



ENERGee Watch

Learning course - Adaptation

22nd of May 2023

Preliminary information



You can contribute and ask questions to the speakers in the conversation section



The presentation will be sent to you later



Please turn off microphones and cameras during the presentation



The webinar is recorded for replay

Agenda

Unit start time	Unit name
09h30	Introduction
09h45	Fundamentals of climate change adaptation and assessment
10h30	Establishing a diagnosis
11h00	Break
11h10	Establishing a strategy and an action plan
11h45	Examples of the Cities of Paris (FR) and Cascais (PT)
12h15	Conclusion



Introduction

The consortium




ENERGee Watch

Project coordinator + monitoring




ENERGee Watch consortium

 Institute for European Energy and Climate Policy (IEECP)

Communication and dissemination



 European Federation of Agencies and Regions for Energy and the Environment (FEDARENE)

Replication assessment and planning



 University of Piraeus Research Center (UPRC-TEESLab)


Development of the learning program + mentor



 Auvergne Rhône-Alpes Energie Environnement (AURA-EE) and Île-de-France Regional Council Energy (AREC IDF)


Mentor



 Energy agency of Savinjska, Šaleška and Koroška region (KSSENA)


Implementing learning program + mentor




 3 Counties Energy Agency (CEA)

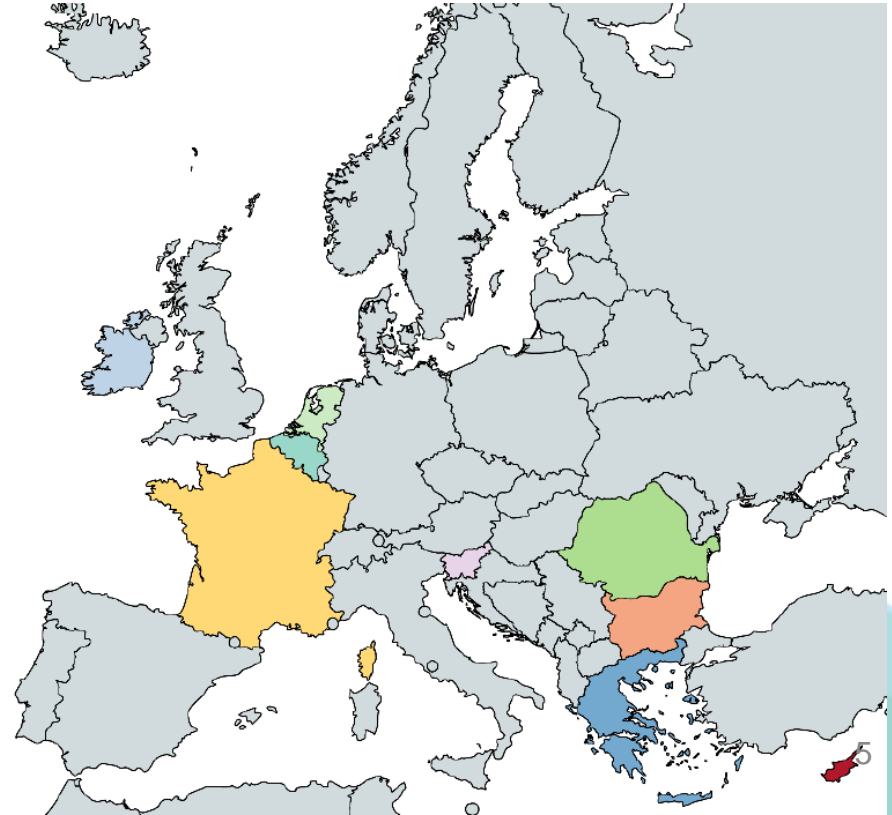
Mentors



 Energy Agency of Plovdiv (EAP)

 Alba Local Energy Agency (ALEA)

 Cyprus Energy Agency (CEA)



The project - ENERGeE Watch

Project funded by the European Horizon 2020 program for the period 2020-2023. It aims to raise the competence of local and regional energy agencies and communities through **peer-to-peer learning sessions** on:

Energy and climate data collection
(KSSENA)



Monitoring & verification
(Cyprus Energy Agency)



Indicators and strategies for adaptation to climate change
(AREC Ile de France)



Data display, dissemination and validation by local authorities
(AURA-EE)



energy & climate data online crash-courses

Available in **English**, free of cost, for local/regional authorities and energy/climate agencies all over Europe

