE-Net Plus focal areas, especially two of the major societal challenges identified in Horizon 2020: 1) health, demographic change and wellbeing; and 2) climate action, resource use and efficiency, and raw materials. The meeting helped twin the labs of the lead participants as part of the broader IDEA Consortium, which already involves 20 institutional nodes. The meeting also deepened collaboration among existing European-Pacific nodes and expanded to add new nodes from the two regions, including the first in Australia. It promoted joint actions of the EU and its Member States with respect to the Pacific through bioregional research cooperation in Science (social science, ecology, environmental science, modelling, computer science), Technology (genetic control methods, scenario based planning software) and Innovation (public and private sector engagement in the evaluation and implementation of new insect control approaches).

4.2. Food security and biosecurity in Melanesia: Land snails as pest agents of decline in self-sufficiency in healthy food production & potential for utilizing edible native snails

Background

There has been a substantial shift in how Pacific Island communities acquire food. A decline in traditional crop use and non-traditional cropping systems has been recorded and this includes a shift towards foods that are not always cooked e.g. English cabbage, lettuce. Not only have new crop species and cropping systems been introduced - but this has been followed by the establishment of a suite of introduced non-native herbivorous insects and snails, and plant pathogens due to expanding trade. Non-native land snails are recognized internationally as one of the most important, non-host-specific crop pests. Non-native, herbivorous terrestrial molluscs (= land snails) are widespread in the Pacific Islands.

Native terrestrial molluscs of *genus Placostylus* have been harvested for human consumption in the wild in New Caledonia for several years and pilot studies on commercial farming have occurred. These native snails are highly valued by the local indigenous people as a traditional food source and they are also used for medicinal, handicraft and ceremonial purposes. Despite their high protein value, and the fact that twice the number of endemic species are recorded in Fiji than in New Caledonia, there is to date no recorded of *Placostylus* land snails ever being consumed by humans in Fiji. It is uncertain if the rat lung worm *Angiostrongylus cantonensis* is also present in native snails but if found, this would undermine the sustainability of native land snails as a traditional source of food.

The project recognized that the loss of traditional crop diversity and increasing introduced species impacts to crop production is threatening food security in the Pacific. There is a need to be innovative but also to build on the evidence base, raise awareness and improve policy responsiveness to the pressures, including an understanding of the potential for associated health risks to humans.



Figure 8: Shell of an endemic *Placostylus* snail native to New Caledonia

Project activities and outcomes

Face to face meeting of project leader with EU partner during regional workshop the role of University's in food security

Respectful relationship established which made later remote contact easier

Meeting of Oceania based project team and stakeholders in New Caledonia

Enhanced understanding of the similarities and differences in terrestrial mollusc perspectives established

Meeting with Fijian Government Departments and relevant local NGO

Willingness of all identified stakeholders to participate in future collaborative activities, particularly Ministry of Health and Biosecurity Authority that have requested MOU's

Meeting with New Caledonian Government Departments and local NGO

Willingness of all identified stakeholders to participate in future collaborative activities confirmed, particularly Pasteur Institute research unit of local hospital in Noumea

Visits to local fresh food markets

Confirmation of relatively "new" introduced foods for sale that are often uncooked

Visit to field sites with endangered native snails and introduced pest snails present

Comparison of native *Placostylus* snail habitat types, species and size made between Fiji and New Caledonia

Draft land snail and *Angiostrongylus* sampling

Contacts established with Ministry of Health, Biosecurity Authority of Fiji and Ministry of Agriculture in Fiji

Theoretically possible and common intermediate host land snail

protocols species in Fiji and New Caledonia determined
Yet to establish molecular methods for detection of *Angiostrongylus* in land snails

Determine knowledge gaps for under taking a formal risk assessment of invasive species in line with regional biosecurity regulations and protocols Contacts established with Ministry of Health, Biosecurity Authority of Fiji and Ministry of Agriculture in Fiji. Knowledge gaps on intermediate and paratenic hosts of *Angiostrongylus* determined
Data lacking on prevalence of *Angiostrongylus* in hosts from the field

Draft framework for human health and environmental risk analyses Contacts established with Ministry of Health, Biosecurity Authority of Fiji and Ministry of Agriculture in Fiji
Draft questionnaires formulated to gather data from medical practitioners and general public
Risk analysis conceptualized pending gathering of data and simulation of scenarios using risk assessment models

Meeting of project team in Fiji Comprehensive framework for future program of collaborative research established and discussed

Draft outline of a larger research proposal Established that requirements for much larger research proposal (to followed developed program framework) will require further investigation and relationship building particularly within Europe

Photographs and Media Reports



Figure 9: Meeting of project team members with government and NGO stakeholders in Fiji (2016)



Figure 10: Photograph of several crop species being sold in main food market in Noumea (2015)



Figure 11: Photograph of relatively juvenile, living *Placostylus*, at coastal dry forest field in New Caledonia

Contribution to PACE-Net Plus project goals

The project has contributed to the PACE-Net Plus goal of enhancing collaboration. The project triggered new long-term research partnerships and has expanded the research collaboration to include support to, and cooperation with, civic society and therefore potential initiatives for policy change via cooperative dialogue. In addition, the project has initiated innovative research in the areas of:

- Molecular tool use, and associated development of fast and cost effective identification of disease causing parasites;
- Risk management analysis to aid priority setting;
- Documentation and exploration of traditional knowledge in native terrestrial mollusc use.

