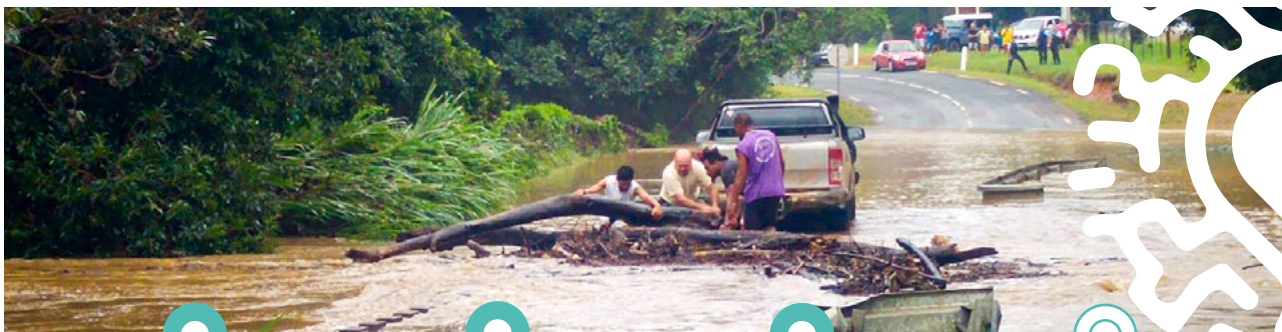


FLOOD RISK RESILIENCE



New Caledonia

French Polynesia

Wallis and Futuna

Pitcairn Islands

 BUDGET: €1,003,000 (XPF 119.7 million)


 ACTION TIME PERIOD: September 2020 – December 2024

 PARTNERS:



- Public Works Department (WF)
- CEREG-Thétis (WF)
- EGIS eau (PF)
- Vai Natura (PF)
- BRL ingénierie
- Commune of Kouaoua (NC)

BRIEF SUMMARY

 The French territories in the Pacific region are exposed to flood risks, amplified by hydro-climatic phenomena that have been intensifying as a result of climate change. These phenomena can be very intense, occur suddenly and recur several times a year, particularly during the rainy season.

Communities are exposed to various risks, such as river overflows and landslides, but also to the health consequences of flooding. These phenomena have a particularly strong impact on residential areas, especially those where buildings are located in flood-prone areas or near watercourses, as well as on infrastructure linked to human activity. Frequent overflows on roads also expose users to major risks when they attempt to cross these areas.

“Concrete and operational actions to strengthen flood resilience”

Against this backdrop, the PROTEGE project supported various actions identified by the territories to strengthen their resilience to the consequences of flooding.

For **Wallis and Futuna**, the establishment of a stormwater management master plan was identified as a priority. This document provides the Territory with a multi-year plan for the work to be carried out, as well as an infrastructure management plan. In particular, it identifies a major issue in the urban centre of Mata'Utu, where work was undertaken on the Kafka sports complex. Poor stormwater management on the site had serious consequences for village homes and local roads.

In **New Caledonia**, Territorial Route No. 1, which links the north and south of Grande Terre on the west coast, was fitted with flood markers to inform users of water levels in the event of flooding. This road, used by 20,000 motorists every day, is regularly submerged during heavy rains, exposing users to major risks on certain problematic stretches.

In addition, for the commune of Kouaoua, whose urban centre is located in a flood-prone area, a pilot project was undertaken in consultation with the local community to assess the area's vulnerability and develop a plan to make the commune more resilient to the risk of flooding.

In **New Caledonia** and **French Polynesia**, flood watch and warning systems were studied and implemented. In New Caledonia, PROTEGE has confirmed the feasibility of setting up a warning system for Grande Terre, based on the availability and reliability of pluviometric and limnometric (flow measurement) networks and data. An operational prototype currently covers 14 catchment areas. Extending the system to a larger scale will require the water level network to be strengthened, in particular by installing stations equipped with

remote transmission. For the urban area of Papeete on Tahiti in **French Polynesia**, a system was studied to improve flood hazards monitoring and three catchment areas have been equipped with instruments. However, remote transmission is also missing on existing measurement networks. Its deployment would be necessary to further extend the system and provide useful information to decision-makers and communities.



