

A partnership approach between researchers and territorial stakeholders to reinforce adaptation to coastal risks in the context of climate changes in Québec and France



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ARICO
Adaptation aux RISques CÔtiERS



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de la recherche

1. Context

Increasing risks of coastal erosion and flooding

- Concentration of human establishment and buildings on the coast (Meur-Ferec et al., 2008)
 - Context of climate change (Bernatchez et al., 2012; Hénaff et al., 2013; IPCC, 2022)
 - Exacerbation of the vulnerability of coastal communities, notably on the Quebec and French coasts (Meur-Ferec et al., 2022)
 - Multiplicity of stakeholder positions complicating the managements of those risks (Meur-Ferec et al., 2008; Chouinard et al., 2011)
 - Challenges are numerous, even if there have been progress in climate change adaptation, planning and implementation recently (Tobey et al., 2010; IPCC, 2020)
- Rethinking those spaces in a sustainable future is a challenge to which interdisciplinary research involving scientists, coastal risk management professionals, elected officials and residents in a partner-based approach, can contribute some essential insights



AFP, 2022

Concentration of issues along the
Wimereux seafront (France)

1. Context

The Franco-Quebec research project ARICO



Co-construction of scenarios for adapting maritime territories to coastal risks in a context of climate change in France and Quebec (*Sept. 2020-Sept. 2024*)

The aim of the project is to better understand and **promote the adaptive capacities** of populations and territories at risk from coastal hazards, by **co-constructing adaptation scenarios** with stakeholders

Project specifics

- Exchanges between two territories, France and Quebec
- Exchanges between two disciplinary sectors, natural sciences and humanities and social sciences
- Exchanges between several fields of knowledge, those of researchers and those of society's stakeholders (management professionals, elected officials and residents)

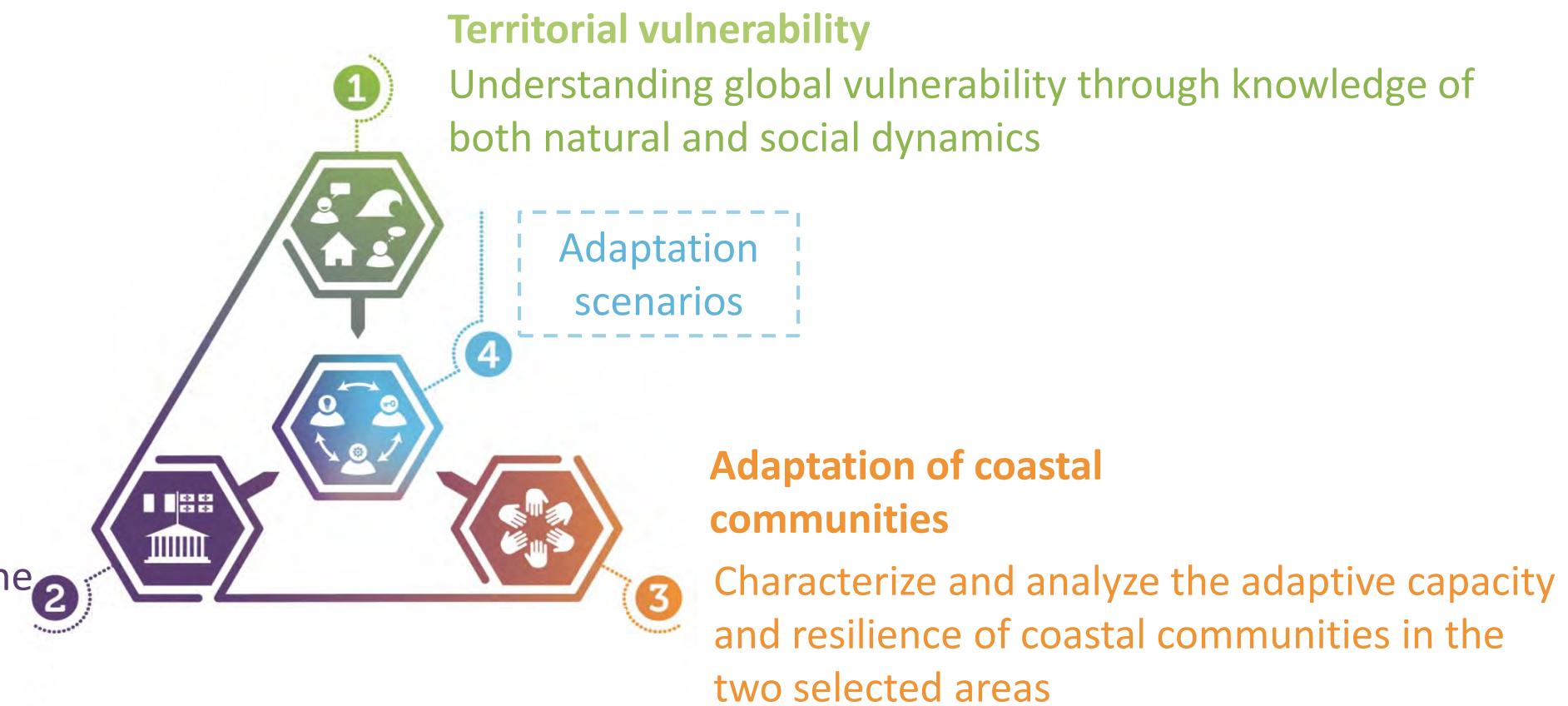
1. Context

The Franco-Quebec research project ARICO

- Some 50 researchers from different disciplines and professionals from coastal territories
- The work is structured into 4 work packages:

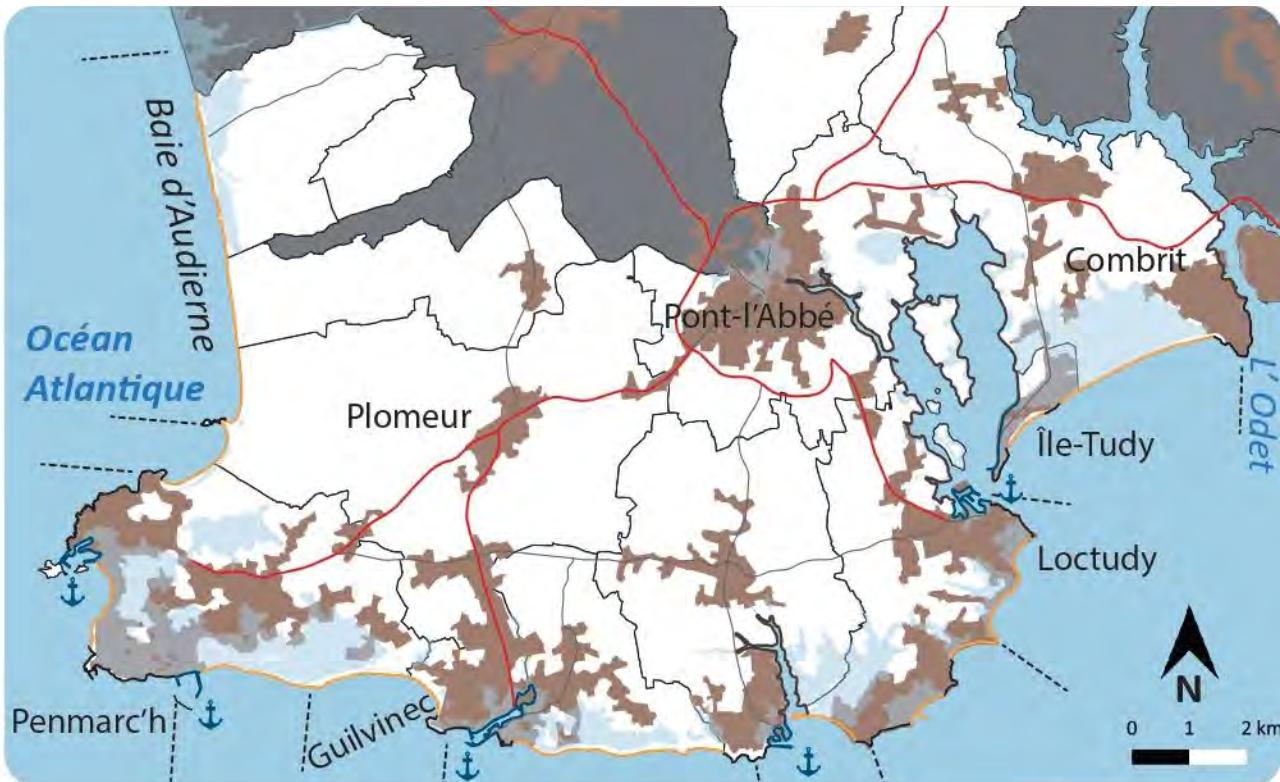
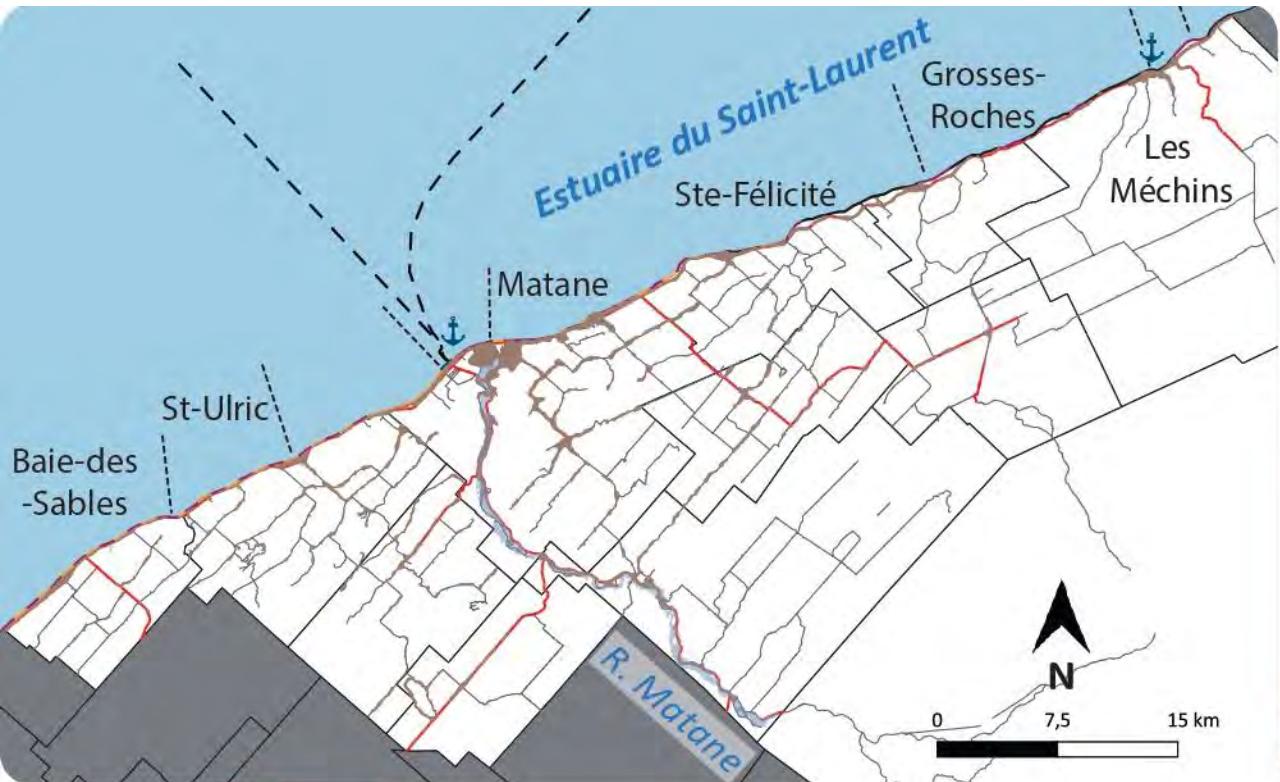


Public policies & stakeholder dynamics
Analyze public policies, stakeholder dynamics and the use of management tools in both countries



