

# **MANGROVE :** Ecological restoration strategies

# How to use the platform

## ❖ PARTICIPANTS

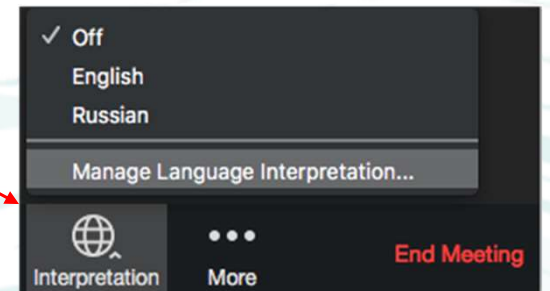
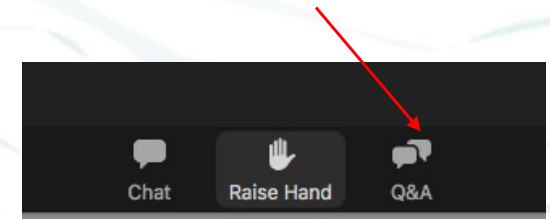
You can ask questions through the « question box ». The moderators see them and relay them to the speakers who will answer them in the "question and answer" sessions.

## ❖ TRANSLATION

If you need interpretation please choose the channel below...

## ❖ SPEAKERS

Think that everyone can see and hear you...and that you are being recorded for future broadcasts! Please turn off your microphones when you are not speaking.



# Context & objectives

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## Series « Ecological restoration of mangroves »

Share concrete practices to support their replication with experiences from project/program managers and experts in the field.

How to implement them? What are the difficulties and how to prevent and overcome them ? What are the keys to success?



# Context & objectives

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## ICO SOLUTIONS

Islands, Coasts, Oceans Solutions : Identify and share good initiatives and practices all around the world with our partners



French public institution : acquire parcels of coastline threatened by urbanisation or degraded in order to turn them into restored, developed and welcoming sites that respect the natural balance.

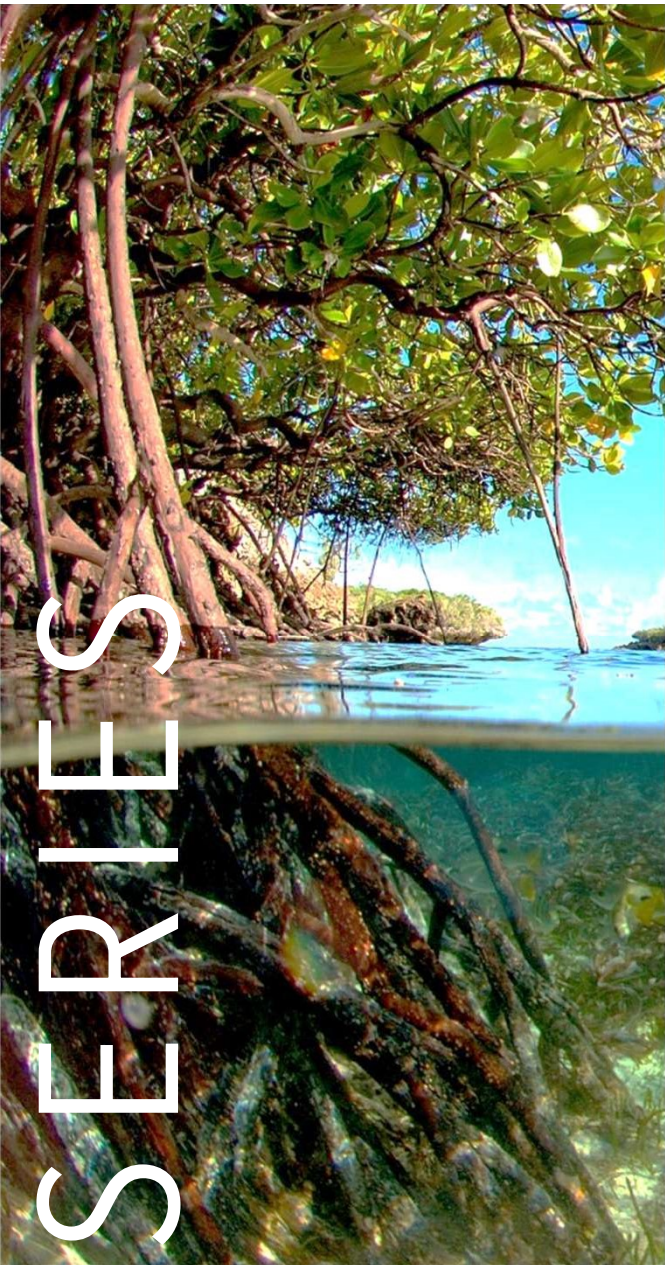


International NGO : promotion and assistance in the management of Mediterranean island areas by the implementation of concrete actions in the field.



Small Islands Organisation, international NGO : supports small islands of less than 150 km<sup>2</sup> towards their sustainable development and the sustainable management of their resources (water & sanitation, waste, energy, biodiversity, landscape and cultural heritage).





# MANGROVES : Ecological restoration strategies

- **Today** >> 3<sup>rd</sup> Episode : Passive restoration technics – Encourage the spontaneous recolonisation of mangroves
- **2 weeks ago** >> 1<sup>st</sup> Episode : Avoid mangrove destruction – Understanding and reducing pressures (*replay on ICO Solutions website*)
- **Last week** >> 2<sup>nd</sup> Episode : Active restoration technics – Innovations and challenges (*replay on ICO Solutions website*)

# Organizing team



**Fabrice Bernard**  
**Moderator**  
Europe & International  
Head-Officer  
Conservatoire du littoral



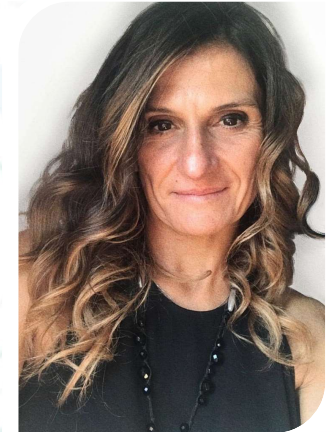
**Enora Tregouët**  
**Organization /  
Question Box**  
Europe & International  
Project officer  
Conservatoire du littoral



**Angélique Triguel**  
**Back Office**  
Europe & International  
Project Manager  
Conservatoire du littoral



**Cyrielle Grouard**  
**Organization**  
Project Manager  
PIM Initiative



**Isabella Ranieri**  
**Intepreter**



# Program – Episode 3

## Encourage the spontaneous recolonisation of mangroves

- ❖ **Introduction** – Christophe Proisy - 5’
- ❖ **First part** – Jim Enright - 7’
  - **Q&A**
- ❖ **Second part** – Dr. Jorge A. Herrera Silveira – 7’
  - **Q&A**
- ❖ **Third part** – Jérémy Amiot – 7’
  - **Q&A**
- ❖ **Fourth part** – Virginie Tsilibaris - 5’
  - **Q&A**
- ❖ **Closing**