BACKGROUND

💧 The French Overseas Countries and Territories (OCTs) in the Pacific region record significant rainfall, reaching 5,000mm in some years in Wallis and Futuna, 6,000mm in southern New Caledonia and 11,000mm on Tahiti in French Polynesia.

The combined effects of the geology and mountainous configuration of many islands expose part of the population to water-related hazards, particularly excess water, which can be brutal and devastating. These phenomena not only threaten residential areas and human activity, but also endanger the lives of local residents.

The risk of flooding, which seems to be increasing as a result of climate change, has not been sufficiently taken into account in regional planning, particularly in urban areas. In New Caledonia, more than 20,000 people live in flood-prone areas, while in French Polynesia, particularly in the Papeete conurbation, urban development often takes place in the immediate vicinity of watercourses.

The overflows observed are sometimes the result of poor infrastructure or a lack of maintenance, making the watercourses incapable of handling floods, even those of very low recurrence. Whether on Futuna, Tahiti in French Polynesia or the west coast of New Caledonia, some roads are regularly flooded. Roads are sometimes undersized, while the artificialisation of watercourses, although it protects certain areas, increases flow speeds, and therefore intensifies flooding downstream of catchment areas.

Stormwater management is also insufficient in many cases, due to a lack of maintenance of existing structures or the absence of suitable infrastructure to manage discharges.

Excess water can also lead to "debris flows" and landslides with dramatic consequences. In November 2016, for example, the commune of Houailou suffered a major disaster, resulting in the disappearance and death of 8 people. Other communes in New Caledonia and French Polynesia are also affected by these phenomena.

"Territories facing devastating floods"

Heavy rainfall also poses health risks, making water unfit for human consumption.

Water can be contaminated, particularly when sanitation is inadequate or uncontrolled. This was the case in February 2019 in the village of Mua on Wallis, where floodwaters carried contaminants to the borehole used for drinking water.

Aware of the risks to which their communities are exposed, local governments have decided, within the framework of PROTEGE, to strengthen their resilience by carrying out various actions adapted to each area's specific priorities and challenges.



ISSUES & OBJECTIVES

 A community's flood risk resilience refers to its capacity to anticipate risk, adapt and recover from flooding.



IN RESPONSE TO THE NEEDS AND PRIORITIES IDENTIFIED BY LOCAL GOVERNMENT, ACTIONS CARRIED OUT UNDER PROTEGE HAVE TARGETED 3 MAIN OBJECTIVES:

- Establishing planning tools to improve stormwater management and increase resilience to flood risks
- Addressing local issues, by carrying out priority works or installing observation markers to inform local communities
- Defining and implementing crisis management tools, in particular by deploying monitoring and warning systems



OUTCOMES

RT1 roadway flood markers – New Caledonia

In **New Caledonia**, several actions were implemented to strengthen the territory's flood risk resilience. Submergence markers were set up at 12 problem sites along territory's main road on the west coast. The devices include 2-metre flood scales, incremented by visible markers at the edge of the road, indicating the height of water at the lowest point. These markers are complemented by vertical delineators, allowing motorists and road users to see the limits of the roadway. In total, and depending on the configuration of the sites, the project resulted in the installation of 19 2-metre flood markers, 315 roadside markers, 54 ground markers and 22 roadside signs.

New Caledonians, used to flooding, tend to cross submerged areas. The systems installed aim to make this practice safer, where it is still possible, by providing clear and visible information. In addition, the flood gauges provide essential information for the civil protection services, who can then decide to close the road if the crossing becomes dangerous.

“Flood gauges on the RT1”

Identifying vulnerability to flooding and strengthening the resilience in the commune of Kouaoua – New Caledonia

In the commune of Kouaoua in New Caledonia, where the village is located at the confluence of the Kouaoua and Kaviju rivers in an estuarine area, flooding is a frequent occurrence. The flood hazard map is well known, and the village regularly experiences overflows of up to one or two metres for floods recurring every five or ten years. A project to relocate the village was considered by the Northern Province and the commune in the early 2000s, but failed to garner the support of the local community, who are deeply attached to their place of residence. Aware of this reality, the local government and partners in the PROTEGE project decided to take action to strengthen the resilience of the local community concerned.

A pilot project, designed to be replicated in other communes, has helped to identify the issues at stake and their vulnerability to flooding. It included participatory workshops to help build a community resilience plan.