2. Study areas

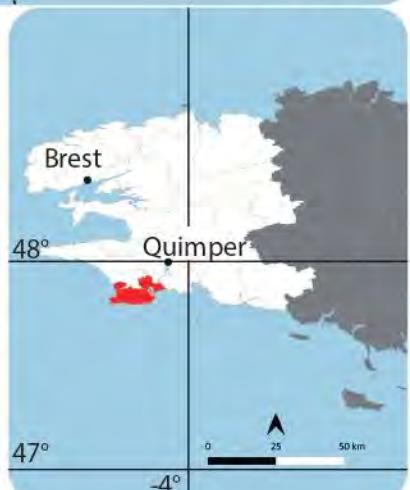
Matanie and South Bigouden country



- | | | | | | |
|---|--|-----------------------------|--|--------------------------|--|
| Côtes d'accumulation limno-sableuse | | Côte artificialisée | | Ports | |
| Côte d'accumulation adossée à une terrasse de plage | | Slikke (vasières) | | Tissu urbain | |
| Falaise meuble (<20m) | | Cellules hydro-sédimentaire | | Zones basses /inondables | |
| Falaise rocheuse (<20m) | | | | Routes : | |
| | | | | — principales | |
| | | | | — secondaires | |
| | | | | - - - féro-maritime | |

Design and production: Brice Lesouëf (UQAR/UBO)

Sources : LDGIZC (2021), AQréseau+(2021), OURANOS (2018), BDZI (2020), Hénaff & Le Berre (2003) IGN BD TOPO (2021), EROSION/Cerema (2019), Cerema (2011), CORINE Land Cover (2012)
Fonds : data.gouv.fr (?) mern.gouv.qc.ca (2022) Réalisation : B.Lesouëf (2022)



3. Methods & Tools

Coastal hazard vulnerability indices

- Two systems of indicators and indices (Quebec and France) built for the same purpose: to estimate a territory's vulnerability to coastal hazards
- Determining a method for improving indices based on a meta-analysis of international literature and semi-structured interviews with managers and researchers (Lesouëf et al., 2023)
- World café workshops with territorial stakeholders in the two study areas
- Suggestions for improvement by removing, modifying or adding indicators
- Indicator weighting by territorial stakeholders
- Greater convergence between the two methods



Cazaux, 2023

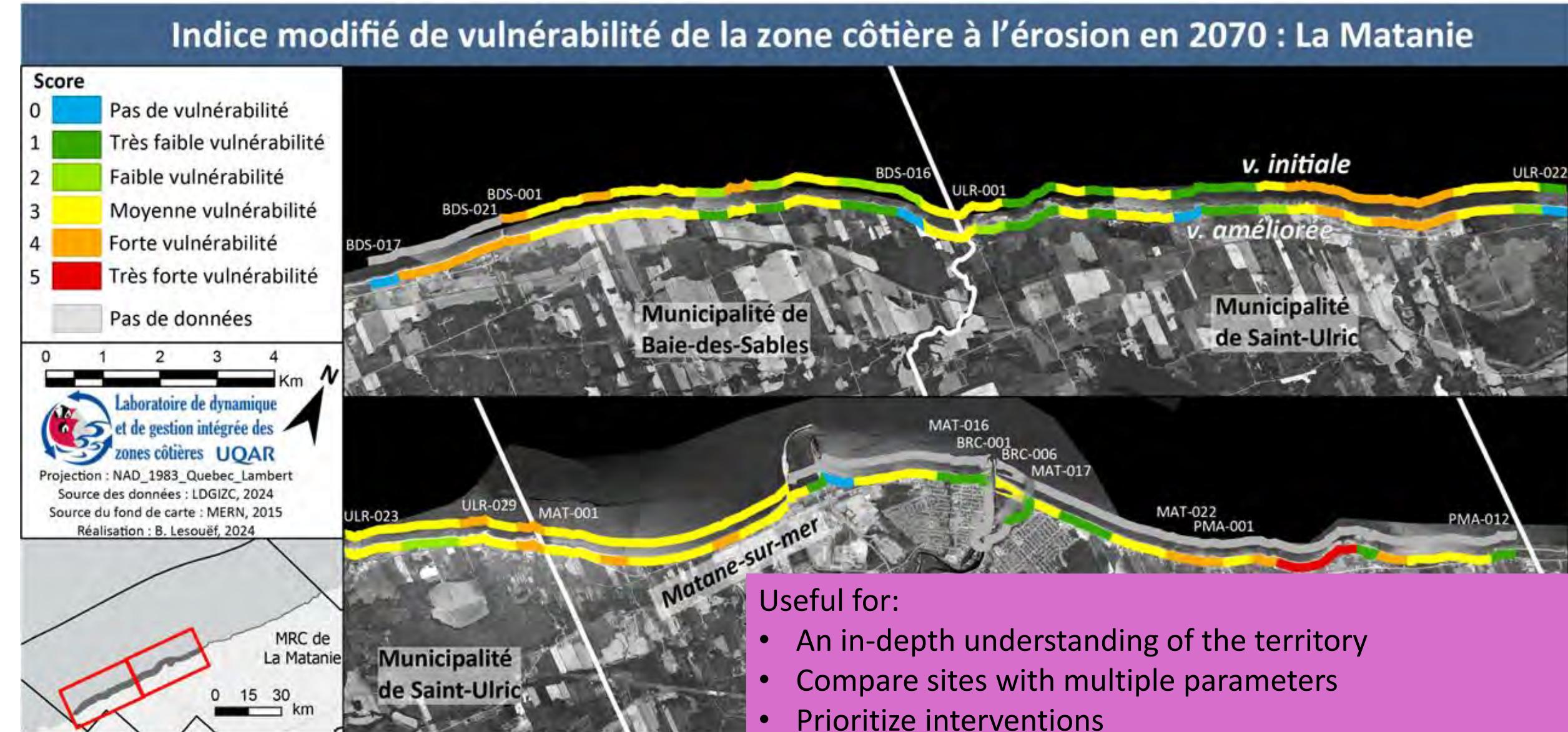


Marie, 2023

3. Methods & Tools

Coastal hazard vulnerability indices

Mapping the vulnerability of the western half of Matanie with the new index



3. Methods & Tools

Public Policy comparison

Similar coastal risk management systems, but with some notable differences (Delannoy et al., 2023; Guyon et al., 2023)

