How a public institution is addressing the country's adaptation to the effects of the climate change through the bilateral research

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Thierry Braine-Bonnaire

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Content overview

The Carnot system in a few words

The Carnot system in a few words

1

Founded in 2006

The Carnot Label was designed to develop partnership-based research, meaning research conducted by public laboratories in partnership with socio-economic players to serve their needs.

2

Carnot institute

A Carnot Institute is a research structure that is committed to developing quality partnership research. He is recognized for his scientific and technological skills and his ability to respond professionally to the research and innovation needs of companies.

3

39 Carnot institutes

There are 39 Carnot institutes in total, each focusing on specific areas of research and innovation.

Asked to improve steam engines, Nicolas Léonard Sadi Carnot (1796-1832) established the second law of thermodynamics, which governs the workings of devices that we all use on a daily basis.

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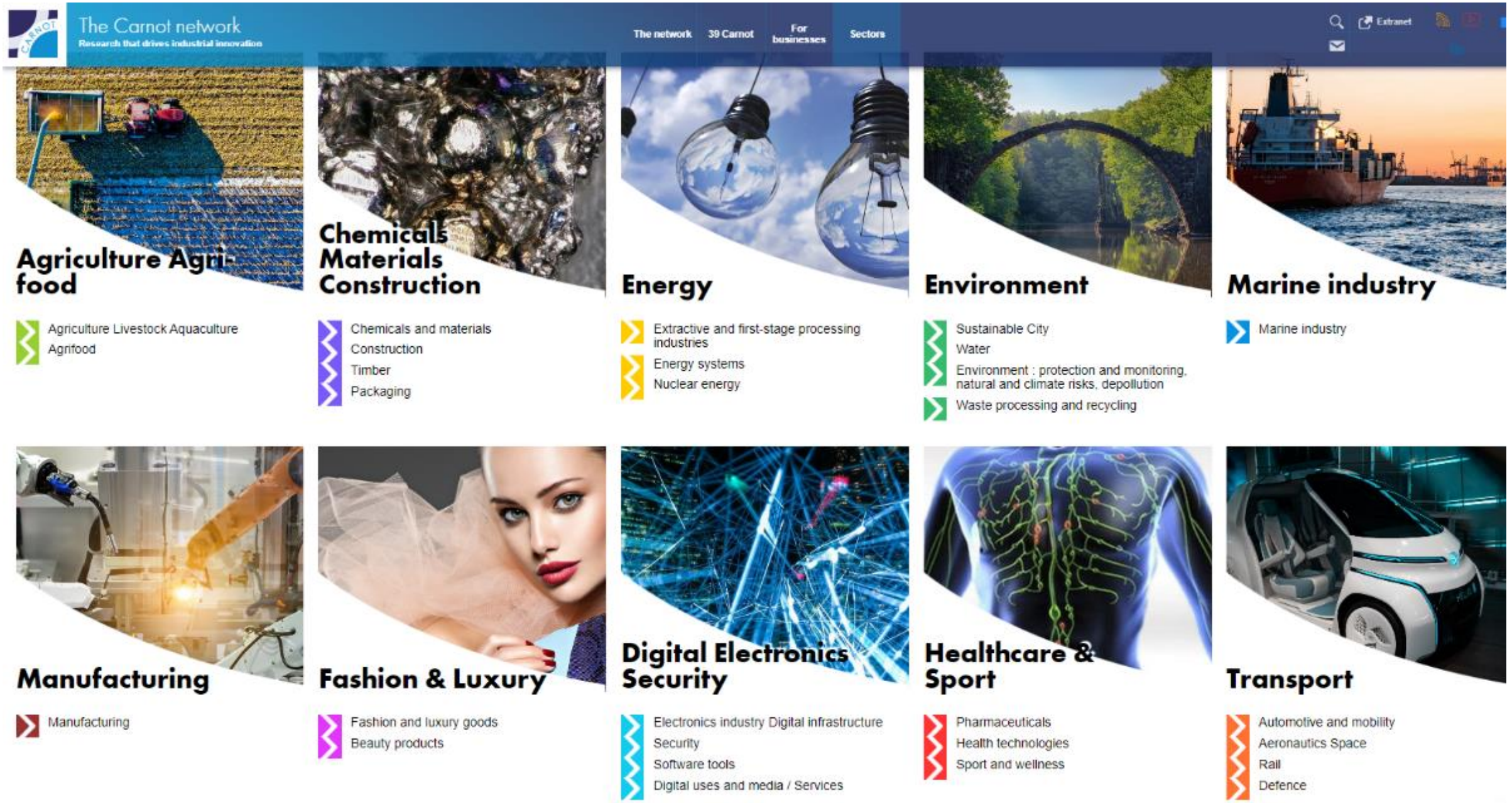
https://www.lereseaudescarnot.fr/en

The Carnot system in a few words



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Cerema: adapting to climate change

Public institution of expertise

Cerema is the public institution of expertise for the adaptation of the territory to the effects of the climate change.

Shared governance

It is the only national institution whose governance is shared between the State and the local authorities, of which more than 950 are members.

Wide presence

It is present in mainland France and in the overseas territories thanks to its 27 locations and its 2500 agents.

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CEREMA – SIX FIELDS OF ACTIVITY

THE TWELVE CEREMA RESEARCH TEAMS

THE TWELVE CEREMA RESEARCH TEAMS

RHITME	Hydraulic Risks and Environmental Impacts at the Land-Sea Interface	**TEAM**	Transfers and interactions linked to water in built environments
EL	Light and Lighting	**STI**	Intelligent Transport Systems
UMR MATRiS	Mobilities, Planning, Transport, Risks and Society - *This team is a joint research unit with the University of Cergy*	**BPE**	High performance buildings in their environment
PsyCAP	Applied Psychology	**UMR MCD**	Materials for a sustainable construction
REPSODY	Response of Soils, Sites and Structures to dynamic stresses - Earthquakes and vibrations	**UMR AE**	Environmental acoustics
GéoCoD	Geomaterials and Geomechanics: couplings and dynamics for geotechnical structures and risks	**ENDSUM**	Non-Destructive Evaluation of Structures and Materials

Cerema and its Carnot institute, Clim’adapt

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CLIM'ADAPT, THE CARNOT INSTITUTE OF THE CEREMA

Cerema's scientific excellence at the service of the French economy and its adaptation to the effects of climate change

The Clim'adapt Carnot Institute helps companies and local authorities to meet the climate challenge and make their transition to a low-resource, low-carbon and environmentally friendly economy.

Cerema = Expertise & ingénierie territoriale · Bâtiment · Mobilités · Infrastructures de transport · Environnement & risques · Mer & littoral

= Cerema, seen from the perspective of **bilateral contractual research**

THE CUSTOMERS OF CLIM'ADAPT

They belong to two categories:

- the **local authorities**
- the **companies**, of all sizes, French and foreign

Startup *SME* *intermediate-sized* *large groups*

Cerema LAB.

A system dedicated to innovative startups and SMEs

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METHODS OF INTERVENTION

Knowledge or technology transfer

Response to a specific request from a company

Addressing particular challenges, such as a lock to be broken

Long-term commitment

Joint laboratory

Industrial Chair

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METHODS OF INTERVENTION

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Cerema's scientific excellence at the service of the country's adaptation to the effects of the climate change Clim'adapt *1/2*

Anticipating natural hazards

example of

floods,

fall of boulders,

shrinkage and swelling of clays

Securing infrastructure

for instance :

checking the bridges of the country,

roads and shrinkage and swelling of clays

Offering sustainable mobility

Road resilient to climate change

Decarbonization of mobility

Impacts of mobility on territories platform

Active modes – cycling and walking

Urban Logistics

Road safety

Optimising the use of land

Territories adapted to the climate of tomorrow program

Low Carbon Territories Program

Geoportal of the renewable energies

Cerema: institut Carnot Clim'adapt

Cerema's scientific excellence at the service of the country's adaptation to the effects of the climate change Clim'adapt *2/2*

Adapting to coastal erosion

how will the French coastline look like in 2028, 2050, 2100 ?