This study has made it possible to integrate flood risks more effectively into the communal protection plan and to identify pragmatic and appropriate solutions, together with the community, such as setting up a new organisation for the collection, sorting and storage of waste to prevent pollution of rivers and groundwater during floods; organising meetings to monitor the management of mining catchment areas, in collaboration with mining stakeholders; and defining practical measures to speed up recovery after a crisis, focusing on maintaining communications (telephone antenna), drinking water and electricity distribution.

This initiative demonstrates the importance of a participatory and local approach to building resilience to flood risks, and ensuring that the solutions adopted meet the needs and expectations of the local community. This approach provides a replicable model for other communes facing similar challenges.



🚰 Developing a prototype flood forecasting tool – New Caledonia

In New Caledonia, a third major action involved the development of a prototype flood forecasting tool, designed to improve flood risk management on Grande Terre. The territory's meteorological department has a network of 60 automatic rain gauges and three weather radars. In addition, the DAVAR operates a network of 77 rain gauges without real-time remote transmission, as well as 40 water level gauging stations across Grande Terre, providing information on water levels.

At the instigation of the Department of Civil Security and Risk Management (DSCGR), the New Caledonian government decided to look into the implementation of an operational flood warning system for the whole of Grande Terre, which would enable flooding to be predicted based on rainfall forecasts. The project involved the creation of "rainfall-flow" models for 14 catchment areas using available data. The results exceeded the initial expectations of the government technicians. The existing data was deemed sufficiently reliable to enable the deployment of a prototype flood forecasting tool, which is now ready to be tested under real conditions. A timetable has been drawn up for deploying the tool across Grande Terre up to 2030. This timetable includes improving the real-time availability of river flow and rainfall data, by means of remote transmission. To date, the tool operates on the basis of historical flow data, coupled with the rainfall forecasting systems used by the meteorological service.

🚰 Flood hazard monitoring system - French Polynesia

In French Polynesia, PROTEGE supported the Department of Public Works (DEQ) in a project to set up a meteorological hazard monitoring system, designed to reduce response times and improve the efficiency of emergency services in the event of flooding.

The first phase of the project focused on the six main rivers in the urban area of Tahiti, based on an analysis of existing documents and a series of interviews with local stakeholders. This approach made it possible to compile information on six catchment areas and to develop a crisis management plan. This plan integrates the various stages of decision-making, mobilisation and implementation of technical resources to protect communities.

Three watercourses were finally selected for implementation, based on their vulnerability to flooding and the technical feasibility of installing suitable equipment: the Fautaua, the Nahoata and the Tipaerui.

“The weather hazard monitoring system, a major advancement for the island of Tahiti”

The monitoring system that has been developed is based on direct monitoring of rising water levels, using water level gauges whose data is remotely transmitted, and on a better understanding of the relationship between rainfall on mountain peaks and river flow in populated areas.

To ensure that the system works properly, the existing network in the area has been supplemented by the installation of three rain gauge stations and one water level station.





Rainwater drainage master plan – Wallis and Futuna

In Wallis and Futuna, the PROTEGE project has enabled the Territory to draw up a master plan for rainwater drainage. Rainwater management is a recurring problem on both Wallis and Futuna, particularly during periods of heavy rainfall. Some inhabited sites are particularly affected by flooding, mainly due to the lack of appropriate infrastructure to control rainwater discharge or a lack of maintenance of the existing network.

The context of the two islands is different. On the island of Wallis, there is no permanent hydrographic network. Runoff is relatively low due to the gentle topography, predominantly permeable soils and low proportion of sealed surfaces. However, these conditions do not prevent significant problems occurring during heavy rainfall. The underground water table, fed by run-off, is the only freshwater resource for all the island's uses. Futuna's environment is characterised by a dense hydrographic network of permanent streams originating in the highlands. Currently, all the water used comes from river catchments, whether for water supply or irrigation of the taro paddies. However, the state of the catchment areas increases rainwater run-off, which quickly reaches the rivers before reaching the coastal fringe, leading to problems linked to the management of these flows.