# Speakers



## Christophe Proisy

Researcher in remote sensing of mangrove forests at the IRD UMR-AMAP



## Jim Enright

Mangrove Restoration Trainer in Mangrove Action Project



## Dr. Jorge A. Herrera-Silveira

Titular Professor, CINVESTAV-IPN, Unidad Mérida



## Jérémy Amiot

Project manager Conservatoire du littoral, délégation Outre-Mer – Antenne de Guadeloupe



## Virginie Tsilibaris

Coordinator of the French Mangrove Monitoring Network



**MANGROVES** : Ecological restoration strategies | 3rd Episode – April 27th, 2023



# Speaker

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**Jim Enright**

Mangrove Restoration Trainer  
at the Mangrove Action Project



Thailand



# Speaker

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**Dr. Jorge A. Herrera-Silveira**

Titular Professor, CINVESTAV-IPN, Unidad Mérida



**Cinvestav**  
UNIDAD MERIDA

Mexico



# Speaker

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**Jérémy Amiot**

Project manager  
Conservatoire du littoral, délégation Outre-  
Mer – Antenne de Guadeloupe



Guadeloupe

# Speaker

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## Virginie Tsilibaris

Coordinator of the French Mangrove Monitoring Network (*Réseau d'Observation et d'aide à la gestion des Mangroves – ROM*)

French Tropical Wetlands Network (*Pôle-Relais Zones Humides Tropicales*)  
- IUCN French National Committee



Guadeloupe



# Introduction

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## Christophe Proisy

Researcher in remote sensing of mangrove forests at the IRD UMR-AMAP



French National Research Institute for Sustainable Development

Cayenne, French Guiana



# Introduction

## Passive restoration technics

- **Wisdom and good sense required!**
  - Mangroves develop >50 Ma ([Plaziat et al. \(2001\)](#))
  - Opportunistic adaptive ecosystems ⇔ sheltered coasts and estuaries
- **Hydrology x Sedimentology x Mangrove (species x vegetal forms)**
  - Complex forest functioning ⇔ Myriad services
- **Lessons from undisturbed mangrove areas**
  - Capability of expansion (e.g. 500 m/y on sediments in French Guiana)
  - Natural establishment may outreach plantation rates (height growth, expansion)

## Understanding natural & societal processes

- Complex, rapidly changing interface
- Hydrology, sedimentology, ecology... to be understood
- Local strategy, local scale processes, local population involved
- Diversity of services restored and equity preserved

Natural mangrove establishment



Vegetal opportunism when sediments are supplied (over >100 ha in a few months, French Guiana)



Vegetal plasticity and complex functioning

# *Community-based Ecological Mangrove Restoration*

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**Jim Enright**

Mangrove Restoration Trainer



Thailand



# ***Background to MAP's CBEMR Method***

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- CBEMR is not **PASSIVE** but **ACTIVE** focusing on promoting **NATURAL REGENERATION**
- Post Indian Ocean Tsunami of 2004 > Massive mangrove **PLANTING FAILURES 70-80%**.
- Learned from Robin Lewis, Florida in India 2005 '**ECOLOGICAL MANGROVE RESTORATION** '
- Added "**COMMUNITY**" (CBEMR) because mangrove importance to coastal Asian communities
- Mangrove restoration should be a **LONG-TERM** intervention & commitment
- Mangrove restoration should be **HOLISTIC** > protection & conservation first priority; environmental education; livelihood interventions; promote community or co-management of mangroves



# ALTERNATIVE RESTORATION APPROACHES

## CBEMR PROCESS

## TRADITIONAL RESTORATION

...with the local community...

- **Research proposed site - hydrology, mangrove stressors, local species & social issues, etc.**
- **Study a local, natural reference site**
- **Understand changes, problems and corrections needed**
- **Map, discuss, plan & agree action**
- **Implement. Correct changes, improve hydrology / topography, remove stressors, implement social changes**
- **Monitor and amended as necessary**
- **Plant only if too few seeds arriving**

**NORMALLY SUCCESSFUL**

Build a nursery



Plant

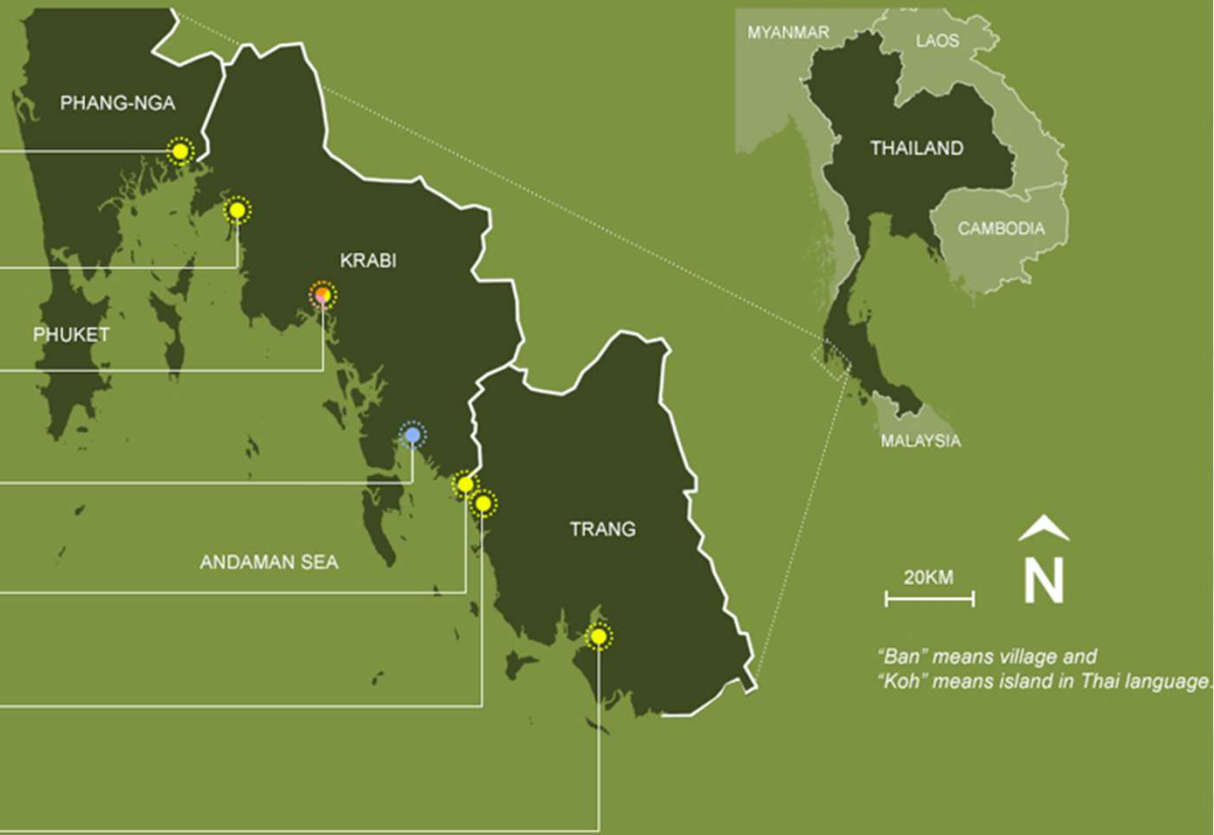
**OFTEN FAILS**

5

# Implementation of CBEMR: Learning by Doing

Click on project sites below to search blog posts per location or scroll down

- Ban Tha Sanook
- Ban Nai Nang
- Koh Klang
- Ban Thung Yor
- Ban Laem Makham
- Ban Bang Kang Kao
- Ban Thung Gor