Developing nature in the city

Nature-based solutions for the adaptation of territories to climate change,

Zero net artificialisation,

Restoring permeability,

Implementing the National Biodiversity Strategy,

Fight against urban heat islands

Saving energy in buildings

working on both mitigation and adaptation,

Development of new sectors of ecological construction materials for buildings

Geoportal of the renewable energies

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Holistic vision to avoid maladaptation

The complementarity of the areas of expertise makes it possible to verify that an adaptation solution targeting one aspect does not have a counterproductive impact on another.

Example of Lhoist *: the use of lime slurry to combat road bleeding during heat waves (Softening of bitumen, Radiative properties, albedo)*

A PARTNERSHIP

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Lhoist

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Complementarity of the technosciences and the humanities and social sciences

This complementarity is very valuable in integrating society's expectations and social acceptability into subjects with a very technical dimension.

This allows to anticipate the well-known topics of the rebound effect or the nimby.

*Example of the **Pavin Fog and Rain Platform**: Evaluating and developing products in degraded weather conditions*

Research teams:

- *Intelligent Transport Systems*
- *Light and Lighting*
- *Mobilities, Planning, Transport, Risks and Society*

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Interface between the companies and the local authorities

Being at the interface between local authorities and companies makes it possible to connect

- small companies looking for a testing ground for their solution and
- local authorities with a problem to solve and open to innovation.

Example : The bay of Morlaix, in Brittany, is silting up and has to be regularly dredged. CeremaLab, the support structure for innovative start-ups and SMEs, has launched, with the city of Morlaix and aimed at the local economic ecosystem, a call for projects to recover all or part of these sediments.

How to measure the impact of actions ?

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How to measure the impact

Measuring the impact of adaptation measures to the effects of climate change is crucial to assess their effectiveness and adjust strategies accordingly

Performance indicators

Define clear and measurable indicators, such as reducing economic losses due to natural disasters, improving the resilience of infrastructure, or increasing the availability of drinking water

Impact Assessments

Conduct pre- and post-implementation studies to compare results and identify improvements or persistent challenges

Modelling and simulations

Using climate models and simulations to predict the effects of adaptation measures on different future climate scenarios

Surveys and testimonies

Collect qualitative data from local communities and stakeholders to understand their perception of the measures and their impact on daily lives.

Cost-benefit analysis

Assess the costs associated with implementing the measures against the expected benefits, in terms of risk reduction and improved quality of life.

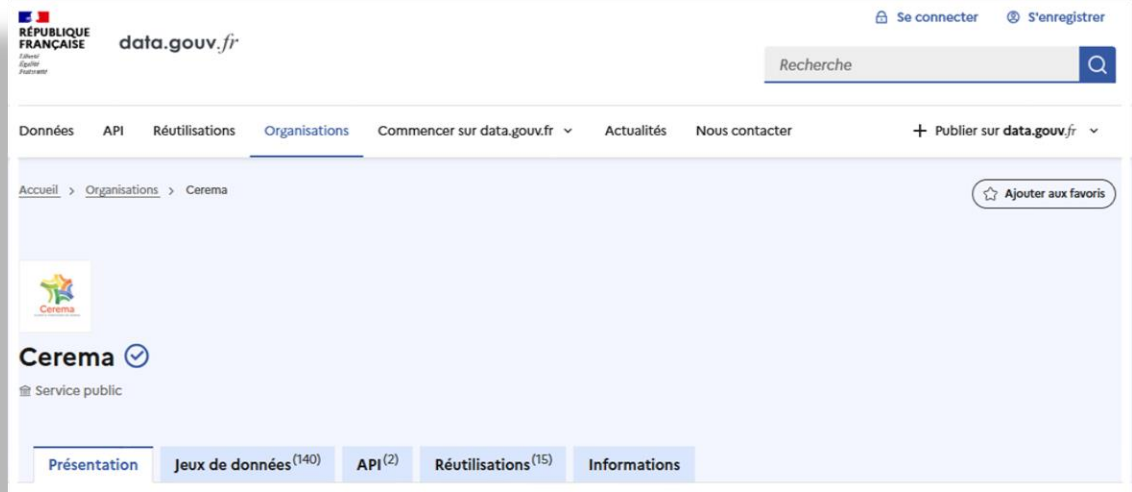
To go further

Bibliography, to go further

Cerema has produced a very rich documentary database (more than 10 000 references, in open access)

Below, quality readings, grouped thematically (most in French language)

- *Move*
- *Protecting and developing the nature*
- *Water, a precious commodity and a risk*
- *Reducing our carbon emissions*
- *Adapting to the effects of climate change*



Thank you for your attention

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Back up

RHITMME Hydraulic Risks and Environmental Impacts at the Land-Sea Interface

The scientific issues concern the characterization and forecasting of hydro-sedimentary hazards at the land-sea interface, from continental hydro-geosystems to estuaries and the open coastal zone.

The research program is structured around three axes:

- River-sea interactions for water level and flow forecasting
- Morphodynamic responses: coastline and interactions with estuaries
- Hazards and environmental impacts in navigated rivers

EL Light and Lighting research team

Its research programme is structured around three areas:

- Modelling the human visual system (HVS) using imaging techniques and image processing algorithms;
- Optimising road lighting installations;
- Assessing the visibility of road infrastructure objects.

UMR MATRiS Mobilities, Planning, Transport, Risks and Society

The scientific project of the UMR MATRiS is developed along four lines:

- Analysis of the interdependencies between transport networks, mobility and land use
- The processes of making public transport policies, interplay of actors, territorial impact and evaluations
- Risk-proof planning practices and networks
- Mobility routines and their adaptations (passengers and goods)

PsyCAP Applied Psychology Research Team

The PsyCAP Team's scientific objectives are as follows:

- To study and analyse the human behaviour, to understand and predict it
- Better understand and promote the individual and social acceptance of innovative developments (techniques, technologies, services and structures)
- Produce knowledge and methods to support the changes incurred by technological and/or structural evolutions and innovation.

REPSODY Response of Soils, Sites and Structures to dynamic stresses - Earthquakes and vibrations

The project is organized along three axis:

- On site dynamic experimentation
- Digital prediction of seismic and vibratory movement
- Empirical prediction of seismic and vibratory movement

GéoCoD Geomaterials and Geomechanics: couplings and dynamics for geotechnical structures and risks

The GéoCoD research team project consists in characterising the mechanical behaviour of geomaterials when they are subjected to various loads or external aggressions, and then defining protection solutions and protective dimensioning methods.

The mechanical behaviour of the geomaterials and structures is therefore defined according to the interaction between multi-physical phenomena (Axis 1), and then according to dynamics (Axis 2):

- Consideration of hydric, chemical, thermal and mechanical interactions in the behaviour of geomaterials and sites.
- Dynamic behaviour of soils, rocks, structures and sites.