Tue. 9 May

Data Collection (Acquisition and Treatment)

organised by the Energy Agency of Savinjska, Šaleška and Koroška

Mon. 15 May

Data Monitoring and Validation

organised by Cyprus Energy Agency

Mon. 22 May

Indicators for Adaptation to Climate Change

organised by Île-de-France Regional Energy and Climate Agency

Tue. 30 May

Data Display, Dissemination, Validation by Local Authorities

organised by the Auvergne-Rhône-Alpes Energy Environment Agency

Learning objectives of the adaptation module

- | **Objective 1:** to appropriate the concepts and notions associated with adaptation to climate change
- | **Objective 2:** to understand the challenges in your territory, to understand the climate impacts and associated effects
- | **Objective 3:** to be able to prefigure an adaptation to climate change policy on your territory
- | **Objective 4:** to draw on the associated methods and tools, in particular to assess their effects



Who is participating today...



How do you view adaptation ?



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1



2



3



7



4



6



5



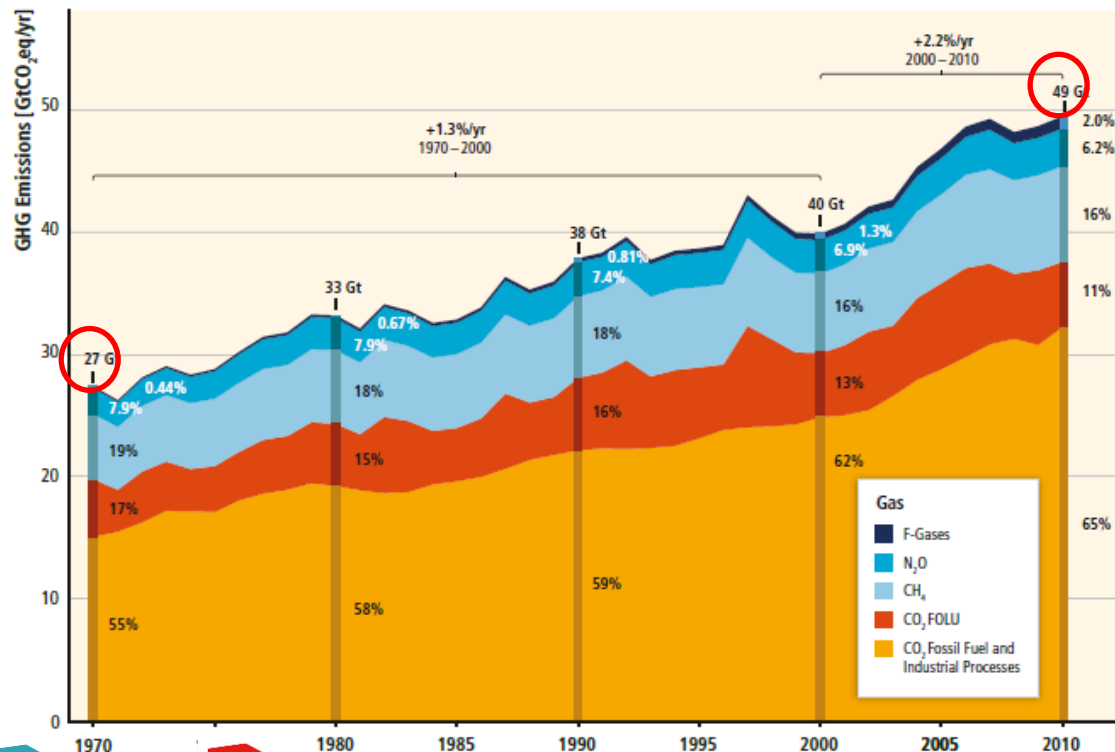
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Fundamentals of climate change adaptation

Markers of climate change

Total Annual Anthropogenic GHG Emissions by Groups of Gases 1970–2010

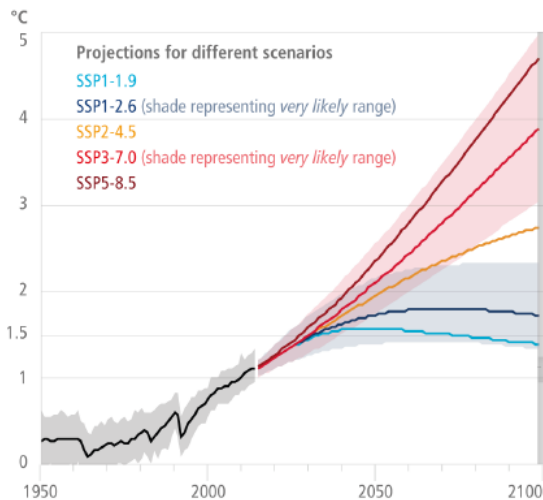


- GreenHouse Gas (GHG) emissions doubled in the span of 40 years
- Intensification of emission accumulation
- Latency time