The master plan developed as part of PROTEGE has a number of key objectives. First and foremost, it seeks to preserve water quality, which is essential for its many uses, while reducing the risks of flooding and landslides. It also aims to limit terrigenous inputs into watercourses and coastal areas, and to combat pollution of Wallis' freshwater lens, as well as surface and coastal waters. This document proposes a multi-year programme of works over a nine-year period, detailing the maintenance requirements for existing infrastructures and the management arrangements for the works. It also takes into account the specific characteristics of land ownership and the division of responsibilities between the government, the territory and the village authorities involved in managing the works.



Improving rainwater drainage – Wallis and Futuna

The master plan identified the area around the Kafika sports complex as particularly problematic in the event of heavy rain. Thanks to the PROTEGE project, the territory was able to carry out priority work to resolve this situation, as the rainwater drainage system was previously dysfunctional and ineffective. In fact, during heavy rainfall, rainwater was discharged uncontrollably onto the territorial road, considerably increasing the volume of water discharged downstream, causing flooding in inhabited areas. These overflows affected the urban centre of Mata'Utu in particular, causing damage to homes located on lower ground. As a result of the work carried out, the wastewater treatment system operational. Rainwater is now redirected to an infiltration basin located on the site, limiting discharges to ditches along local roads.

“Major works to limit flooding and associated risks in Mata'Utu”



FIRST-HAND ACCOUNTS



ALEXANDRE PELTIER

Meteorologist at Météo France, New Caledonia



Based on observed or forecast rainfall, New Caledonia's flood risk prevention tool would enable us to identify the impact on flood-prone or vulnerable areas, and to anticipate the amount of water or flow we can expect.



STÉPHANE DELICHÈRE

Project Manager at BRL Ingénierie, New Caledonia



The flood risk prevention tool would consist of a map, with graphic representations of the various sites at risk, which would be coloured according to the level of risk. This map would enable New Caledonia's Civil Security Department to identify at a glance the sites affected by flash flooding and prepare to intervene. We hope that, in the future, the tool will enable us to anticipate risks even earlier, with even wider flood horizons, and thus save on forecasting time.



GWENAELLE BUISSON

*Co-head of the Hydrology Unit at GEGDP,
Directorate of Equipment, French Polynesia*



As part of the "Flood Warning System" action, the study phase confirmed that it was not necessary to set up such a system. Flood propagation times for the 6 rivers in the Papeete urban area studied were between 50 and 90 minutes, which is less than the time required for the Directorate of Equipment to mobilise resources. As a result, the project was redirected towards improving knowledge of the meteorological hazard in the Papeete urban area. To this end, a works contract, funded by the Directorate of Equipment is underway to install 4 rain gauges and a water level gauge equipped with a remote data transmission system.