TEAM Transfers and interactions linked to water in built environments

The TEAM research work is divided into three areas:

- Multi-scale hydrological functioning of built environments
- Pollution of the environments: water/soil/vegetation transfers and treatment structures
- Climate regulation processes in the urban environment

ITS Intelligent Transport Systems, towards greater safety and integration into sustainable regions

The research activities of the team are organized around two scientific areas:

- towards safer efficient infrastructures for the mobility of the future
- towards automated driving

BPE High performance buildings in their environment

The BPE team is focusing its research efforts on:

- The elements of buildings (envelope, systems and bio-sourced materials) and their overall performance as an integral part of the building, therefore taking into account interactions linked to local conditions and uses
- The assessment of the overall real performance in an approach that ranges from the building in its context to a group of buildings (major property assets, urban islands or districts, including those that are “energy plus”…)

UMR MCD Materials for sustainable construction

The main research themes implemented by UMR MCD are organised into 3 major areas applicable to different types of materials (including in particular those used within cementitious and bituminous materials):

- The interaction mechanisms of alternative materials:
- Durability of materials in their environment
- Life cycle analysis - Circular economy - Environmental impacts

UMR AE Environmental Acoustics

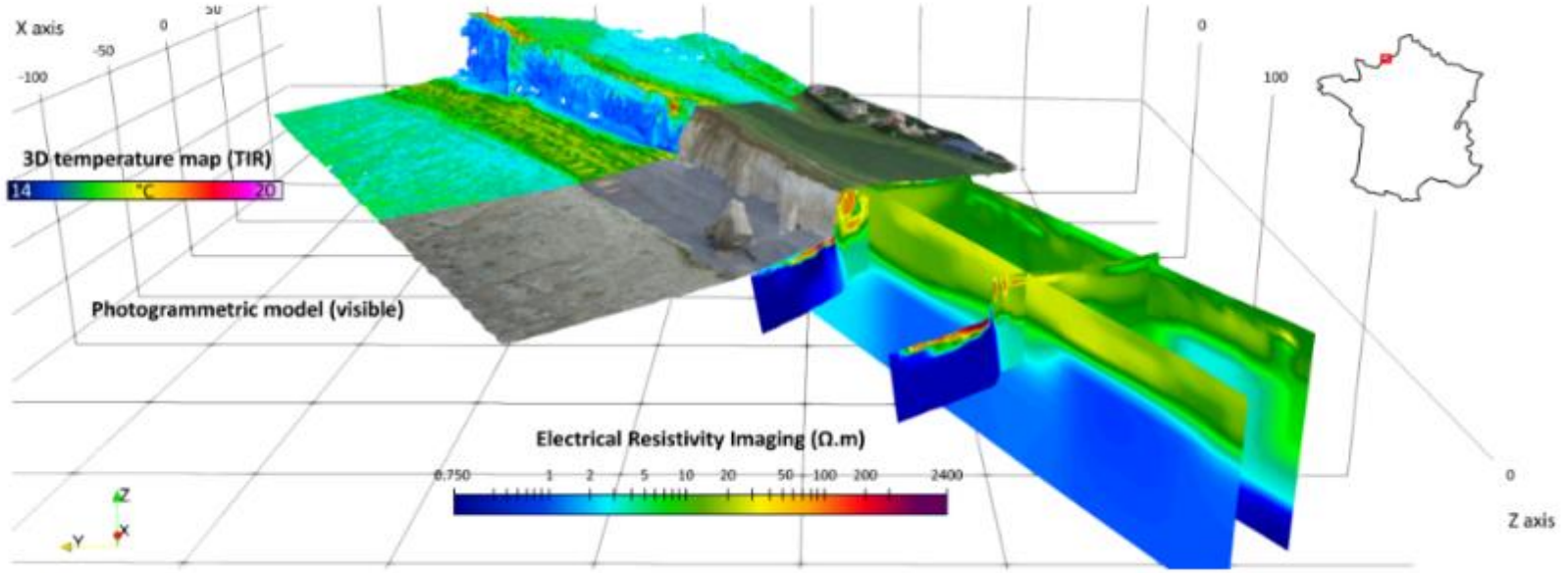
The UMRAE themes:

- The sources of noise in the environment
- The noise propagation in the environment
- The impact of noise on humans and biodiversity

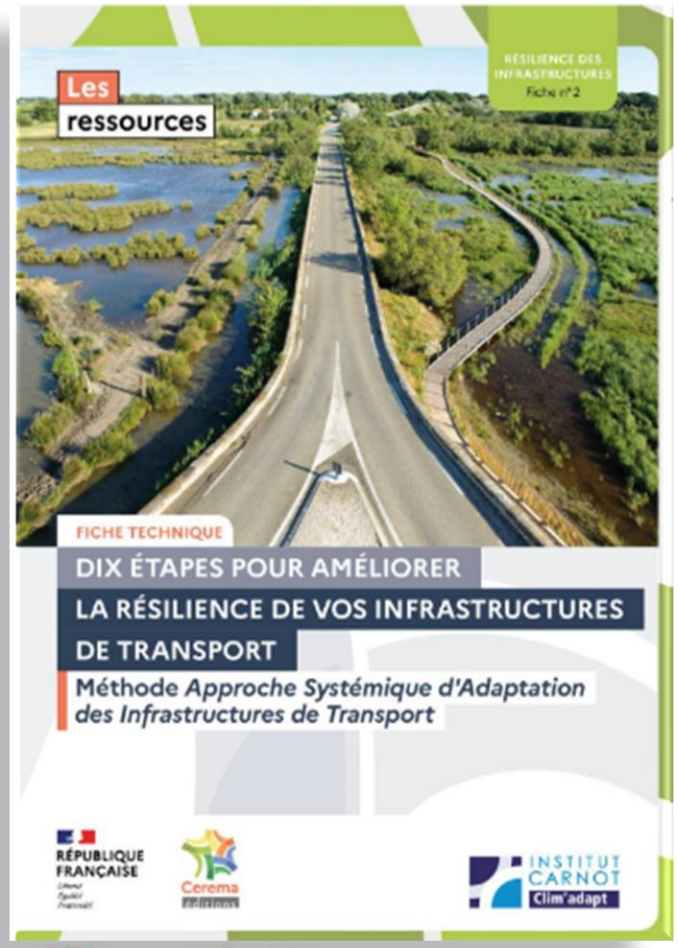
ENDSUM Non Destructive Assessment of Structures and Materials

The scientific problem of ENDSUM is divided into three parts:

- The physical characterization of environments
- The development of measurement and data processing tools
- The development of diagnostic, prognostic and visualization methods