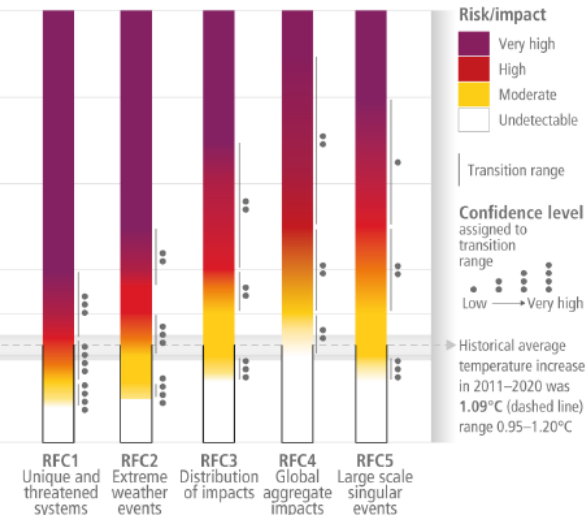
Markers of climate change

Global and regional risks for increasing levels of global warming

(a) Global surface temperature change
Increase relative to the period 1850–1900



(b) Reasons for Concern (RFC)
Impact and risk assessments assuming low to no adaptation



- Global average temperature increase of 1.1°C compared to 1850-1900
- Unequivocal human influence in the global warming
- +1.5°C reached around 2030, 10 years earlier than estimated
- **Climate stake = articulated answers Mitigation + Adaptation**

Each additional fraction of warming counts

Markers of climate change



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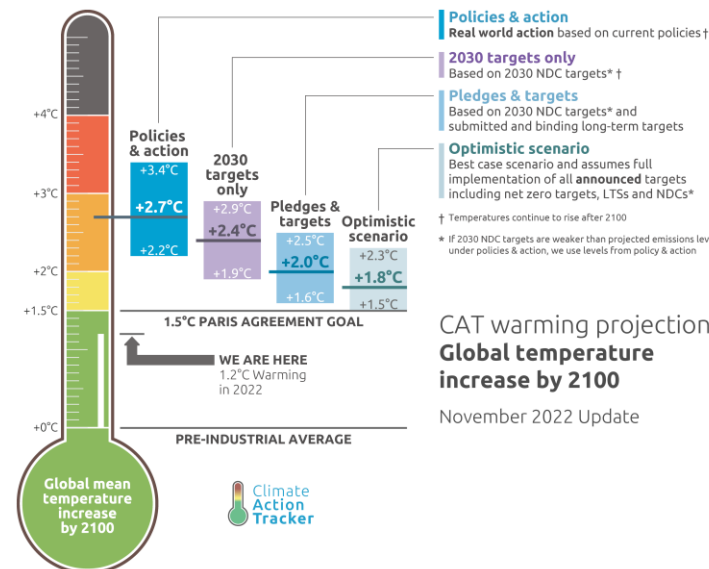
Nowdays...

Approximately 3.3 to 3.6 billion people live in contexts that are highly vulnerable to climate change (high confidence).

Irreversible changes already underway (oceans, ice caps, global sea level)

«Approximately half of the species assessed globally have shifted polewards or, on land, also to higher elevations (very high confidence).»

«Climate change has adversely affected physical health of people globally (very high confidence) and mental health of people in the assessed regions (very high confidence).»