....a dozen CBEMR demonstration sites on Andaman Sea coast of Southern Thailand. 2007-2018





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# More CBEMR activities:





# Monitoring: Time-lapse Photos

(View B-A) October 20th, 2017



(View B-A) November 13rd, 2018





# ***Conclusion: CBEMR Method***

- ✓ No nurseries required > lower costs, especially for large sites
- ✓ Every species is in its correct zone > nature decides
- ✓ Higher biodiversity > 10-13 species per site in Thailand
- ✓ Environmental Education & Livelihood interventions ensure long-term community buy-in & protection of site
- ✓ CBEMR trainings have been given in Thailand, Cambodia, Myanmar, Malaysia, India, Sri Lanka, Columbia, Honduras, El Salvador, The Bahamas, Tanzania, Kenya, Senegal & virtually for many more
- ✓ **CBEMR List Server** : <https://groups.io/g/MAP-CBEMR>
- ✓ E-mail: [Jim.Enright.MAP@gmail.com](mailto:Jim.Enright.MAP@gmail.com)






# Intro / Part I

## Question & Answers





# Dispersal centers “Tarquinas” as an innovative method for ecological restoration in mangroves

**Dr. Jorge Alfredo Herrera Silveira**, Dr. Claudia Teutli-Hernández, Dr. Diana Cisneros-de la Cruz, Dr. Daniel Arceo-Carranza, Biol. Mar. Andrés Canul-Cabrera, M. C. Javier Pedro Toral-Robles, Biol. Oscar Pérez-Martínez, Q. I. Daniela Sierra-Oramas, Biol. Karla Zenteno, Biol. Heimi Us-Balam, Biol. Eunice Pech, Dr. Xavier Chiappa-Carrera; Dr. Francisco Comín



# Dispersal centers “Tarquinas” as an innovative method for ecological restoration in mangroves



Dr. Jorge A. Herrera-Silveira

Fonction  
Organisation



Mexico

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# Natural & Human Impacts, the last most severe in *space and long term*





# IN RESPONSE: Diversity of restoration actions *with a lot of financing \$\$, ... BUT THEY HAVE FAILED*

"técnicas multianual"



"del Peten"



"encamados"



"entubados"



"chinampera"



"enlazados y ensartados"



"Ovnis"



"huacaleros"





# THEN: Strategy development



**Basic  
Research**

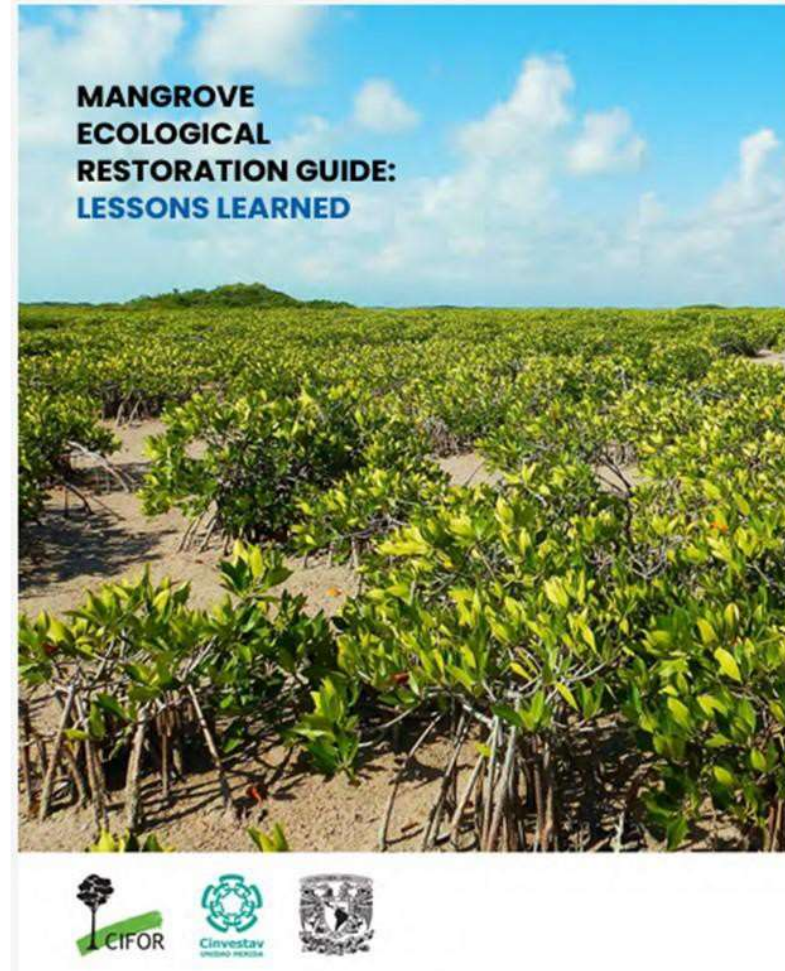
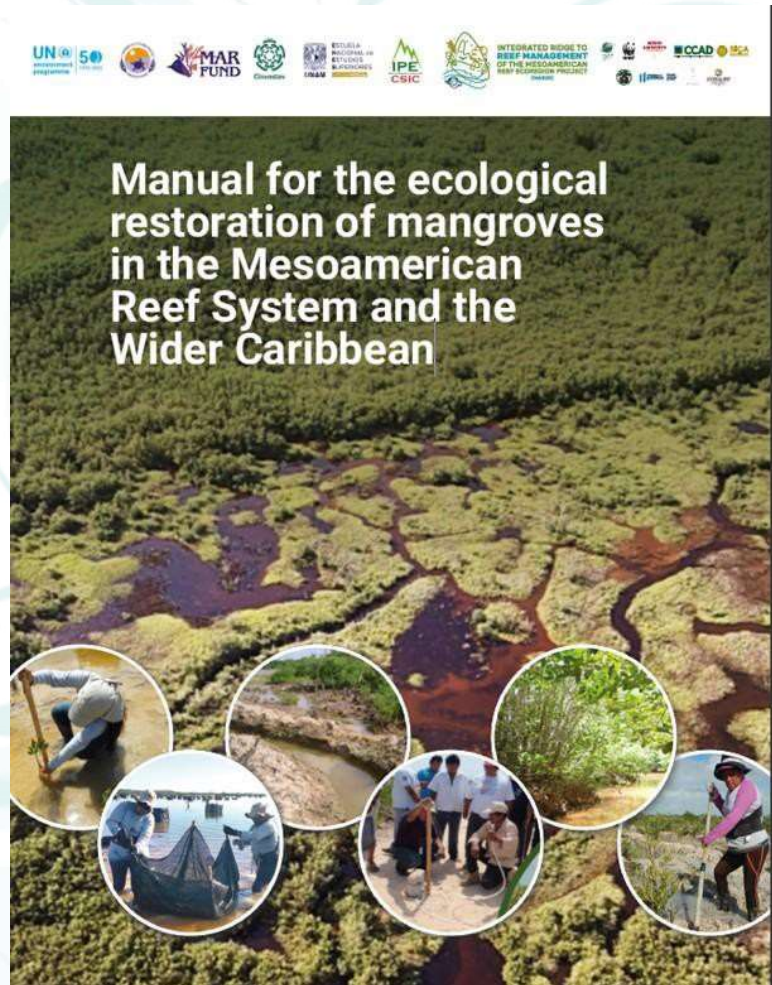
**Demo  
Projects**