MOVE



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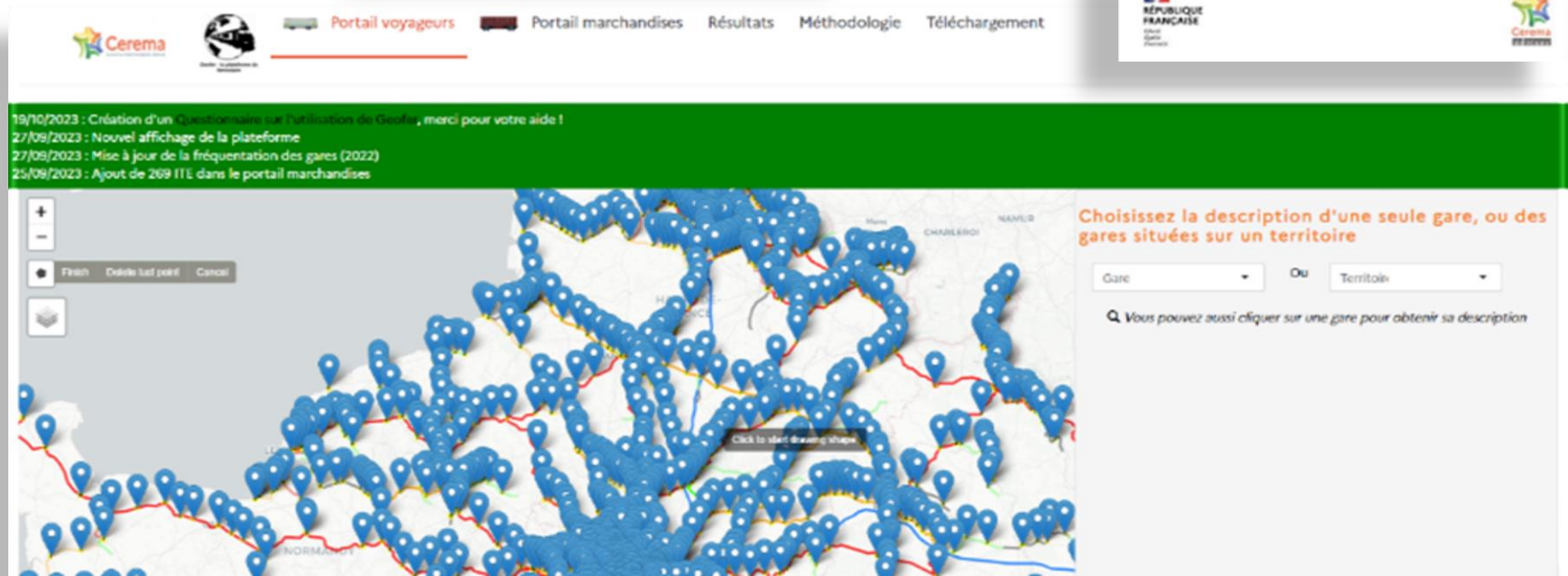
MOVE



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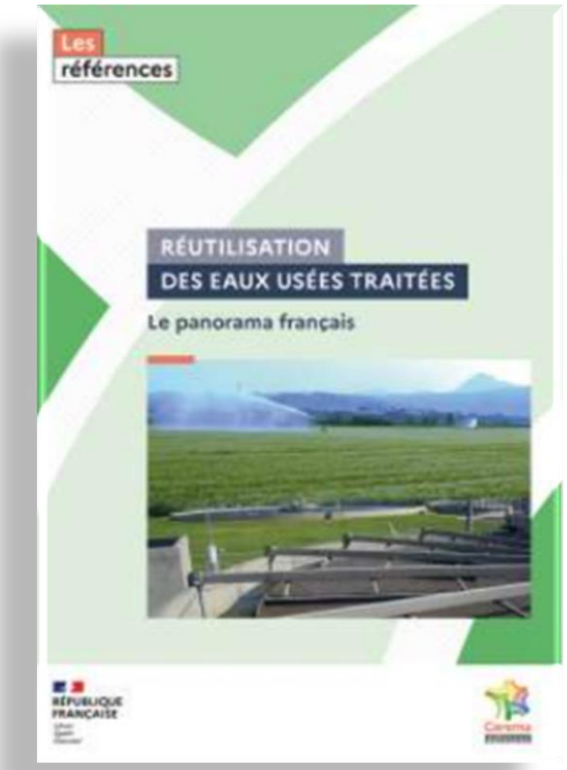
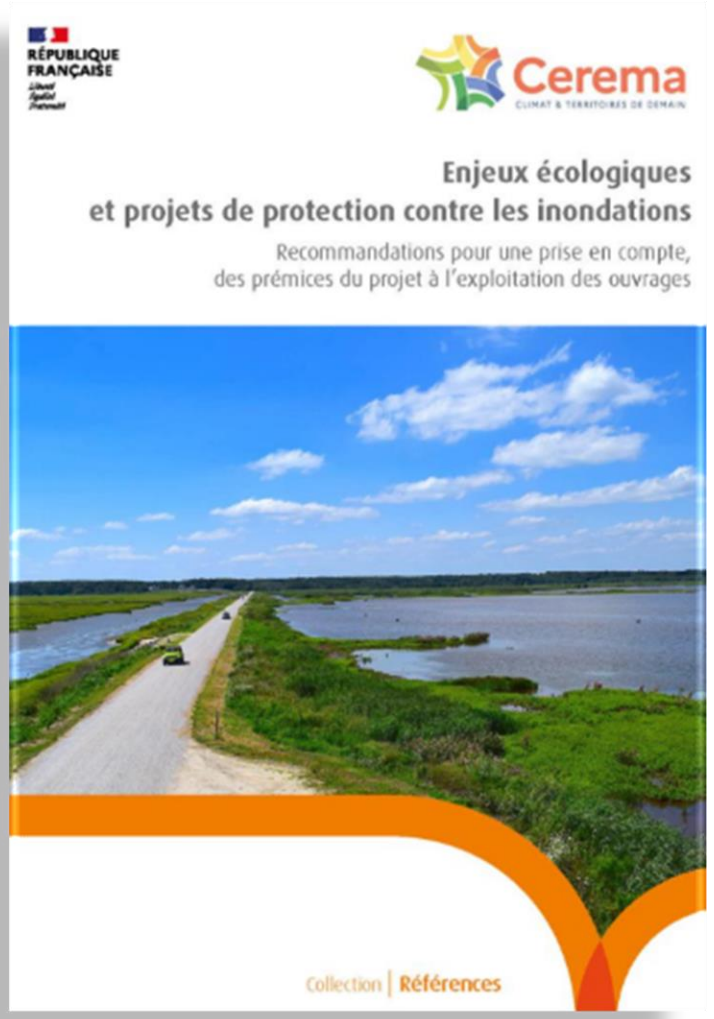
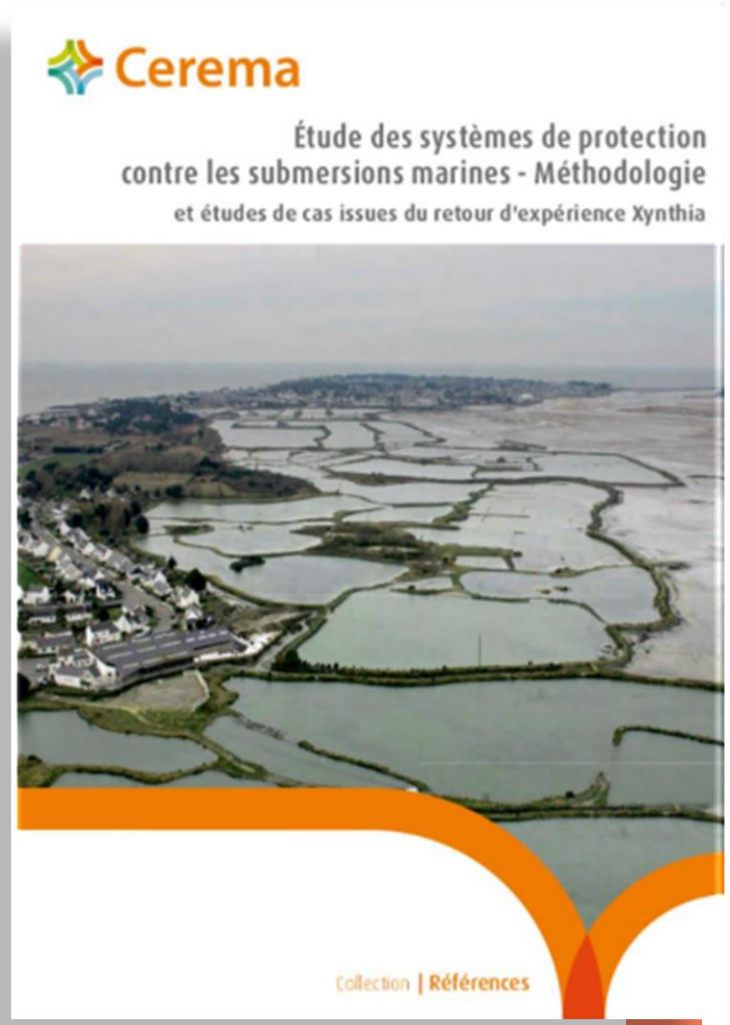
WATER, A PRECIOUS COMMODITY AND A RISK