CAT warming projections
Global temperature increase by 2100

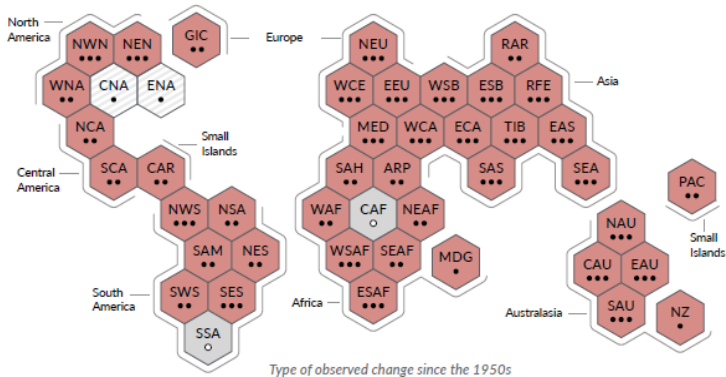
November 2022 Update

Markers of climate change

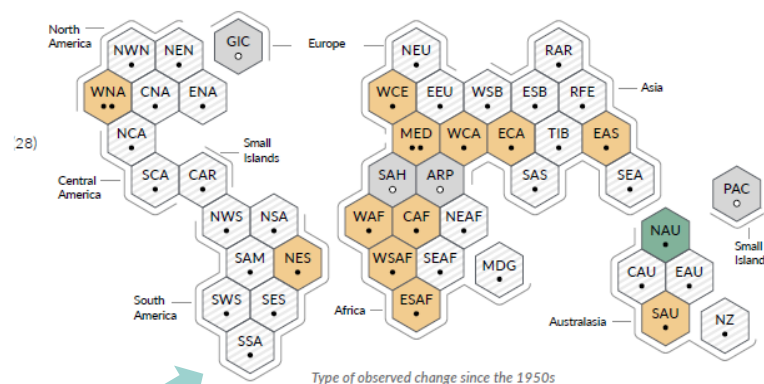


FNERGeo Watch

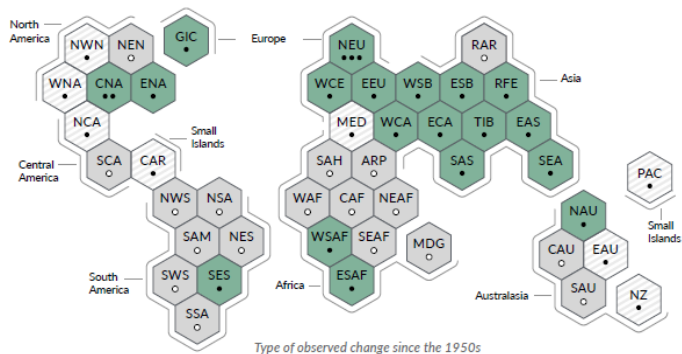
a) Synthesis of assessment of observed change in **hot extremes** and confidence in human contribution to the observed changes in the world's regions



c) Synthesis of assessment of observed change in **agricultural and ecological drought** and confidence in human contribution to the observed changes in the world's regions



b) Synthesis of assessment of observed change in **heavy precipitation** and confidence in human contribution to the observed changes in the world's regions



In red, yellow and green: increase
Grey: insufficient data
Points: degree of confidence in the attribution

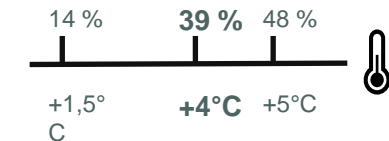
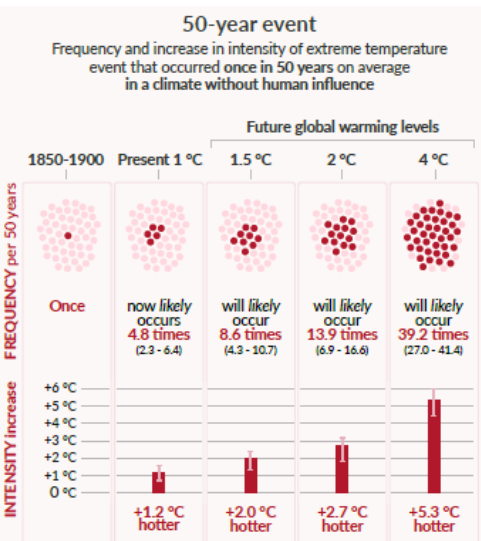
Access to regional summaries and interactive maps
<https://interactive-atlas.ipcc.ch/>

<https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/>

Markers of climate change

In the future...