Human life	Very few differences for the safeguarding of human life (emergency plan at local level and transfer to national level if too important)
Protective structures (management and financing)	France: more public funding for structures protecting private property from coastal flooding (PAPI, GEMAPI) Quebec: no financial support for private property, but many structures protect roads, so public assumption too
Urban planning regulations related to coastal risks	France: more urban planning constraints (PPR, TRI, Loi Climat Résilience + Loi Littoral...). Quebec: also exists (cadre normatif sur l'érosion côtière), but zoning more or less precise according to local authorities (depending on their will and the availability of data on coastal erosion, does not yet exist for submersion, but in progress)
Information for residents	France: mandatory (DICRIM and IAL) Quebec: at the discretion of municipalities (not mandatory)
Concertation	France: concertation mainly between State and local authorities (PPR...), less involvement of citizens Quebec: greater role for citizens (TCR, ZIP committees, etc.)
Compensation	France: greater public funding, principle of national solidarity (CatNat, Barnier), but for coastal flooding only Quebec: compensation in case of emergency or, more recently, prevention, for erosion and coastal flooding, but only for principal residences

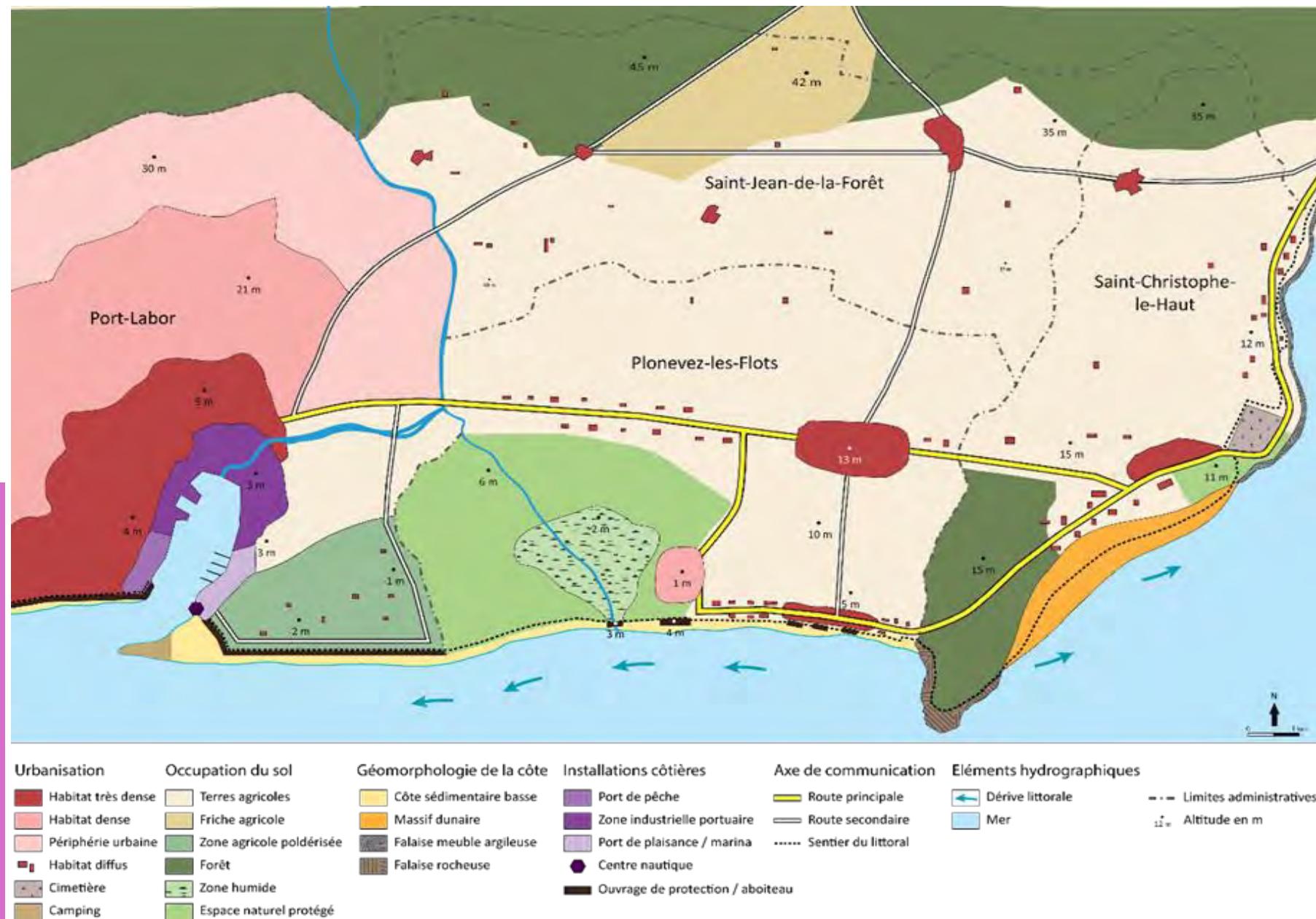
3. Methods & Tools

Public Policy comparison

An archetypal Franco-Quebec territory was designed (Guyon et al., 2023)

Useful for:

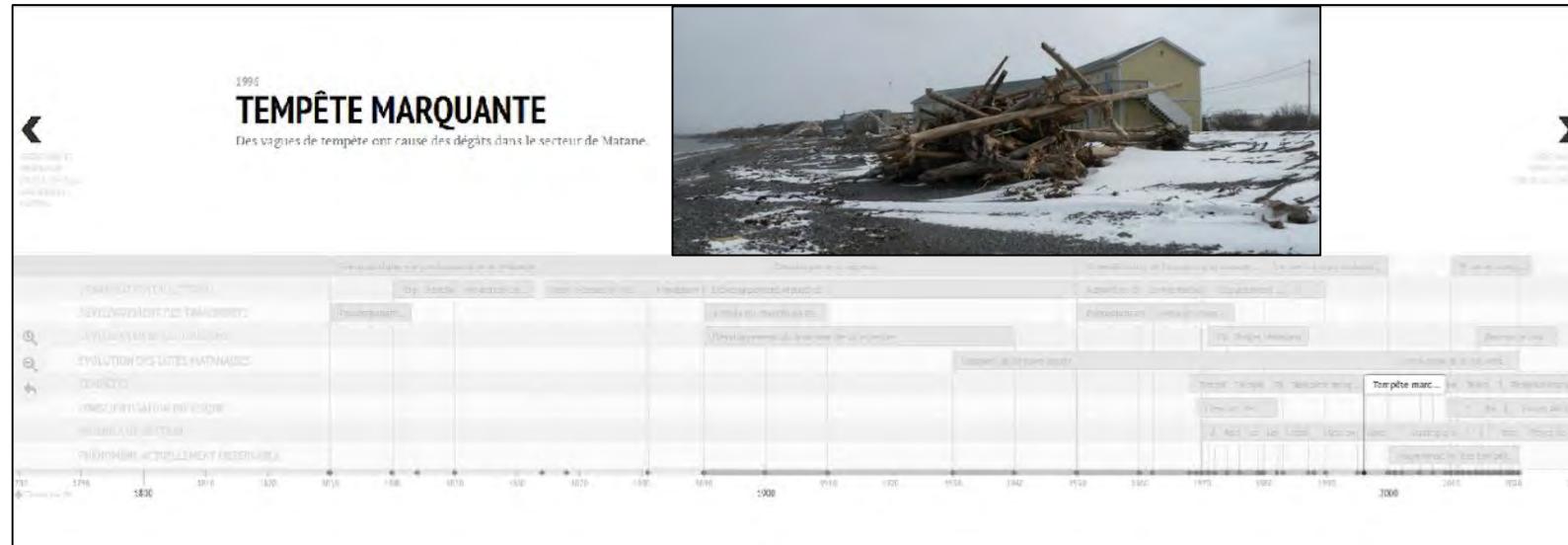
- Materialize the application of PP in both contexts
- Encourage comparison on simplified but representative territories
- Facilitate analysis of the limits and strengths of PP in the two territories



3. Methods & Tools

Coastal hazards Timeline

- Multimedia timeline built for the two territories incorporating four themes: hazards, assets, context, adaptation
- Based on the free open-source Knight Lab software JS (Northwestern University) and adapted to our needs
- The database of events was built in collaboration with local partners, using various databases and archives, including personal archives from researchers, historic newspaper archives, and libraries



Useful for:

- Making managers and the public aware of risks and their recurrence
- Identify patterns in the interplay of hazards and adaptation actions and policies
- Analyze a region's adaptation (or maladaptation) trajectory
- Creation of a chrono-systemic timeline

3. Methods & Tools

Serious games on coastal risks

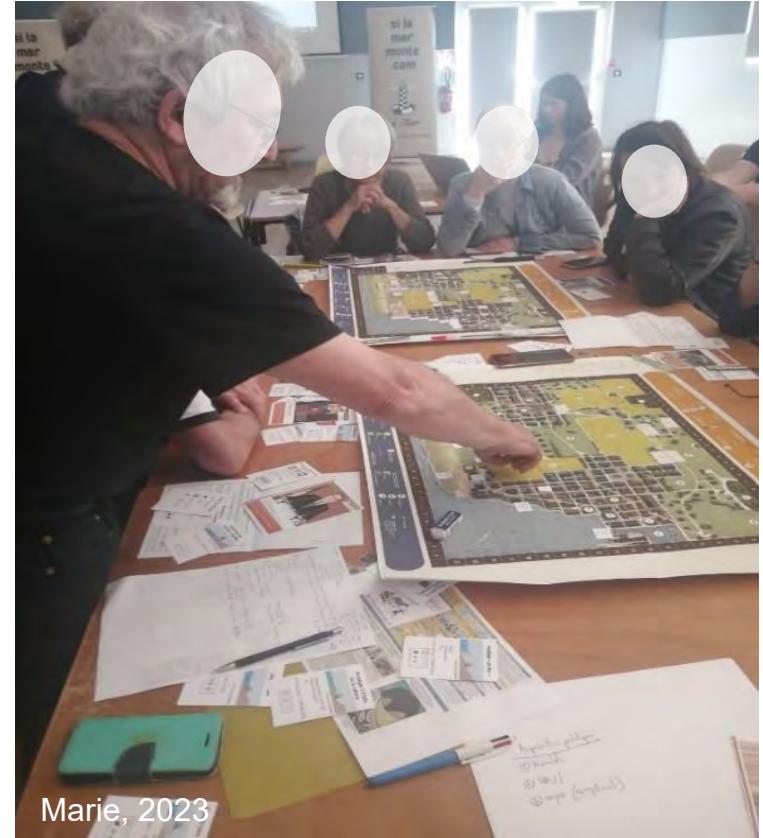
- An activity that combines "serious" intent with playfulness



Viviers-sur-Mer, a coastal risks adaptation
serious game played with managers

Useful for:

- Raising awareness of risks
- Raising awareness of the role of various local stakeholders
- Think about territorial prospective