WATER, A PRECIOUS COMMODITY AND A RISK





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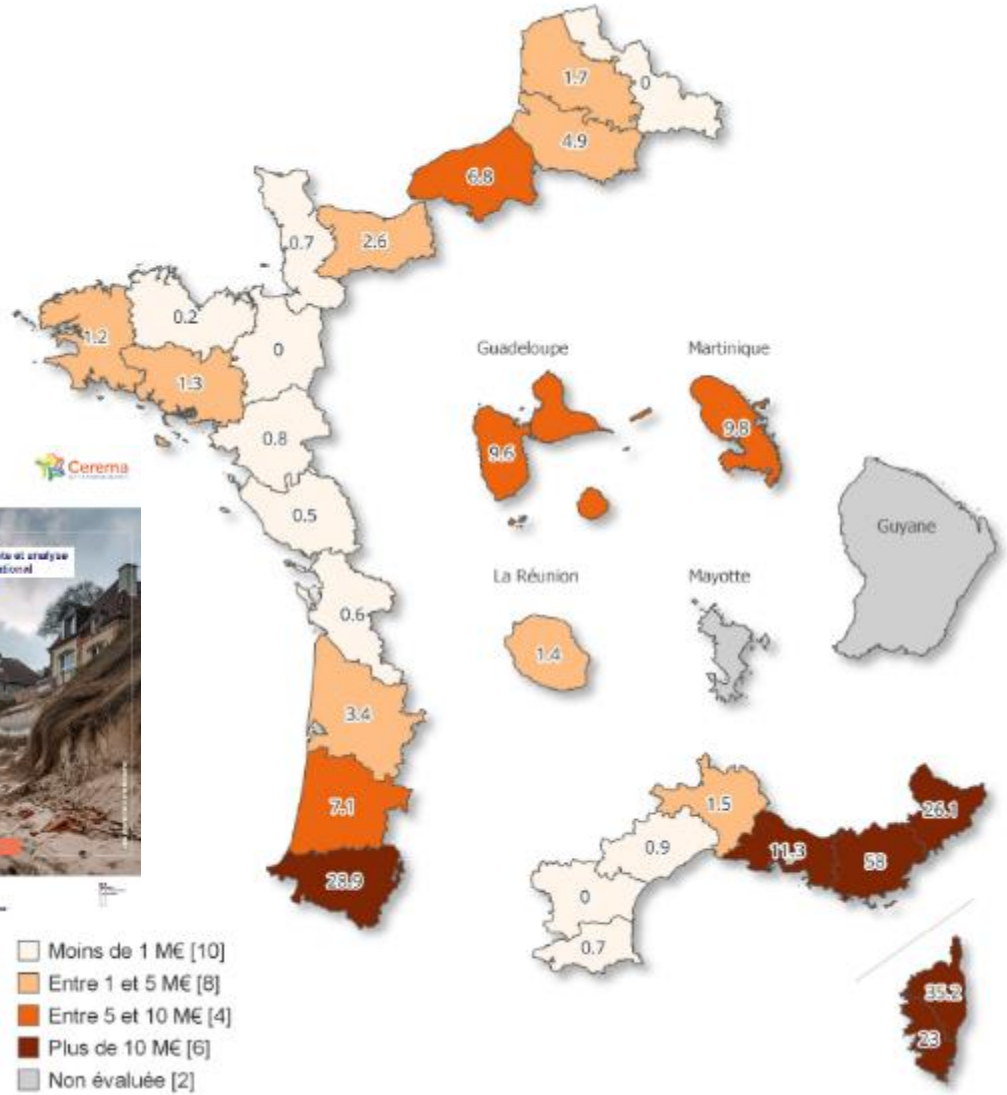
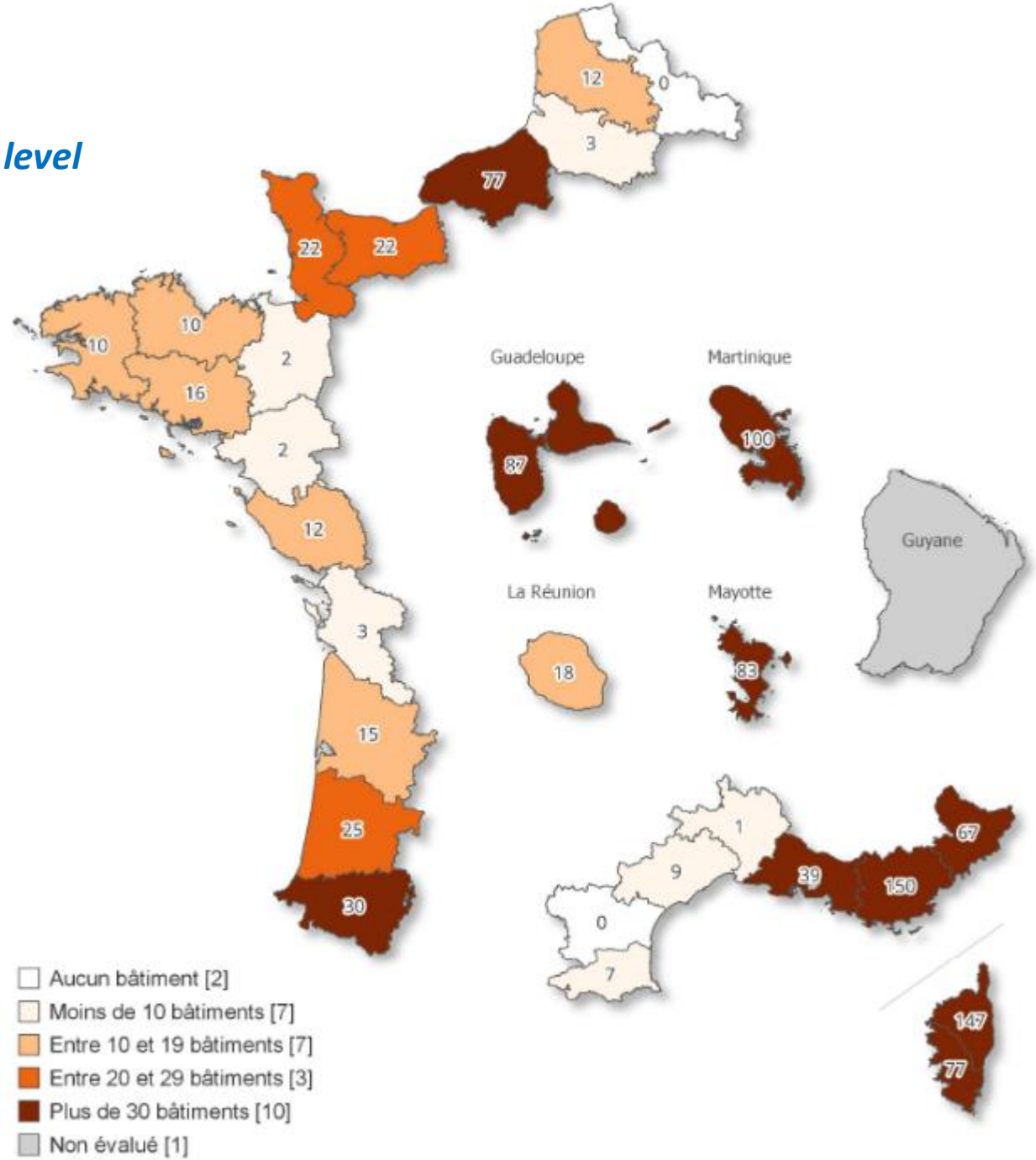
COASTLINE