- All regions are expected to experience changes in at least 5 climatic impact drivers
- Extreme precipitation is projected to increase by about 7% for every 1°C of global warming
- More intense, more frequent climatic events



% (max.) of species in terrestrial ecosystems at very high risk of extinction / level of warming

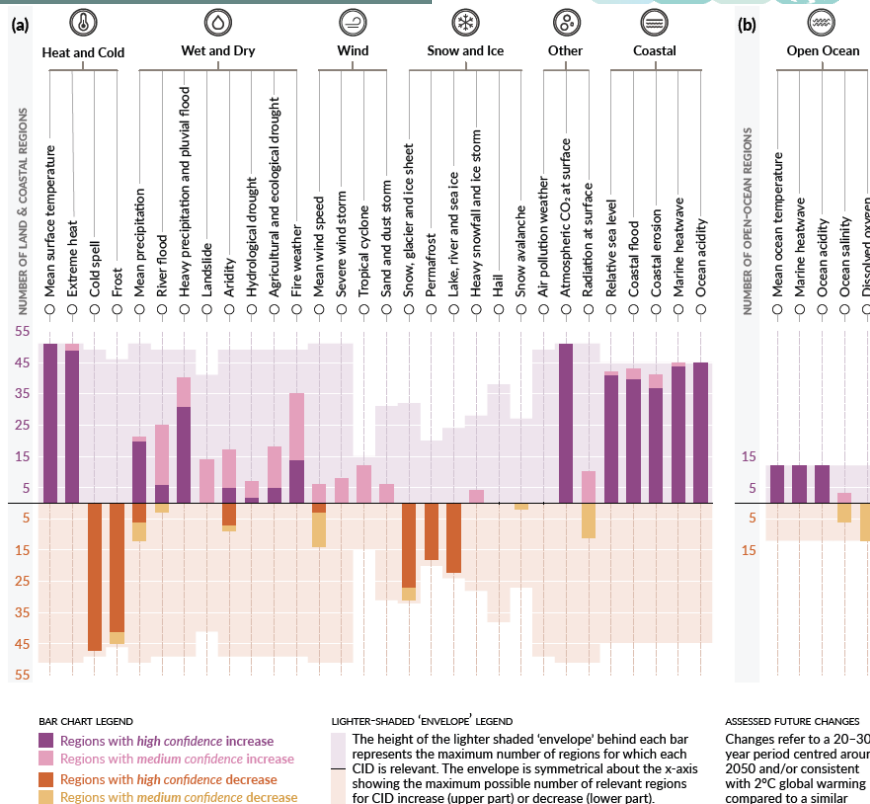


Figure SPM.9 | Synthesis of the number of AR6 WGI reference regions where climatic impact-drivers are projected to change

Markers of climate change



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Key risk: a fundamental notion of the IPCC's reports

An interaction between climate-related hazards with the exposure and vulnerability of the affected human or ecological system

« Four key risks (KR) have been identified for Europe, with most becoming more severe at 2°C global warming level (GWL) compared to 1.5°C GWL in scenarios with low to medium adaptation (high confidence). From 3°C GWL and even with high adaptation, severe risks remain for many sectors in Europe (high confidence) »

Key Risk 1: Mortality and morbidity of people and changes in ecosystems due to heat

Key Risk 2: Heat and drought stress on crops

Key Risk 3: Water scarcity

Key Risk 4: Flooding and sea level rise



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! Staying within the limits of capacity to cope with the accelerating pace of climate change

A temperature increase of 3.5°C in France is equivalent to a global warming of 2.3°C

“Ecosystem-based Adaptation and other Nature-based Solutions are themselves vulnerable to climate change impacts.

They need to take account of climate change adaptation if they are to remain effective and will increasingly be under threat at higher warming levels. Nature-based Solutions cannot be regarded as an alternative to, or a reason to delay, deep cuts in greenhouse gas emissions (high confidence).”

The concept of Adaptation

« **Adaptation** : The process of **adjustment to actual or expected climate** and its effects. **In human systems**, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some **natural systems**, human intervention may facilitate adjustment to expected climate and its effects. »