**Training**

**Social  
Participation**



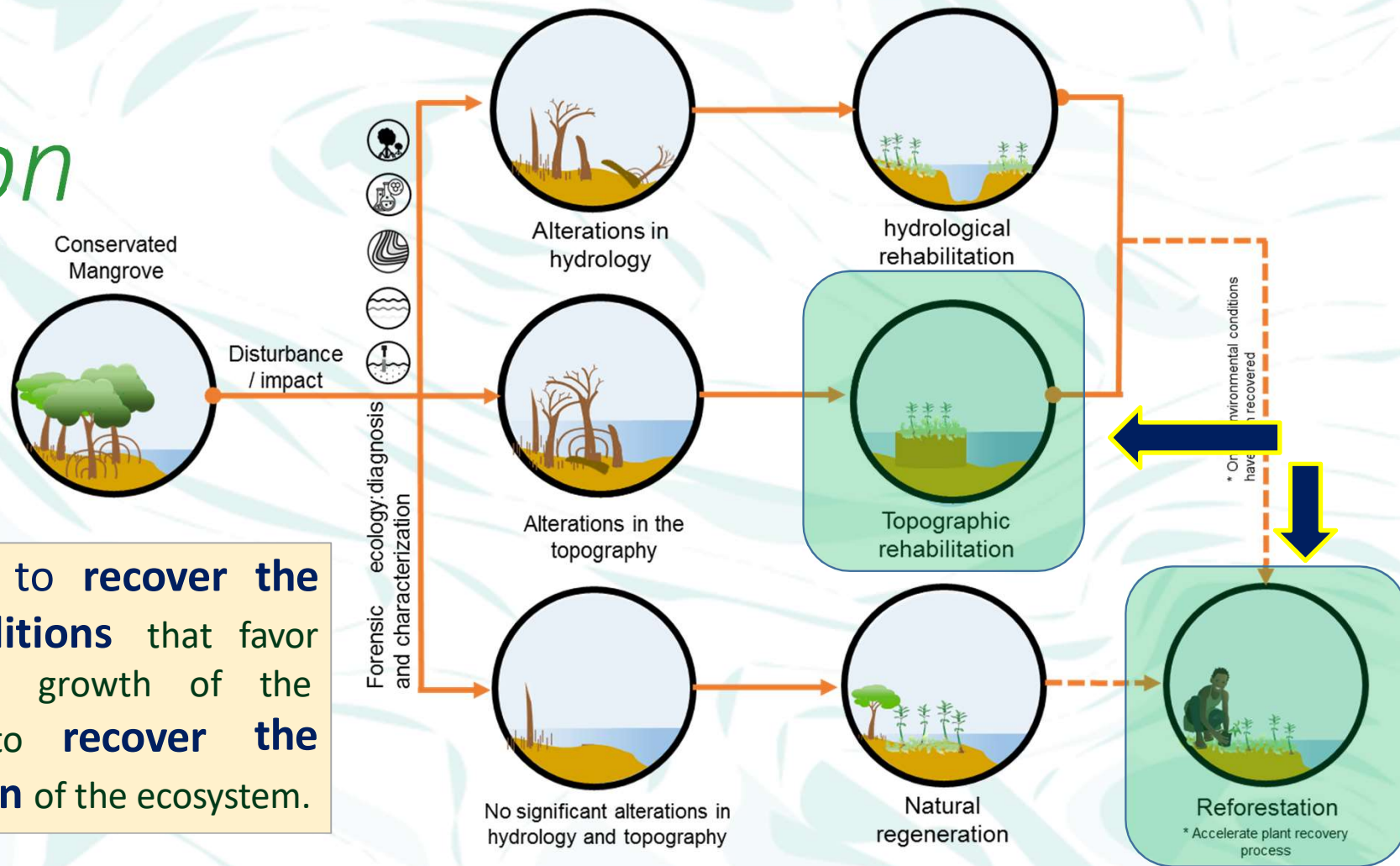
# The Products (Manual and Guidelines)