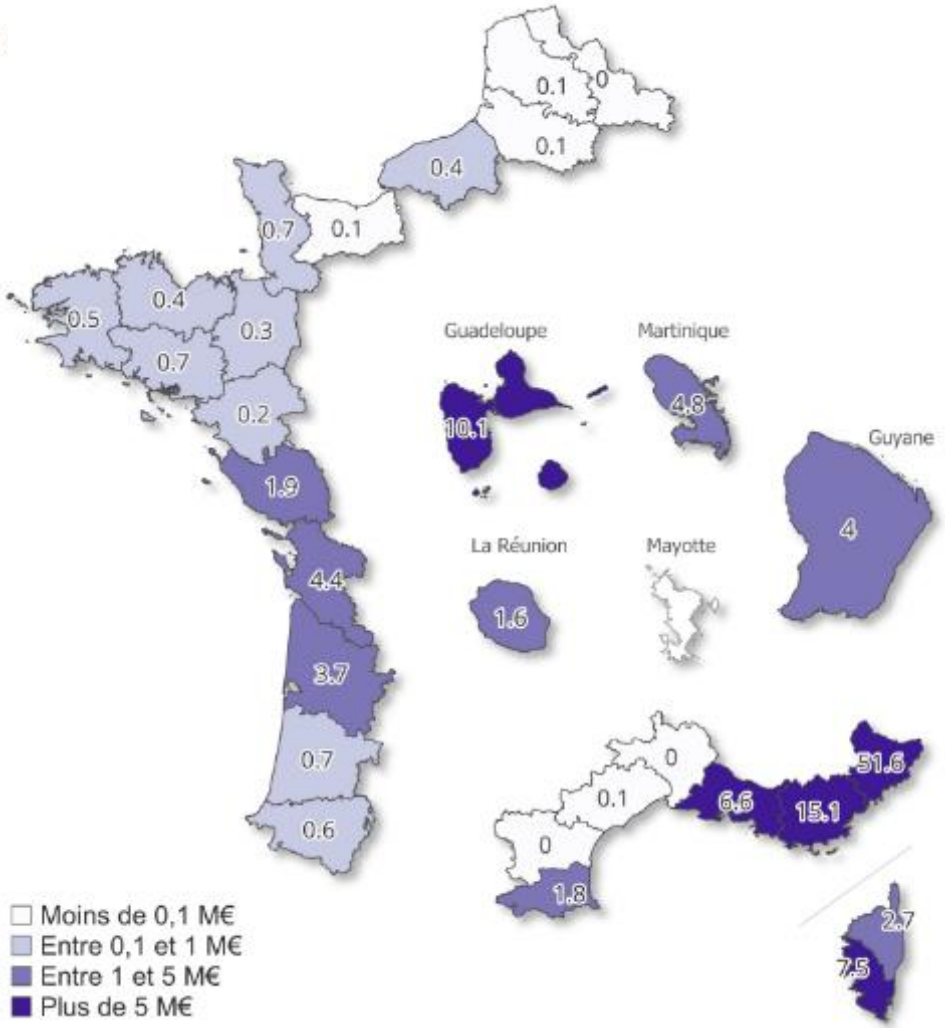
Coastline projection and analysis of issues at the national level
Horizon 2028 - Buildings impacted, in number and value