An approach aiming at change

- ▶ Incremental adaptation
- ▶ Transformational adaptation

Intensity of change

The concept of Adaptation

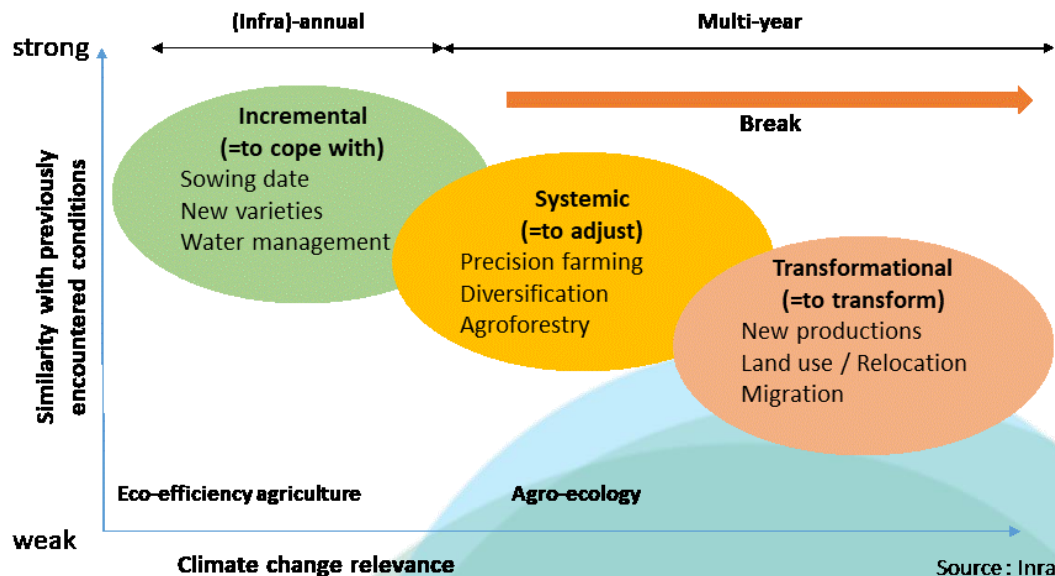
- **Incremental adaptation:**

« Adaptation actions where the central aim is **to maintain** the essence and integrity of a system or process at a given scale. »

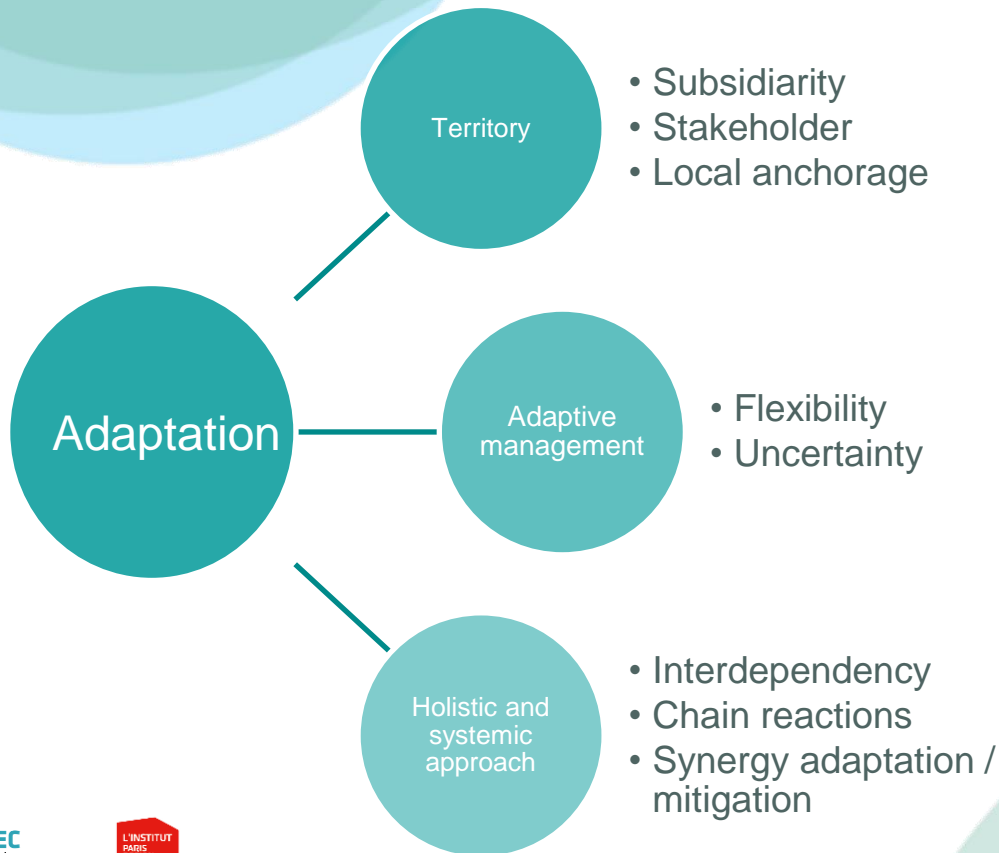
- **Transformational adaptation:**

« Adaptation that **changes** the fundamental attributes of a system in response to climate and its effects. »