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# Ecological Restoration

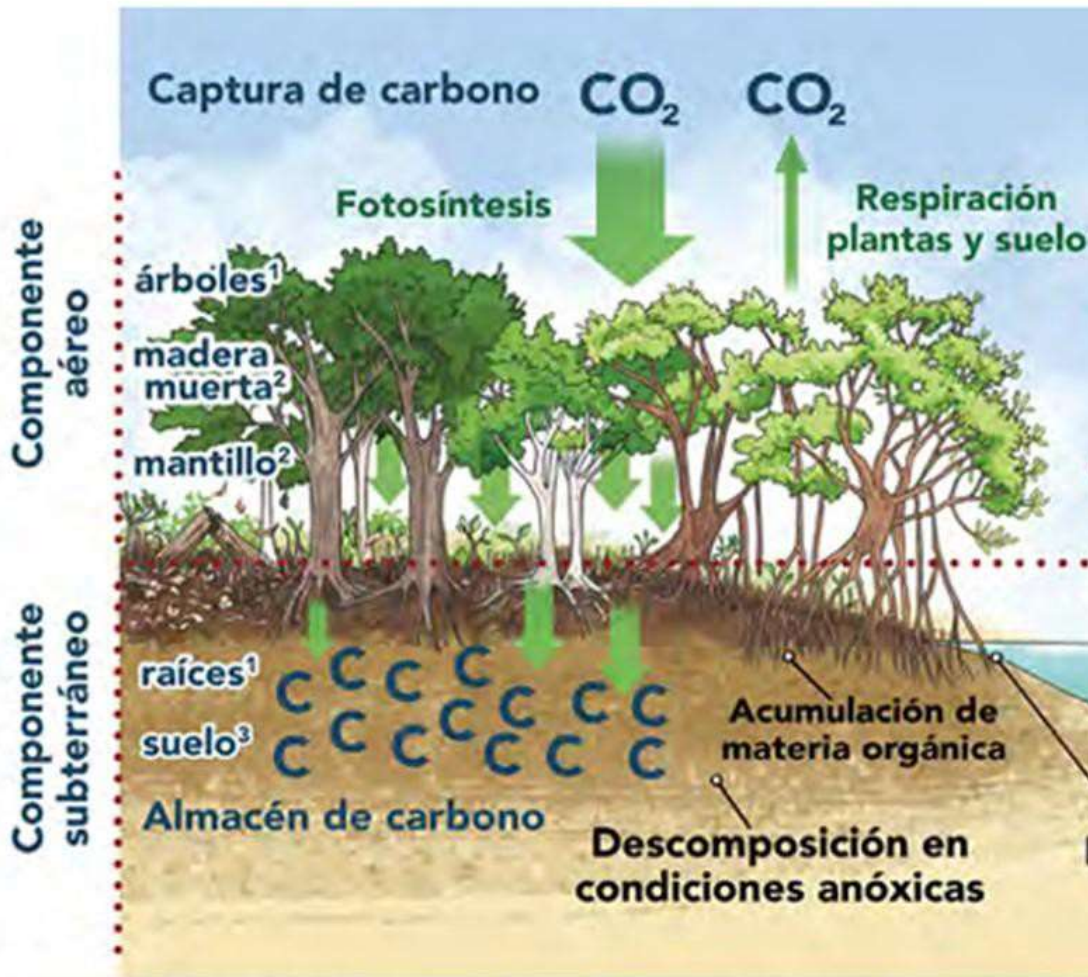


Its main **objective** is to **recover the environmental conditions** that favor the establishment and growth of the mangrove, in order to **recover the structure and function** of the ecosystem.

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# The Problem



*in preserved mangroves the ground level remains in accretion (elevation)...*

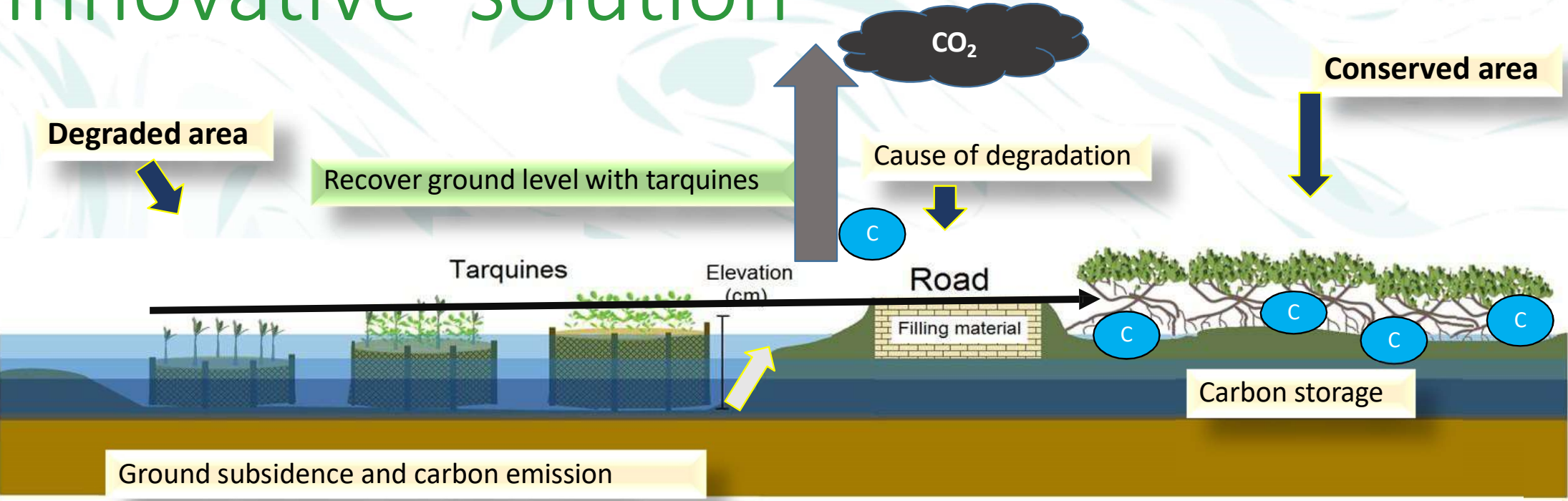
**← Soil level**

*...could compensate for sea level rise and be less vulnerable*





# Innovative solution



**Are delimited and topographically** modified areas for the **elevation of the level** through the disposition of sediment in mounds retained by meshes or other material.

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Image by Cortés-Esquivel J. L., modified from Teutli-Hernández et al., 2020





# Topographic Rehabilitation with tarquinas

**Favor flood condition  
suitable for successful  
seedling establishment.**

**What are the Tarquinas?**

Photos: Primary Production Laboratory

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# Tarquinas construction



- Mesh
- Scissors



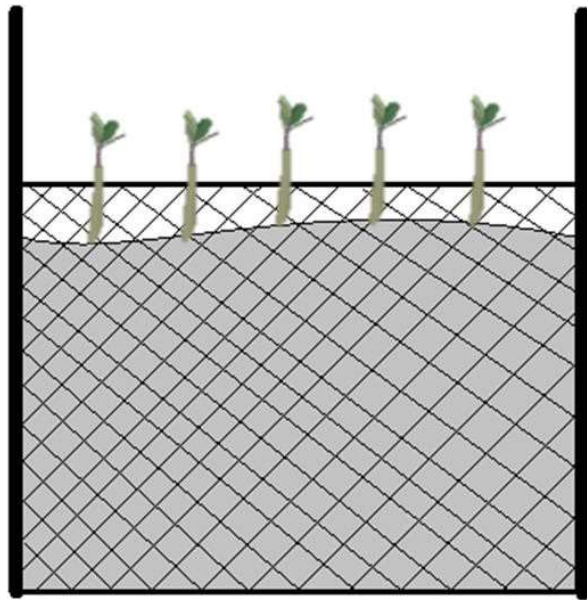
- Waxed thread
- Scissors

- Wood sticks





# Technique for creating tarquinas



1 to 25 m<sup>2</sup>

conglomerate of five tarquinas



Restoration success



# Advantages of conglomerates



- Simulate recovery landscape.
- Over time some conglomerates merge, others do not, favoring a more resilient landscape than monospecific plantations.





# Reforestation



Collection of propagules



Propagules



Reforestation



Direct reforestation



Tarquines area

## MANGROVES : Ecological restoration strategies

Photos: Primary Production Laboratory





# Success stories of restoration with tarquinas

Progreso, Yucatán “Las Chelemeras”



To date, **1000 ha** have been intervened with this technique **in 3 sites**.