KEY FIGURES

2

flood warning monitoring systems

in French Polynesia and New Caledonia



1



master plan

on rainwater in Wallis and Futuna

1



pilot project

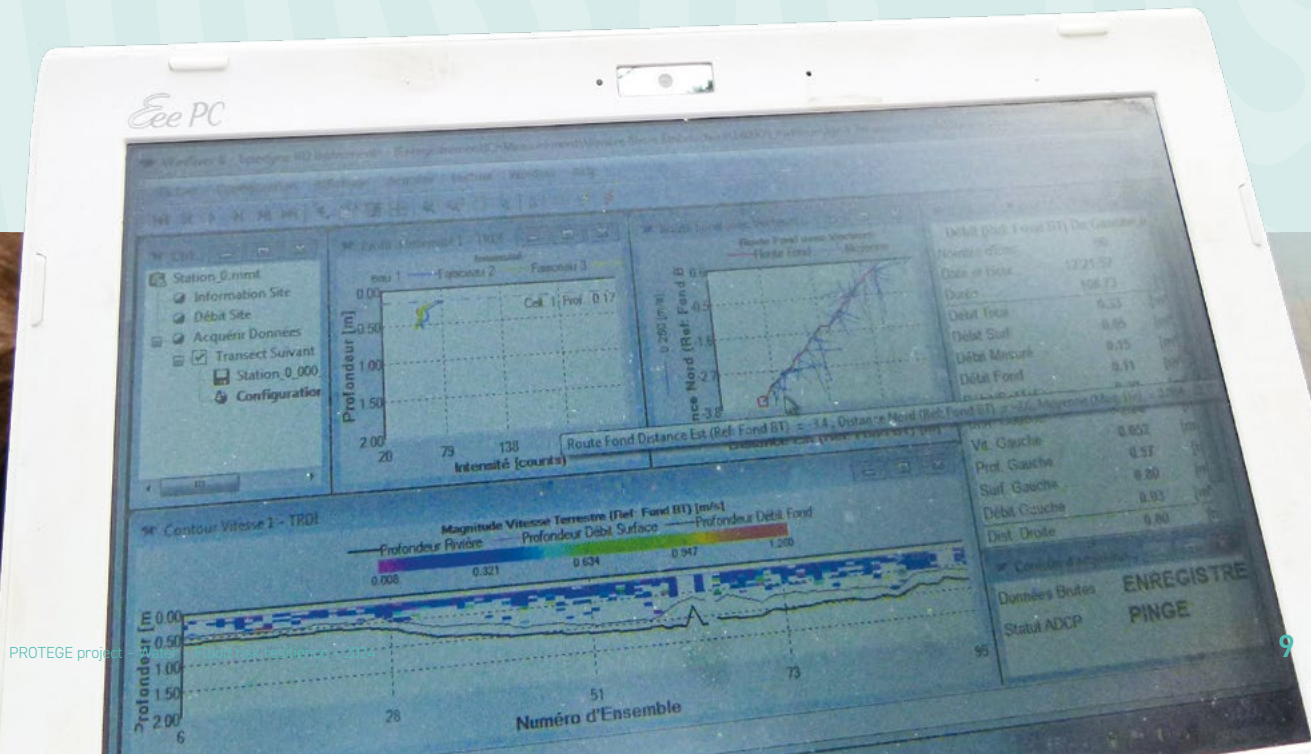
to strengthen the commune of Kouaoua's flood risk resilience

12



RT1 sites

in New Caledonia equipped with flood markers





PROSPECTS AND SUSTAINABILITY

🔹 In **New Caledonia**, the New Caledonian government has noted the effectiveness of the flood markers installed on territorial road no. 1. Following this success, the initiative could be extended to other roads in the territory.

The pilot project carried out in commune of Kouaoua demonstrated the relevance of a participatory approach that involves the local population in building flood risk resilience. Standard specifications have been drawn up to facilitate the replication of this approach in other communes.

PROTEGE also demonstrated the feasibility of a flood forecasting system in New Caledonia. The current prototype, based on historical data, observations and rainfall forecasts, represents a major step forward. However, to make it a real forecasting and anticipation tool, it is necessary to obtain real-time flow data. To this end, the DAVAR and the DSCGR are working on a project to equip around ten stations as part of the Green Fund.

In **Wallis and Futuna**, the multi-year programme of works proposed as part of the rainwater drainage master plan will be the guiding principle for the work to be carried out by the Territory in the coming years. The works must also be managed in accordance with the procedures defined in the Master Plan and approved by the Territory's authorities.

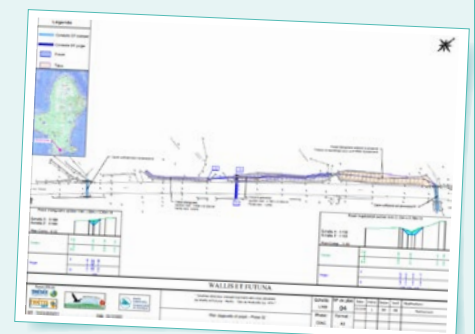
In **French Polynesia**, the flood warning monitoring system could be extended by equipping more existing stations with remote transmission. These improvements will enable essential data to be transmitted more quickly to departments and decision-makers, facilitating more responsive and better-informed decision-making in the face of flood risks.





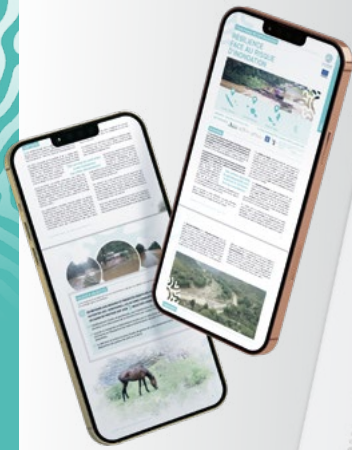
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NEWSLETTER

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