Illustration in agriculture



Principles and notions associated with adaptation



Notions impacting decision process, public policies, stakeholder involving, values sharing

Principles and notions associated with adaptation

Territory

- Subsidiarity
- Stakeholder
- Local anchorage

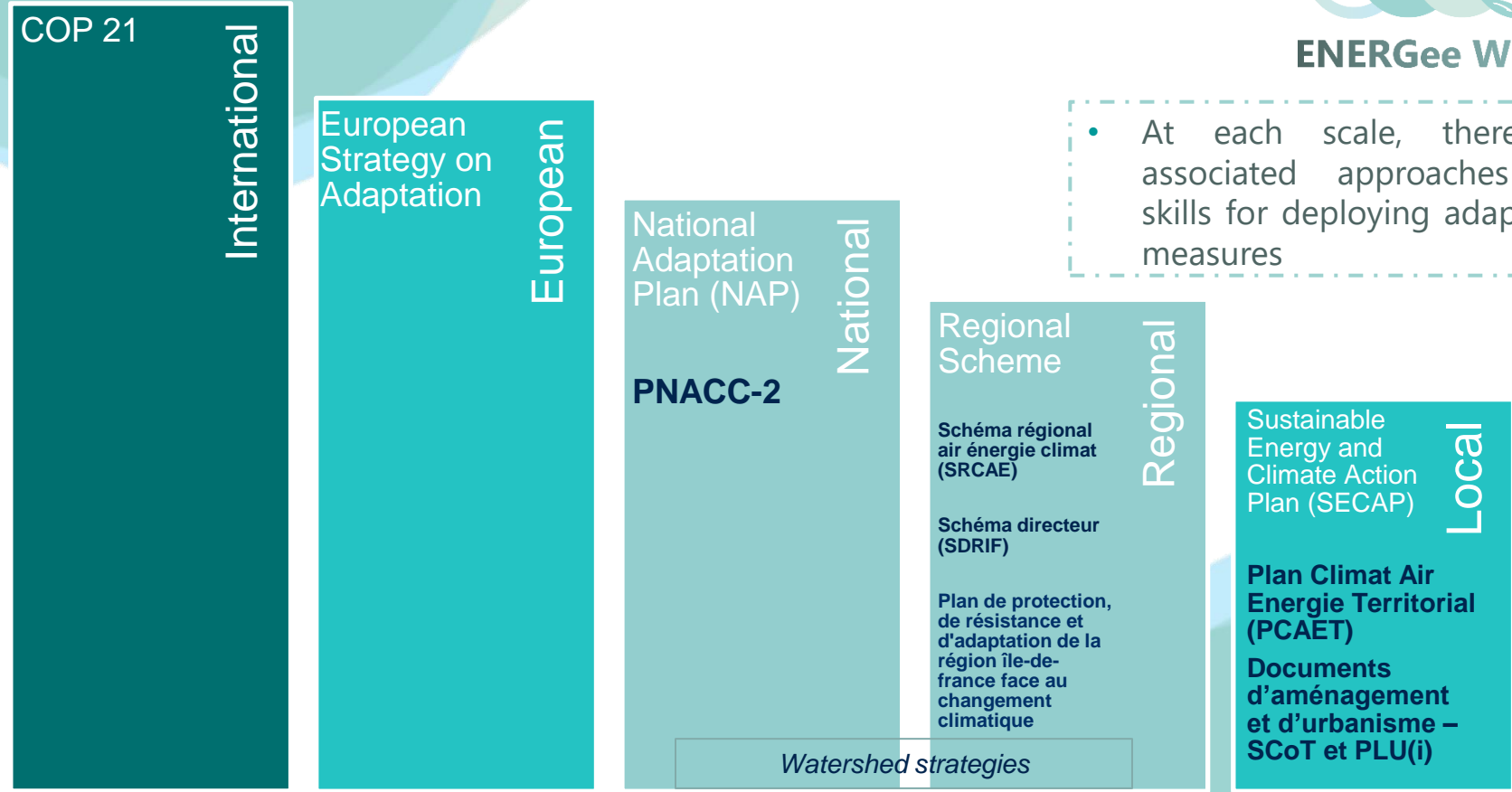


- Development of solutions that are as close as possible to the socio-economic specificities of the territories (coastline / mountains / urban areas / agricultural areas...)
-> Where the stakes lie
- Notion of competences / territorial scales for the implementation of the strategy and the action plan
-> Where the actions are legitimate
- Strategies organised within the public and private spheres
-> Interaction between actors
- Better understanding of stakeholder and actors' interactions
-> Common vision / values sharing