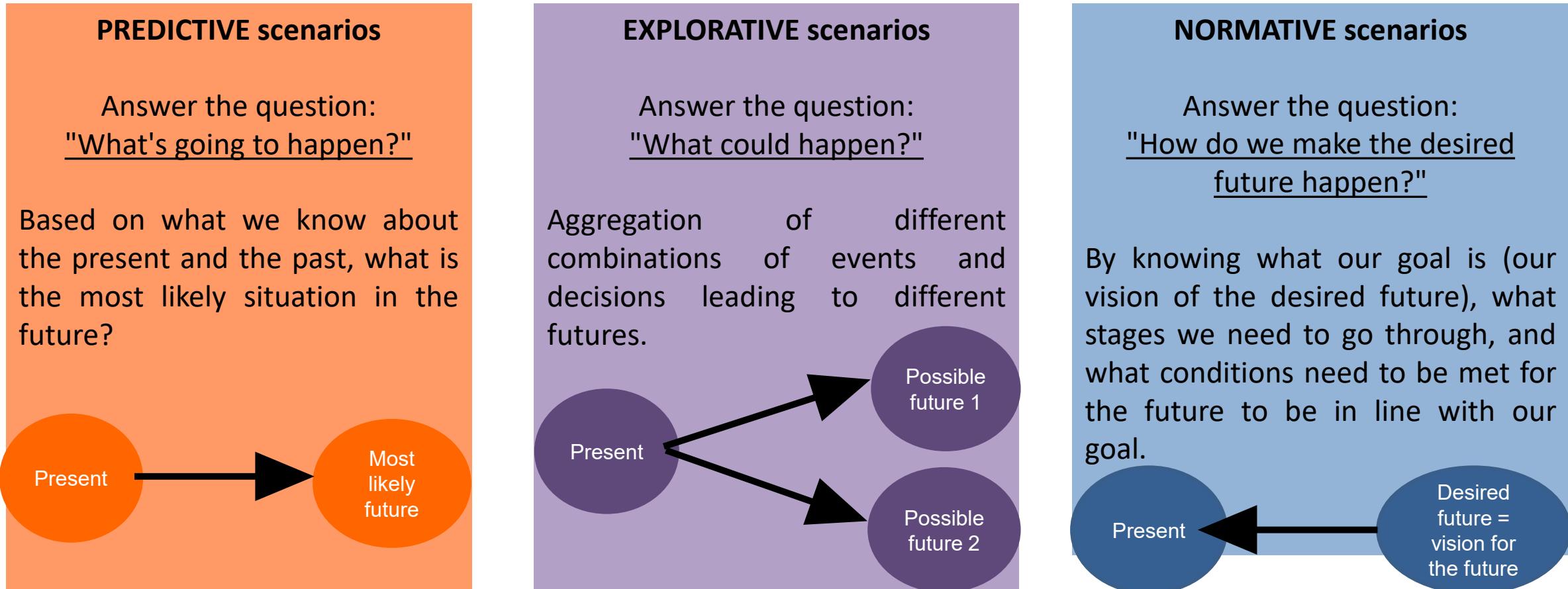


Littopia, a serious game designed to
encourage players to think about
how to develop an area subject to
coastal risks in 30 years' time

3. Methods & Tools

Development of adaptation scenarios

- Co-construction, with stakeholders, of adaptation scenarios for the coastal territories and communities is a proven methodology (Börjeson et al., 2006; Allan et al., 2022)



- A process of adaptation to coastal risks has been initiated with stakeholders in the two test areas with the aim of co-constructing explorative or even normative scenarios
- Mobilization of the work of the ARICO project

3. Methods & Tools

Development of adaptation scenarios

In France:

- **Participatory mapping exercise** (current dynamics of the area and future prospects) for a shared diagnosis with local stakeholders
- **Development of exploratory adaptation scenarios using the PESTEL method** (political, economic, sociological, technological, environmental, legal)
- **A preferred scenario has been adopted by local elected officials**
- **Back-casting stage to come:** what steps will it take to reach the desired territory?



Cazaux, 2023

In Quebec:

- Is part of a territorial approach underway between the City of Matane and the ministry of public safety (solution analysis)
- Focus group on the territorial diagnosis shared with local stakeholders
- Modalities of the approach still to be defined with local stakeholders (decision-making trajectories? forward-looking narratives?)



Cazaux, 2023

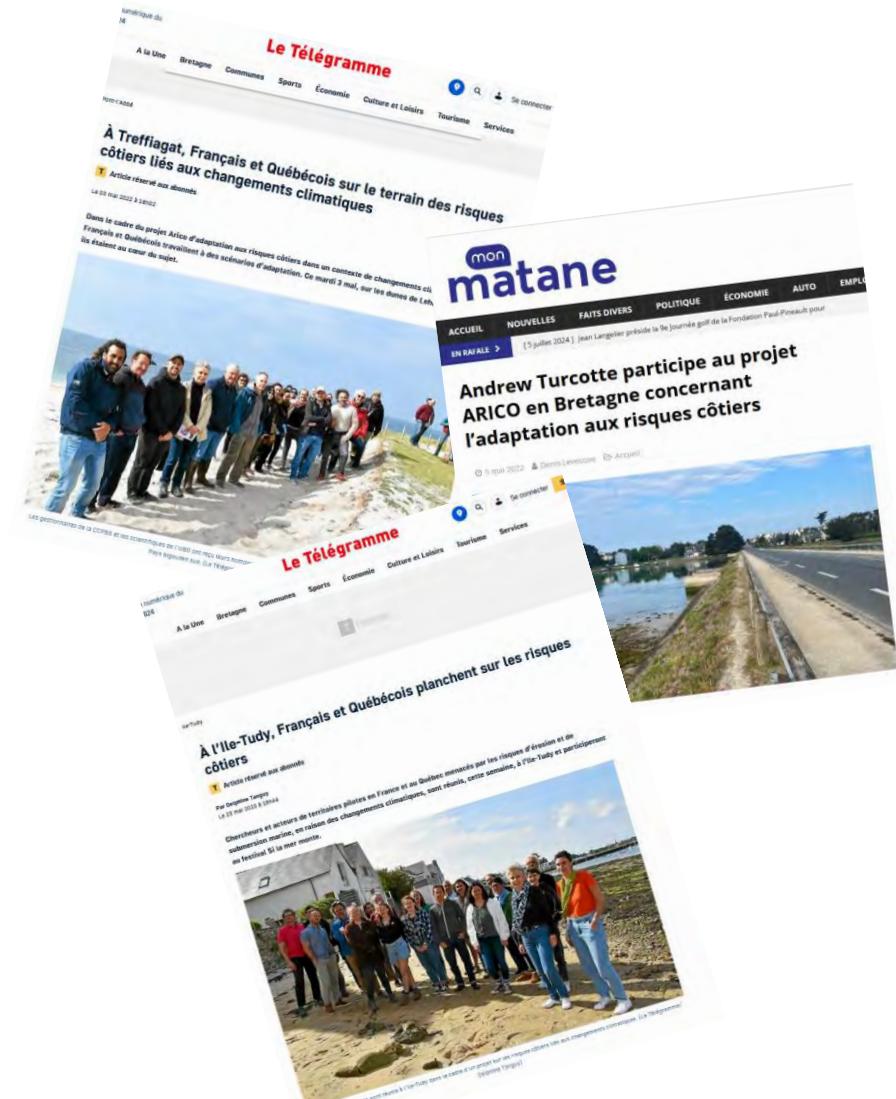


Territory diagnostic sheets

4. Benefits and difficulties of a partnership approach

Close links with practitioners: essential when working on risk management and adaptation

-  **Cross-fertilization of knowledge**
-  **Confronting the realities and constraints of the professions**
-  **More realistic and operational proposals**
-  **Acculturation with mutual influences**
-  **Joint media communications**
-  **A relay that can sometimes be taken by academics**
-  **Guarantee for academics on the social utility of their work**
-  **Availability of managers and especially elected officials**



5. Conclusion

- This international research project, carried out in close collaboration with various local and national stakeholders, has helped to strengthen the adaptive capacities of the areas studied, through:
 - a better assessment of their vulnerability to coastal erosion and flooding risks
 - in-depth exchanges on the advantages and disadvantages of existing and planned public policies in both countries
 - awareness-raising and decision-helping tools
 - co-construction of adaptation scenarios to project into the future and adapt to the effects of climate change on coasts

International Research Project ADAPTACOTE
(Adaptation des écosociosystèmes aux risques côtiers dans un contexte de changements climatiques, 2025-2029)



Merci pour votre attention !