5. Roadmap of the forthcoming efforts required to implement selected projects

The analysis of the selected seed funding projects is the basis for building the Roadmap of the forthcoming efforts required to implement future projects. For that matter, the general structure of the roadmap construction is described in Figure 12. The first step is to develop the general recommendations reported during the implementation of the projects. The second step consists in defining strategic actions to address the recommendations first described. Finally, the Roadmap is presented.

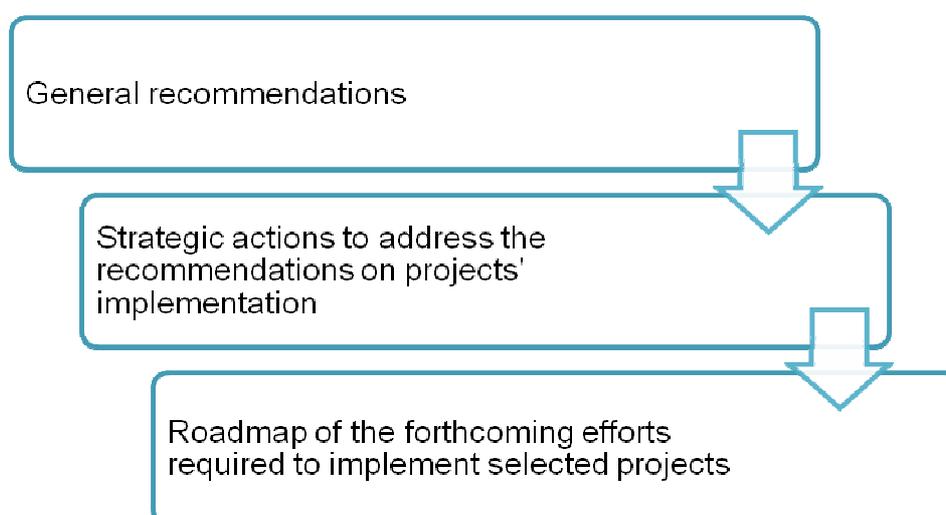


Figure 12: Steps for the Roadmap of the forthcoming efforts required to implement selected projects

5.1. General recommendations on the implementation of the selected projects

Concerning the first step of identifying general recommendations reported during the implementation of the selected seed funding projects, it must be considered not only the experience of the projects described in section 4 but also the overall context of innovation potential in PICs, described in the introduction and analysed across the whole report. The identified points are described as follows:

- Develop a **set of research priorities critical to the advancement of sustainable strategies** in the beginning of the project;
- **Improve knowledge transference mechanisms** among Pacific Islands and between Europe and Pacific;
- **Application deadlines must be extended** in order to make viable for Pacific Island Institutes to apply and accomplish schedules, once it is difficult to mobilize local authorities and there are some climate interferences that might prejudice the project implementation;

- Programs involving **emerging technologies** will need to engage stakeholders and develop credible methods to gain community acceptance - if they are to be successfully deployed at a large scale;
- Programs regarding **change in production systems or processes** must be developed within the community and developing a **common knowledge dissemination method**;
- Programs regarding the **mapping and research for potential health issues** are important to be developed by bilateral teams – both local partners and EU partners – in order to conduct the analysis considering local specificities and international expertise;
- Develop **long lasting research and innovation groups and relationships** including both members of PICs and EU in order to facilitate the application and organization of proposals to apply to programs and aids.

5.2. Strategic actions to address the recommendations on projects' implementation

In order to address the general recommendations pointed above and related during the implementation of the selected projects, there is a need to describe possible strategic actions for each of the recommendations in order to tackle these issues and build a roadmap of the forthcoming efforts required to implement the selected projects. This step is presented in the table above.

Develop a set of research priorities critical to the advancement of sustainable strategies in the beginning of the project	Define a schedule based on the partner's responsibilities and agendas for the project since the beginning of the project
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Improve knowledge transference mechanisms among Pacific Islands and between Europe and Pacific	Create web based platforms for sharing information among partners and for disseminating information for civil society both in Europe and PICs
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Application deadlines must be extended in order to make viable for Pacific Island Institutes to apply and accomplish schedules	Seed funding and programme's chairs must consider the local context in Pacific Islands in order to determine schedules and deadlines
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Programs involving emerging technologies will need to engage stakeholders and develop credible methods to gain community acceptance	Create stakeholder engagement through social participation since the beginning of the innovation process by developing group discussions
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Programs regarding change in production	It is important to disseminate information to the
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systems or processes must be developed within the community and developing a common knowledge dissemination method

practitioners and users – through training sessions and the creation of informative materials to assure the assimilation of the new methods and changes in systems