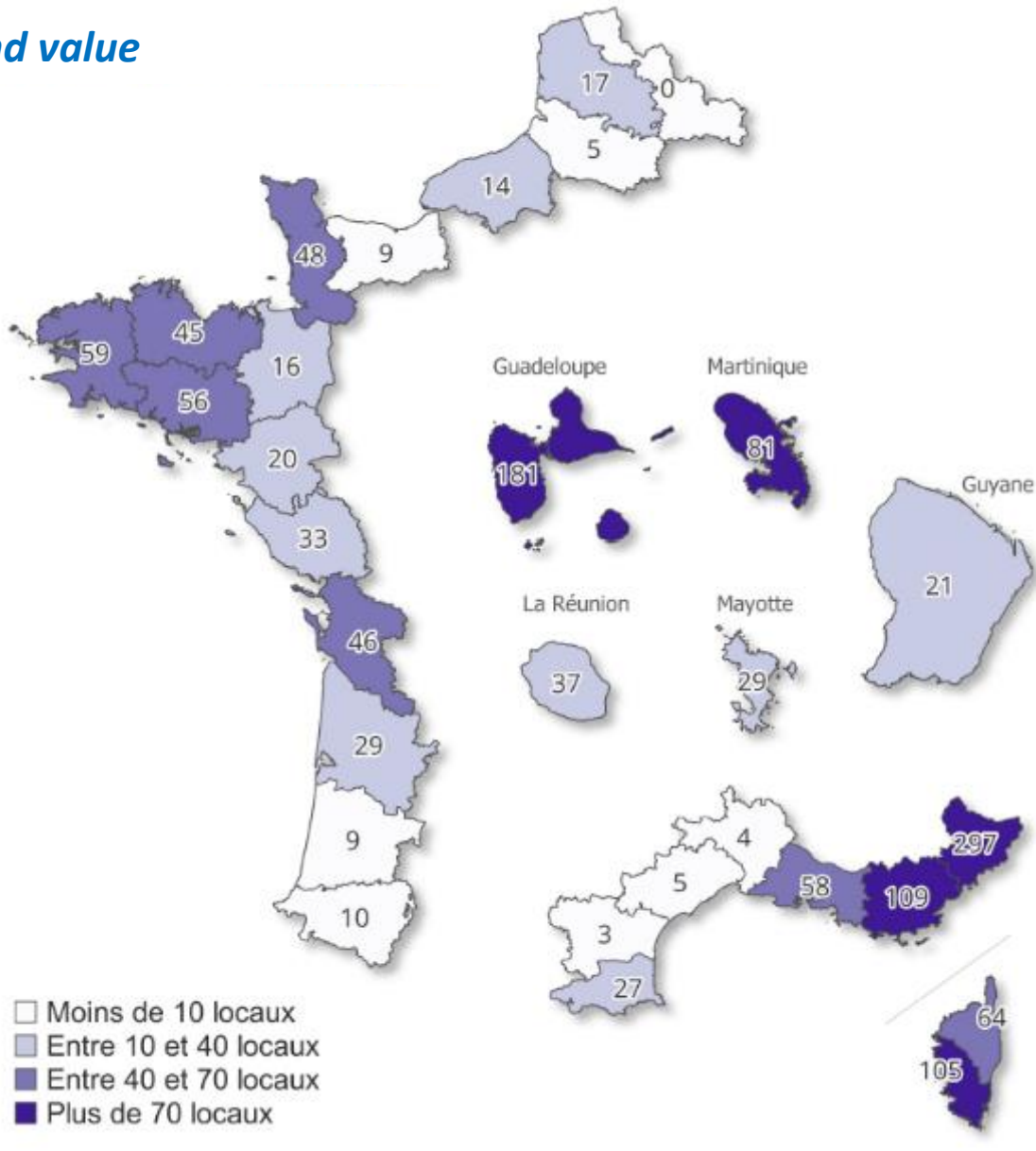




COASTLINE

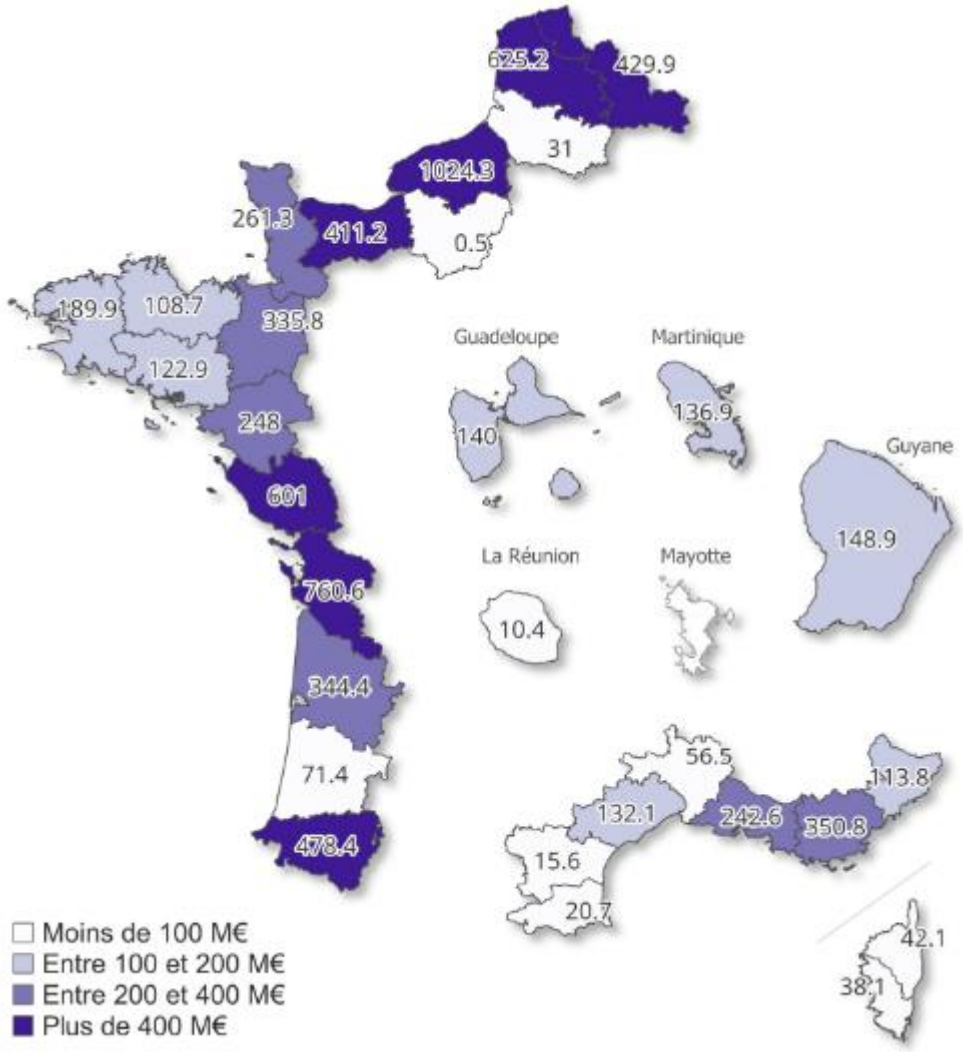
Coastline projection and analysis of issues at the national level
Horizon 2050 – economic activity premises impacted, in number and value