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photos and images of drone: Primary Production Laboratory





# El Playón, Sian Ka'an



**22% increase** in vegetation cover in **four years**

**easy to measure carbon sequestration**



photos and images of drone: Primary Production Laboratory



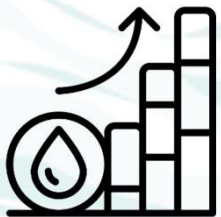
# Conclusions



- The **Tarquinas** generate **favorable conditions for the development of propagules** and, therefore, **increase the survival rate** and recovery of the mangrove in less time compared to other restoration methods.



- The **innovative method of tarquinas** in mangroves where **soil subsidence** has been observed has proven to be a **cost-efficient success story**.



- Without the **support of the communities**, restoration actions would not be implemented.





# Part II

## Question & Answers

# Speakers

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## Jérémy Amiot

Project manager  
Conservatoire du littoral, délégation Outre-  
Mer – Antenne de Guadeloupe



Guadeloupe



# Projet JA-RIV

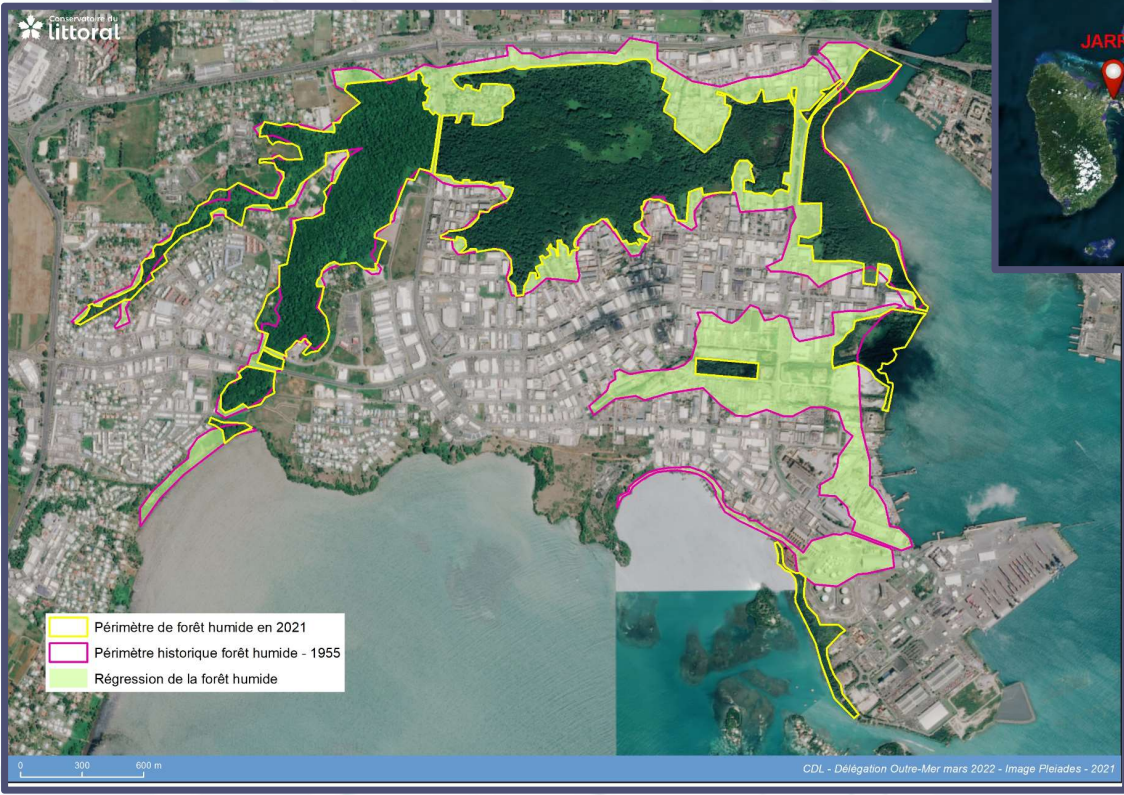
## Plan

- I. Contexte géographique et historique
- II. Les écosystèmes cibles et les menaces
- III. Volets d'action
  0. Libération du domaine public
  1. Diagnostic
  2. Restauration
  3. Aménagement



# Projet JA-RIV

## I. Contexte géographique et historique



**Urbanisation :**  
**1/3 de la surface de forêt**  
**détruite en moins de 70 ans !**



# Projet JA-RIV

## II. Les écosystèmes cibles et les menaces



**Préserver ces écosystèmes permet de:**

- Protéger de la population des inondations, ouragans et de l'érosion du littoral
- Préserver la biodiversité
- Trouver un équilibre entre activités économique et milieu naturel
- Améliorer le cadre de vie des usagers



# Projet JA-RIV

## III. Volets d'action – Libération du domaine public

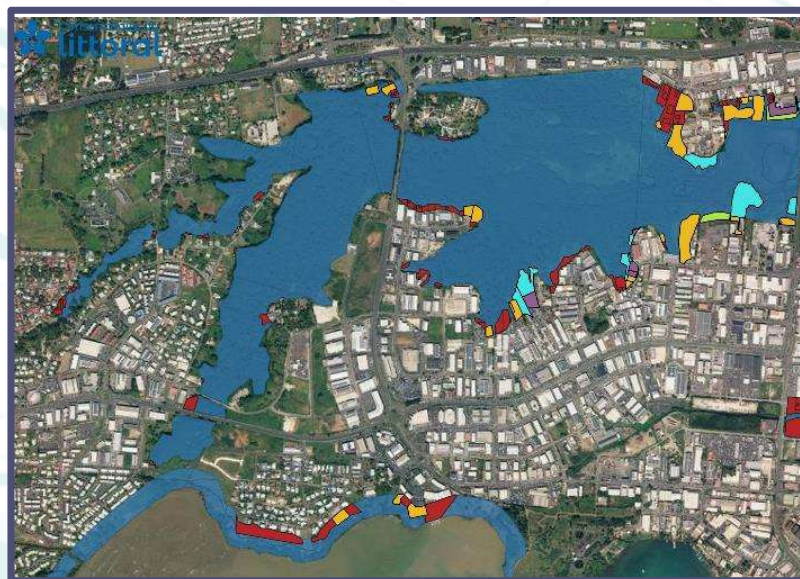
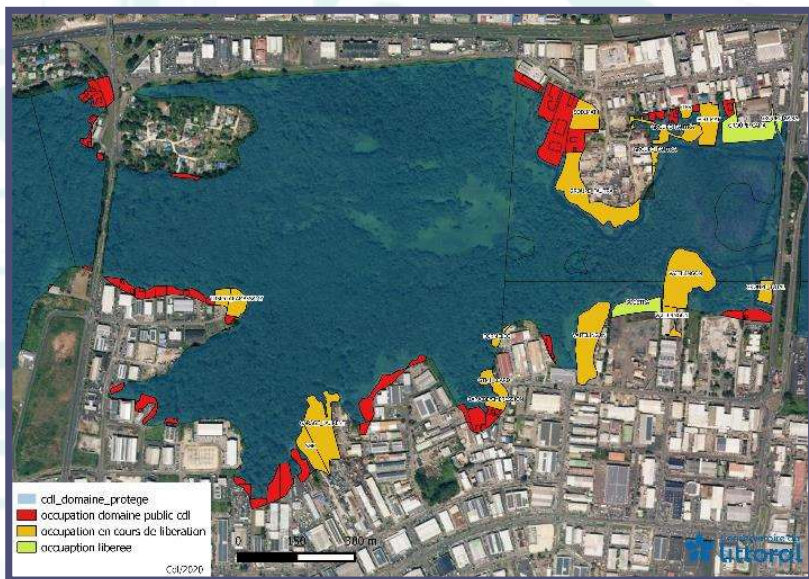
Février 2020