Programs regarding the mapping and research for potential health issues are important to be developed by bilateral teams – both local partners and EU partners

Develop multi-disciplinary and multi-country and continent teams to propose and implement innovation and research actions in health area

Develop long lasting research and innovation groups and relationships including both members of PICs and EU in order to facilitate the application and organization of proposals to apply to programs and aids

Create permanent research and discussion bi-lateral groups among EU and PICs in order to be ready to apply to candidatures

Finally, to the construction of the Roadmap of the forthcoming efforts required to implement selected projects, all the previous described recommendations must be addressed in order to effectively create and trigger the innovation potential of Pacific Countries and most important, it must generate long-term environmental and economic sustainability for the local context.

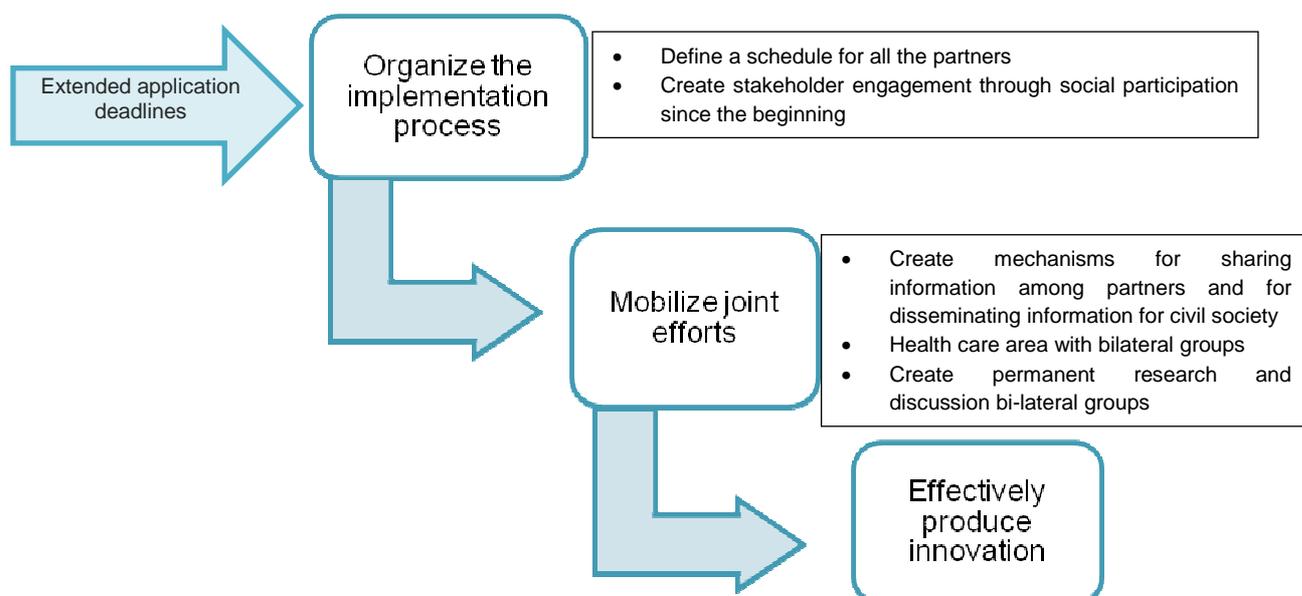


Figure 13: Roadmap of the forthcoming efforts required to implement selected projects

6. Conclusion

This report presents a review of the seed funding selected projects concerning industrial innovation within the thematic fields of PACE-Net Plus project that are: Health, demographic change and well-being; Food security, sustainable agriculture, marine and maritime research and the bio economy; and Climate action, resource use and efficiency and raw materials.

The themes and issues addressed by the Pacific Island Countries are of great relevance especially for local practical issues such as NCDs, infectious diseases, oncology, mental health, e-learning, omics research, sustainable agriculture, agri-aquaculture, lagoon health, integrated sustainable management, traditional knowledge, biodiversity studies, natural resources, impacts of sustainable practices, climate action, clean energy production, and transitions to sustainability.

Moreover, the implemented projects presents also great knowledge to understand and build a roadmap for forthcoming efforts required to implement future projects. The roadmap involves questions such as the strengthening of research networks and public-private partnerships, knowledge transfer, schedule and geographical specificities. In addition, the great importance of the roadmap is to effectively bring the innovation as the output of the whole process, it is to tackle all the obstacles and difficulties by the different responsible actors and to joint efforts to develop environmentally and economically sustainable innovations.

Finally it is important to consider the local reality of Pacific countries and the barriers existing to tackle sustainable growth and industrial innovation because of economic difficulties and insularity, isolation or even socio-political or climate related issues are slow down elements to the process of innovation development. Thus, the development of bilateral cooperation networks between EU and Pacific Countries for research, innovation and economy development are of great value for promoting the development of the region in a great scale.

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