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Financed by:



FRC dossier 280037

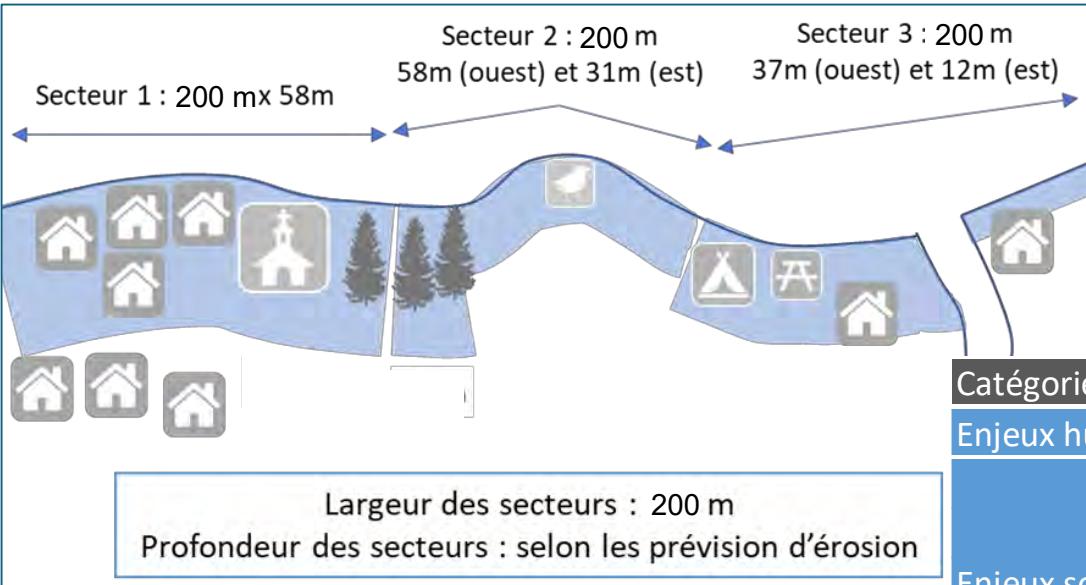
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Calcul d'un indice de vulnérabilité aux aléas côtiers

1 Travail par secteurs exposés ou par maille



Exemple : E2 Enjeux économiques (boutique, comptoir, hôtel, fumoirs, cuisine, usine, débarcadère, dépôts de bois, ensemble de 5 pirogues ou plus...)

Score

0 : aucun

3 : 3 enjeux

1 : 1 enjeu

4 : 4 enjeux ou plus

2 : 2 enjeux

Liste des indicateurs utilisés pour calculer l'indice de vulnérabilité

2 Mise en classes de 0 à 4 (absence à très élevé) pour chacun des 16 indicateurs (enjeux exposés et niveau d'adaptation)

3 Agrégation par addition des scores pondérés par 16 acteurs du territoire

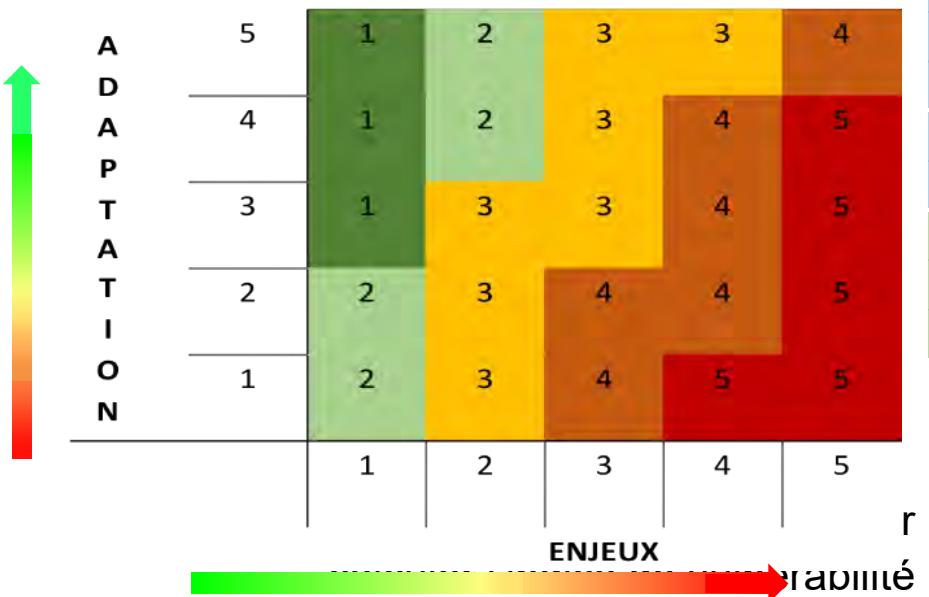
Catégorie	Indicateur
Enjeux humains	E1 Nombre de ménages E2 Enjeux économiques
Enjeux socio-économiques	E3 Enjeux sociaux et stratégiques E4 Enjeux patrimoniaux E5 Routes et chemins E6 Infrastructures
Enjeux environnementaux	E7 Présence d'un site protégé supérieur ou égale à 3000 m ² E8 Sites contaminés à risque environnemental
Solutions d'adaptation	A1 Mesures de protection anthropique A2 Mesures de protection naturelle A3 Mesures de mitigation (submersion/inondation uniquement)
Aménagement du territoire	A4 Présence de zones non constructibles dans le POS A5 Ramassage des ordures et curage des drains, réparation des ponts
Communication / Sensibilisation	A6 Accès à l'information concernant les risques naturels A7 Connaissance des risques et du rôle de la mangrove
Capacité à faire face des ménages	A8 Crainte des inondations (submersion/inondation uniquement)