Juillet 2022



Libération des terrains occupés sans droit ni titre :

- 4 ha de terrains libérés ou conventionnés
- 5 conventions d'occupation temporaire signées
- 6,2 ha en cours de libération ou conventionnement





# Projet JA-RIV



## III. Volets d'action – Diagnostic écologique



© Impact Mer

Diagnostic écologique



Analyse de pollution de l'eau et des sédiments, sondages



Etude hydrologique

# Projet JA-RIV

## III. Volets d'action – Restauration



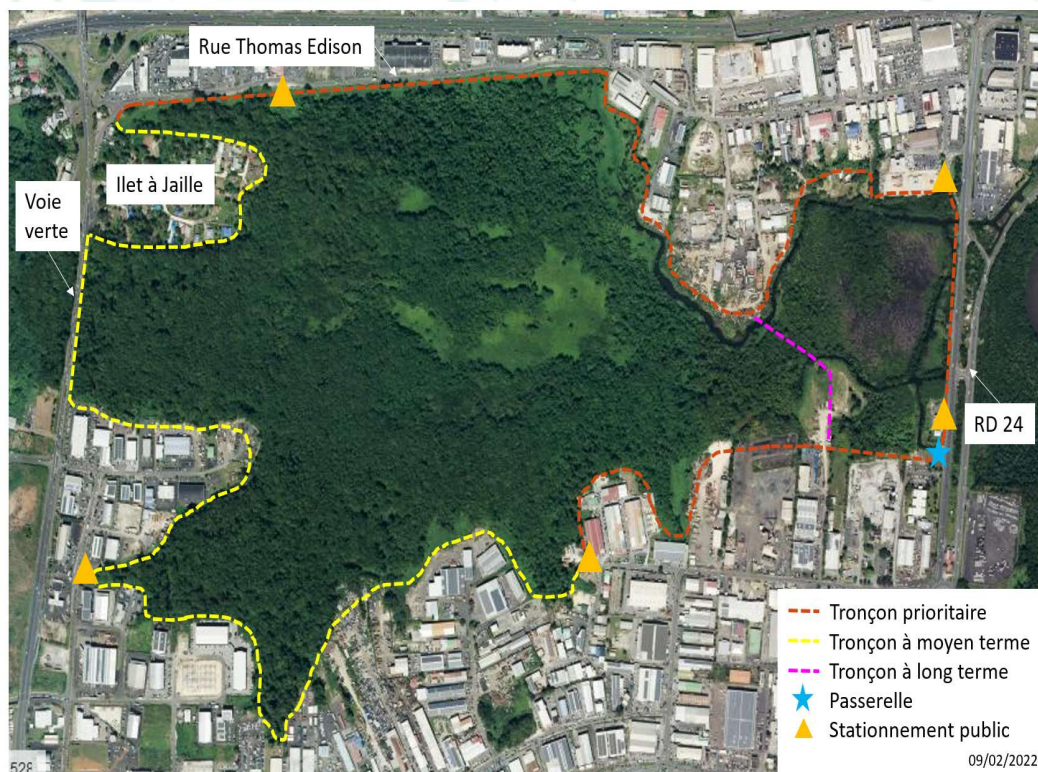
### Exemple : Site CAMA

- **2017** : un remblai servant de dépôt de container.
- **Opération de restauration** : décaissement de 80cm pour restaurer la circulation de l'eau et favoriser le retour de la Mangrove
- **2022** : 3 300 m<sup>2</sup> de Mangrove restauré



# Projet JA-RIV

## III. Volets d'action – Aménagement



**Création d'un sentier périphérique, à l'interface entre la forêt humide et la zone industrielle de Jarry.**

- Valoriser la zone humide en la rendant accessible (stationnement, espaces détente)
- Sensibiliser à l'importance de préserver ces écosystèmes (panneaux pédagogiques)
- Favoriser la mobilité douce
- Ceinturer la zone naturelle, pour contrer toute tentative de nouvelles occupations/ dégradation

# Conclusion

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En moins de 70 ans, nous avons perdu 1/3 de la surface de la zone humide de Jarry

Les principales **pressions** sont *l'augmentation de l'urbanisation, remblai*, le dépôt de *déchets* et la *pollution de l'eau et des sols*.

Or la mangrove et la forêt marécageuse jouent un rôle clé pour la **protection de nos côtes** (inondation, ouragans, érosion des côtes)

Le projet **JA-RIV** a pour objectif la restauration de ces écosystèmes. Il se décline en plusieurs volets d'action ( *libération du domaine public, diagnostic écologique, restauration et l'aménagement d'un sentier pédagogique*).





# Part III

## Question & Answers



# Technical guide for mangrove restoration



# Technical guide for mangrove restoration

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## Tsilibaris Virginie

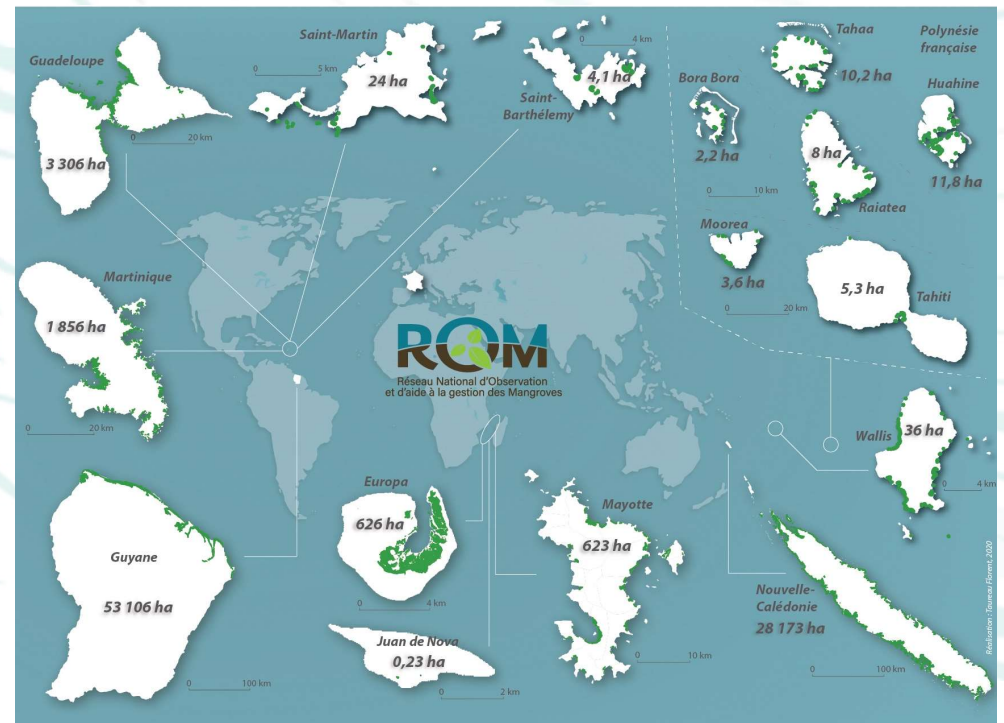
Coordinator of the French Mangrove Monitoring Network (*Réseau d'Observation et d'aide à la gestion des Mangroves – ROM*)