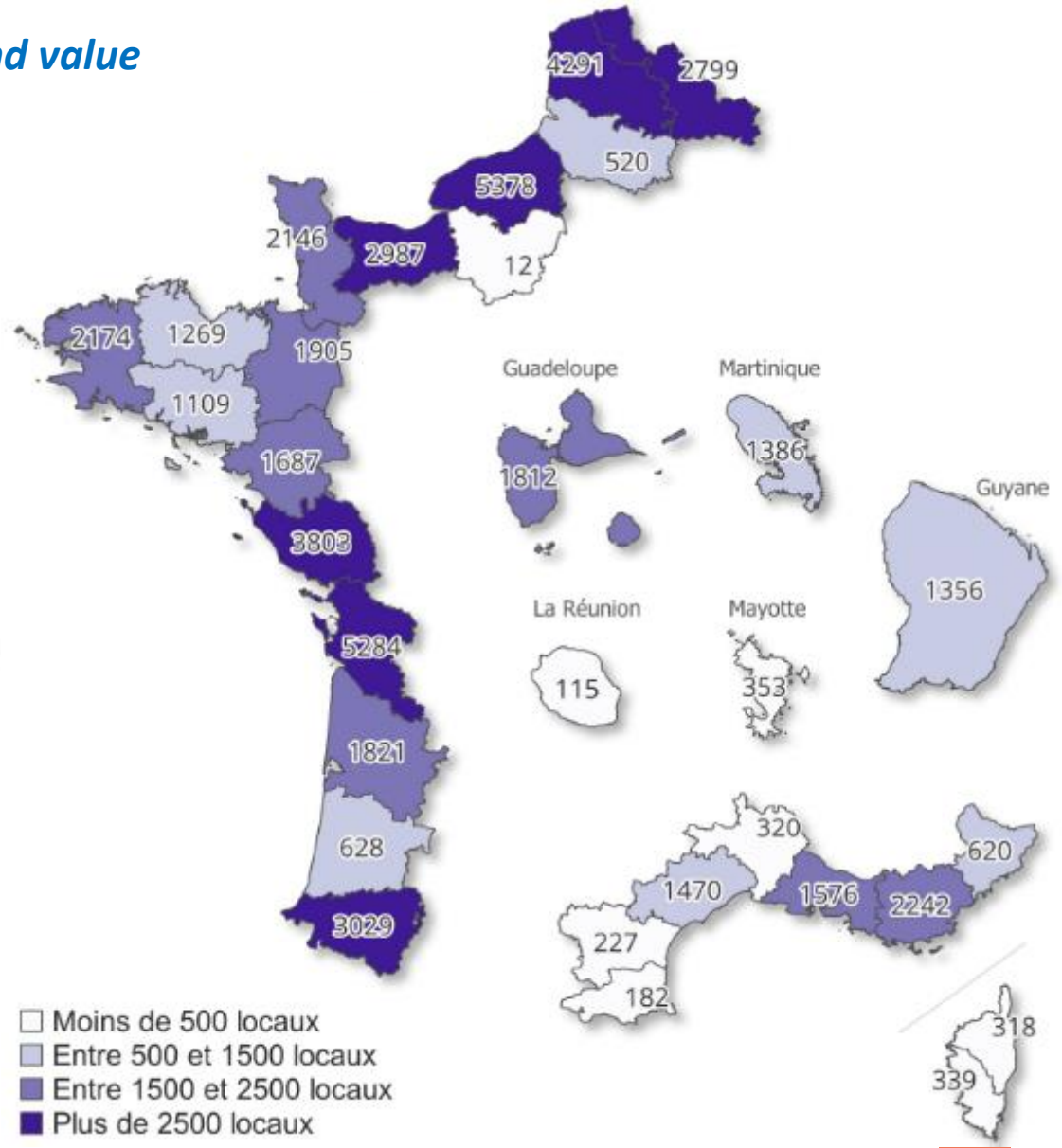




COASTLINE

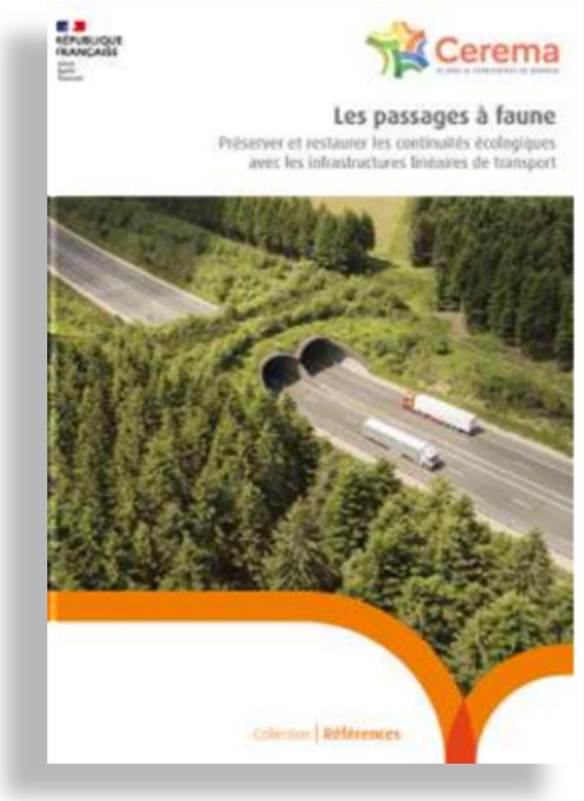
Coastline projection and analysis of issues at the national level
Horizon 2100 – economic activity premises impacted, in number and value

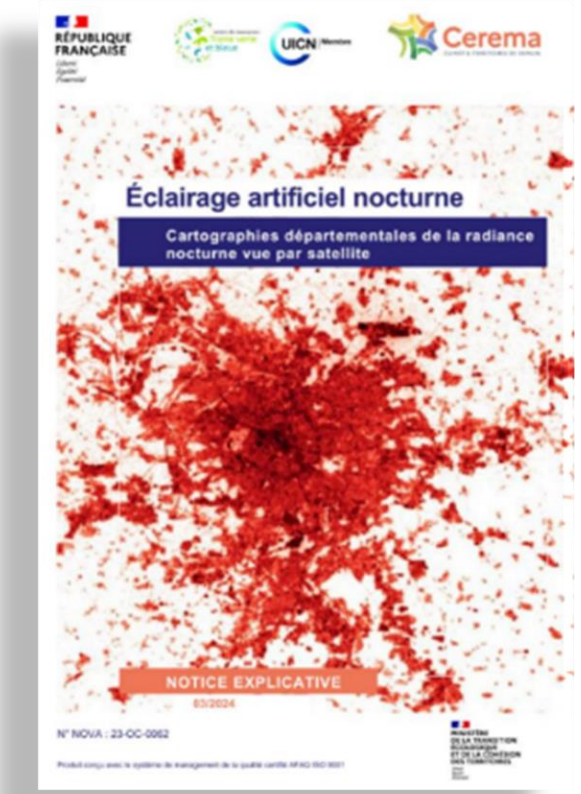




PROTECTING AND DEVELOPING THE NATURE - ZAN

PROTECTING AND DEVELOPING THE NATURE





PROTECTING AND DEVELOPING THE NATURE IN THE CITY

LE CEREMA PROPOSE DES « PARCOURS » THÉMATIQUES PRÉDÉFINIS OU LES COMBINE POUR CRÉER VOTRE PARCOURS PARTICULIER.

EXEMPLES DE PARCOURS THÉMATIQUES POSSIBLES:

RAFRAÎCHISSEMENT DE LA VILLE

RÉPERTORIER les îlots de chaleur et besoins en îlots de fraîcheur, gérer les eaux pluviales, restaurer les sols, végétaliser.

DES ARBRES DANS LA VILLE

IDENTIFIER les espaces disponibles et les espèces adaptées au regard des services recherchés (ombrage, rafraîchissement, gestion des eaux pluviales, renaturation des sols, intégration des arbres dans les aménagements et ouvrages urbains).

VILLE ÉPONGE

ÉLABORER une stratégie de désimperméabilisation, gérer les eaux pluviales et restaurer les sols.

INTÉGRER des trames vertes, bleues, turquoises, brunes et noires, désartificialiser et renaturer les sols, gérer les eaux pluviales et sélectionner les espèces d'arbres.

BIODIVERSITÉ

VILLE APAISÉE

PARTAGER l'espace public entre mobilités douces et espaces végétalisés, concevoir une zone calme paysagée, assurer la gestion de l'eau et mettre en place des cours d'écoles résilientes.

REDUCING OUR CARBON EMISSIONS

Réduire l'impact carbone des bâtiments

Rénovation BBC et exigence du Dispositif Eco Energie Tertiaire

Gérer son patrimoine immobilier

Décrypter la réglementation bâtiments

RECHERCHE & INNOVATION

Solutions d'adaptation des bâtiments au changement climatique

TerraBrenne: les terres ressources pour l'éco-construction et la réhabilitation en Brenne

ÉVÉNEMENTS

Webinaire RE2020 avec les lauréats de l'AMI "Construire avec les matériaux biosourcés et la terre crue" de la Fédération Bretonne des Filières Biosourcées

Publié le 01/06/2022 →

ÉTUDES & MÉTHODES

Solutions d'adaptation des bâtiments au changement climatique

Mieux connaître les performances acoustiques des matériaux biosourcés afin de promouvoir leur utilisation dans le bâtiment

RECHERCHE & INNOVATION

Economie circulaire du BTP

EcoTerra: Un projet de recherche sur les performances des bétons terre-chanvre

ÉTUDES & MÉTHODES

Qualité des environnements intérieurs et ventilation

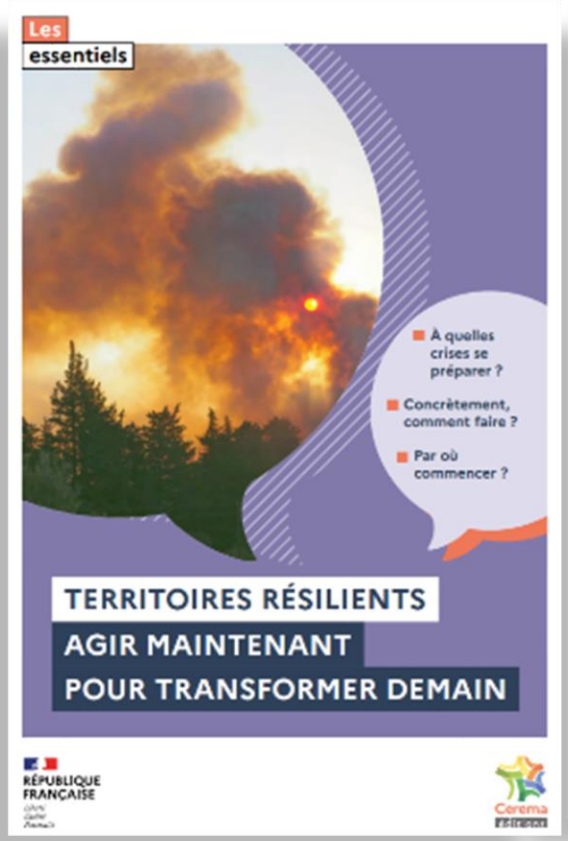
Le Cerema mesure les performances du béton de chanvre comme isolant dans les Hauts-de France

RECHERCHE & INNOVATION

Gestion de patrimoines immobiliers

Un consortium pour développer l'utilisation des bétons et mortiers végétaux

ADAPTING TO THE EFFECTS OF CLIMATE CHANGE



Sentier du littoral - Sentiers de nature
Ports de plaisance - Bases nautiques d'avenir

ADAPTING TO THE EFFECTS OF CLIMATE CHANGE