Calcul d'un indice de vulnérabilité aux aléas côtiers

1 Travail par secteurs exposés ou par maille

4 Calcul d'un score d'enjeux exposés et d'un score de niveau d'adaptation pour chacun des secteurs

5 Calcul d'un score de vulnérabilité pour chacun des secteurs à partir d'une matrice



2 Mise en classes de 0 à 4 (absence à très élevé) pour chacun des 16 indicateurs (enjeux exposés et niveau d'adaptation)

3 Agrégation par addition des scores, pondérés par 16 acteurs du territoire

Catégorie	Indicateur
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4. Benefits and difficulties of a partnership approach

2- **Interdisciplinarity**, cross-fertilization not only between professions but also between disciplines

-  Enables a **systemic approach** to coastal risk issues
-  Mutual **knowledge enhancement**
-  Requires **time spent working together** to understand each other and respect differences in approach



3- **International**, cross-fertilization not only between professions and disciplines but also between countries

-  **For researchers:** crossing concepts, methods, data...
-  **For managers and elected representatives:** exchanges, inspiration in tools and working methods
-  Carbon footprint!

5. Conclusion

➤ Finally, a **take-home message**:

- The key to making this work is to really spend time together in the field
- Several weeks (2 per year, one in each country) of real collective work devoted solely to the project
- Costly in terms of time and money, but possible if teams are committed and with the support of FRQ-ANR, thank you!



Clearly, we're making progress!

1. Context

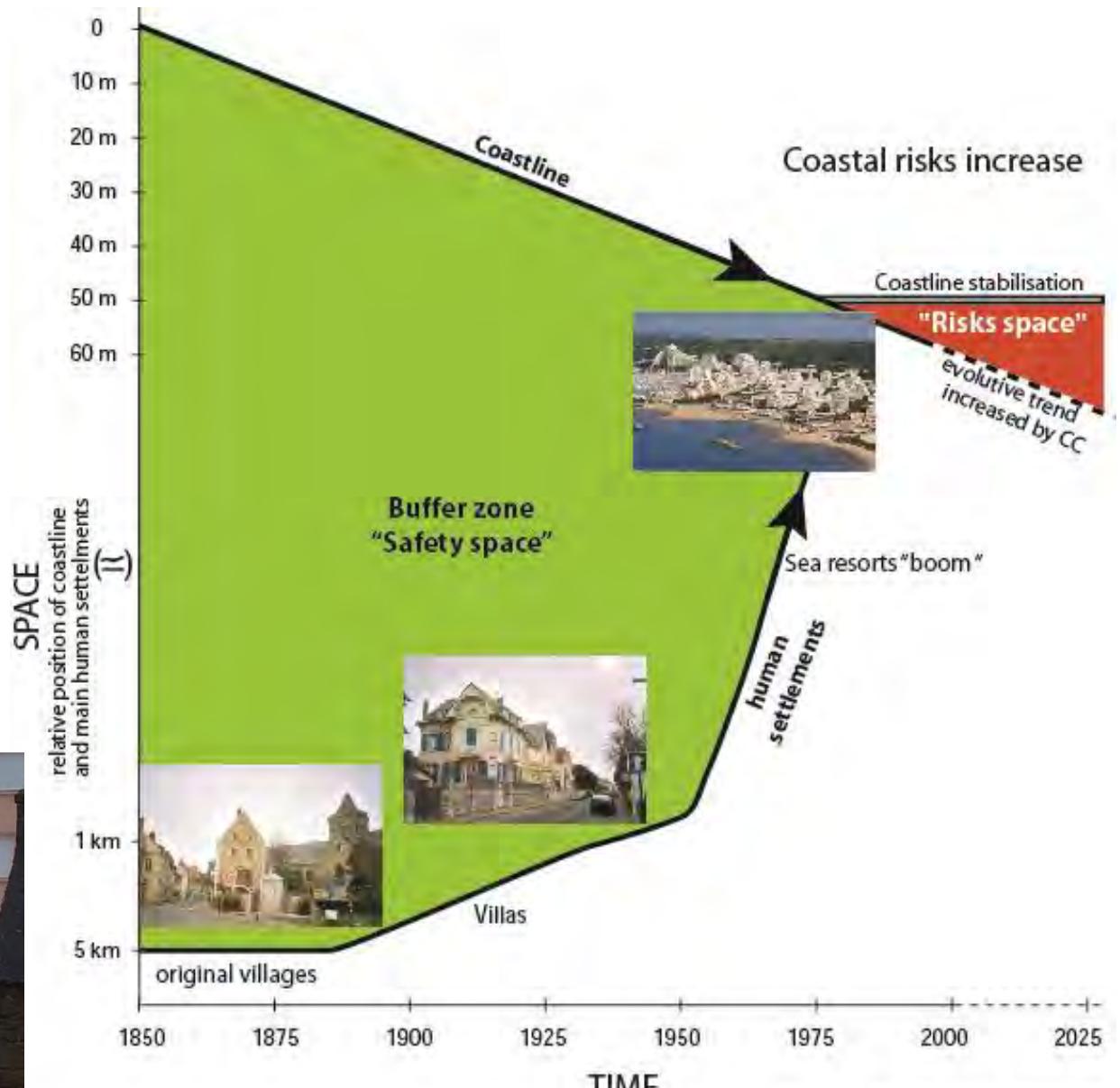
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- Exacerbation of the vulnerability of coastal communities, notably on the Quebec and French coasts (Meur-Ferec et al., 2022)

Storm surge in Saint Guénolé (France) during winter 2013-14



Buisson, CCPBS, 2014



conception : C. Meur-Férec, V. Morel, 2004 modified

Meur-Ferec et al., 2008

1. Context

ICZM challenges

- Multiplicity of stakeholder positions complicating the managements of those risks (Meur-Ferec et al., 2008; Chouinard et al., 2011)
 - Many issues other than natural hazards are present in coastal zones (Kay and Alder, 1999)
 - Challenges are numerous, even if there have been progress in climate change adaptation, planning and implementation recently (Tobey et al., 2010; IPCC, 2020)
- Rethinking those spaces in a sustainable future is a challenge to which interdisciplinary research involving scientists, coastal risk management professionals, elected officials and residents in a partner-based approach, can contribute some essential insights



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