French Tropical Wetlands Network (*Pôle-Relais Zones Humides Tropicales*) - IUCN French National Committee

Guadeloupe



# The French Mangrove Monitoring Network (ROM)





# The French Mangrove Monitoring Network (ROM)



Réseau National d'Observation  
et d'aide à la gestion des Mangroves



# Technical guide for mangrove restoration



## Promote best practices and exchange of expertise

- Restoration is being increasingly undertaken in the French overseas territories
- Success not always guaranteed: important seedling mortality...
- No existing guidelines in French and adapted to the context of the French overseas territories



➔ Date: 2018

➔ Review of international literature and practices

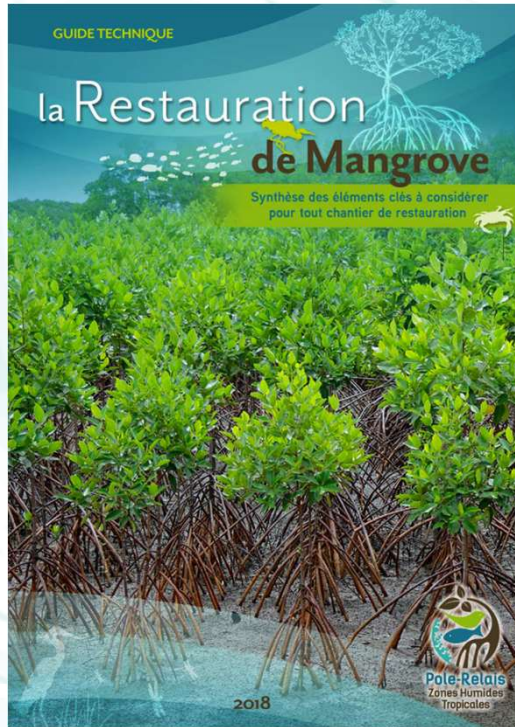
➔ Trainings, workshops...

➔ English translation(2020) with the support of ICRI



# Content of the guide

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## 1. Questions to consider prior to any restoration action

## 2. Natural colonisation (*recommended*)

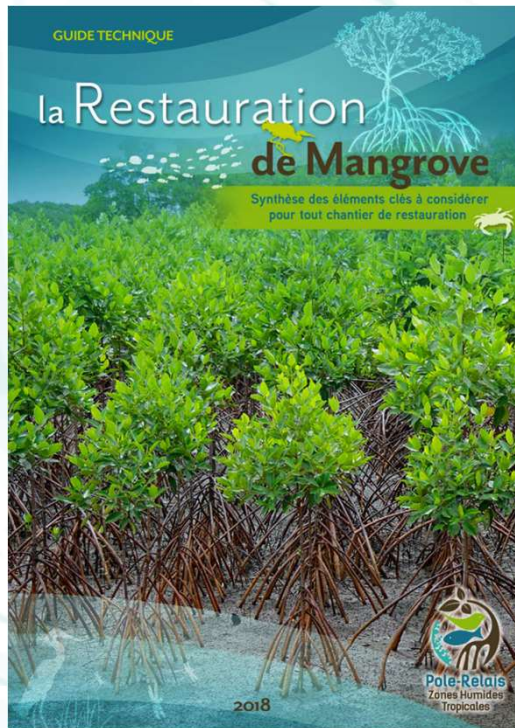
- Analysis of abiotic parameters
- Restoring favourable hydrological conditions

## 3. Mangrove planting

- Choice of the species
- Methods of restoration by planting (direct implantation, nurseries)
- Planting process
- Post-operation monitoring

# Key messages

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- 1. Preliminary analysis of abiotic parameters** : choice of the site, choice of the species to plant... + **empirical approach** : reference mangrove contiguous to the site
- 2. Favour natural colonization when there are signs of self-regeneration** with, if necessary, **re-establishment of favourable hydrological conditions**
- 3. Mangrove planting**
  - ✓ Social acceptance : a necessary pre-requisite - implication of local population
  - ✓ Subject to favourable hydrodynamic and physico-chemical parameters
  - ✓ Monospecific plantations should be avoided, harvested propagules must be mature , proximity of collection – storage – planting sites, ideally grouped, random and low density planting...
- 4. Post-opération monitoring should be carried out**
  - ✓ At least mortality , recovery rate, seedling growth



# Download the guide - contacts

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## Download the guide:

- **Website of the French Tropical Wetlands Network (In French and English):** <https://www.pole-tropical.org/actions/les-actions-du-reseau-dobservation-des-mangroves/>
- **Website of the IUCN French Committee :** <https://uicn.fr/guide-technique-sur-la-restauration-de-mangrove/>
- **Website of IFRECOR:** <http://ifrecor-doc.fr/items/show/1874>

## Contacts:

- **Virginie Tsilibaris** :Coordinator of the French Mangrove Monitoring Network  
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- **Gaëlle Vandersarren** : Coordinator of the French Tropical Wetlands Network  
✉ [gaelle.vandersarren@uicn.fr](mailto:gaelle.vandersarren@uicn.fr) 📍 Saint-Claude, Guadeloupe
- **Anne Caillaud** : Manager of the Overseas program - IUCN French Committee  
✉ [anne.caillaud@uicn.fr](mailto:anne.caillaud@uicn.fr) 📍 Tahiti - Polynésie française





# Part IV

## Question & Answers



# Expert's summary

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## Christophe Proisy

Researcher in remote sensing of mangrove forests at the IRD UMR-AMAP



France



SERIES



# Last Questions ?





# PREVIOUS WORKSHOPS | **MANGROVES** ecological restoration

- Watch the **Replay from our first and second episode on our website ICO Solutions >>**

<https://ico-solutions.eu/fr/ico-workshops/>

**Thank you for your attention and  
for attending our workshops!**

Contact us : [icosolutions@conservatoire-du-littoral.fr](mailto:icosolutions@conservatoire-du-littoral.fr)

ICO Solutions Calendar : [www.ico-solutions.eu](http://www.ico-solutions.eu)



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