Scale of adaptation implementation and related skills



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- At each scale, there are associated approaches and skills for deploying adaptation measures

Principles and notions associated with adaptation



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« **Adaptive management**: A process of iteratively planning, implementing, and modifying strategies for managing resources in the face of **uncertainty** and change. Adaptive management involves **adjusting approaches** in response to observations of their effect and changes in the system brought on by resulting feedback effects and other variables. »



- Flexibility
- Uncertainty



- Several types of uncertainty related to:
 1. the global climate change scenario: the phenomenon of climate change will not have the same impacts depending on the extent of global temperature change (+2°C, +4°C, +6°C);
 2. the local translation of global scenarios;
 3. the responses of major cycles (water, etc.), ecosystems (forests, etc.) and societies to change
- Climate variables with different degrees of uncertainty
- Impact on decision making and the planning process
- Articulation of different time scales

Principles and notions associated with adaptation

« **Climate change adaptation processes** integrate an understanding of cross-cutting (systemic) issues of the organisation by examining interdependencies and internal and external linkages, e.g. through **cause and effect relationships** »

Holistic and systemic approach

- Interdependency
- Domino effect
- Synergy adaptation / mitigation



- Impacts at various scales and in different domains
- Adaptation-related actions covering many domains (governance, infrastructure, urban planning...)
- Notion of maladaptation: implementation of adaptation policies should not hinder adaptation and mitigation objectives (e.g.: air conditioning)

A focus on maladaptation

Definition of Maladaptation :

*"Actions that may increase the risk of adverse climate-related consequences, including **increased greenhouse gas emissions**, increased or **displaced vulnerability** to climate change, more **inequitable outcomes**, or **reduced well-being**, now or in the future. Most often, maladaptation is an unintended consequence."*

Source : IPCC

Infrastructural Maladaptation	Institutional Maladaptation	Behavioral Maladaptation
<p>Example : Seawalls as protection from rising sea-levels</p> <p>Infrastructure give people a false sense of security and encourage them to remain in places or continue with activities that make them vulnerable to climate change.</p>	<p>Example : Climate insurance for agriculture, housing...</p> <p>Can lead to a focus on insured cash crops over drought-resistant subsistence crops or water conservation techniques, → farmers become reliant on the insurance.</p>	<p>Examples : Migration of populations from areas affected by climate change. Change in crops cultivated.</p> <p>In rural areas, this may create labour shortages making farming even more difficult when harvest conditions are good.</p>

Source : Environmental Change Institute, University of Oxford

A focus on maladaptation

Different adaptation actions carry different risks of maladaptive outcomes :

- Actions to increase adaptive capacity
→ **low risk**
- Actions seeking to decrease sensitivity
→ **medium risk**
- Actions seeking to reduce exposure
→ **high risk**

However, **reducing exposure to climate risks** is often an unavoidable measure in the medium to long term in a **transformative adaptation** of the territory.

The risks of maladaptation must therefore be anticipated in order to limit the undesirable effects.

	Increasing adaptive capacity	Decreasing sensitivity	Decreasing exposure
Examples (using sea-level rise as an example)	<ul style="list-style-type: none"> - Strengthening coastal planning institutions - Raising awareness of best practices of coastal management 	<ul style="list-style-type: none"> - Improving building design (elevating houses) - Siting new developments inland - Building seawalls 	<ul style="list-style-type: none"> - Resettlement of entire communities
Risk of maladaptation	Low risk	Medium risk	High risk
Why this risk	<ul style="list-style-type: none"> - Not emission-intensive - Not inequitable if targeted at all groups - Relatively inexpensive 	<ul style="list-style-type: none"> - Can be (temporarily) carbon and cost intensive - Things like seawalls can encourage development in high-risk areas 	<ul style="list-style-type: none"> - Large emissions of greenhouse gases - High opportunity costs - Inequitable to those displaced

Table 1. Examples of low and high risk adaptation activity, using sea-level rise as the example of the climate impacts to which adaptation is directed.

Source: Barnett & O'Neil, 2013.

A focus on maladaptation

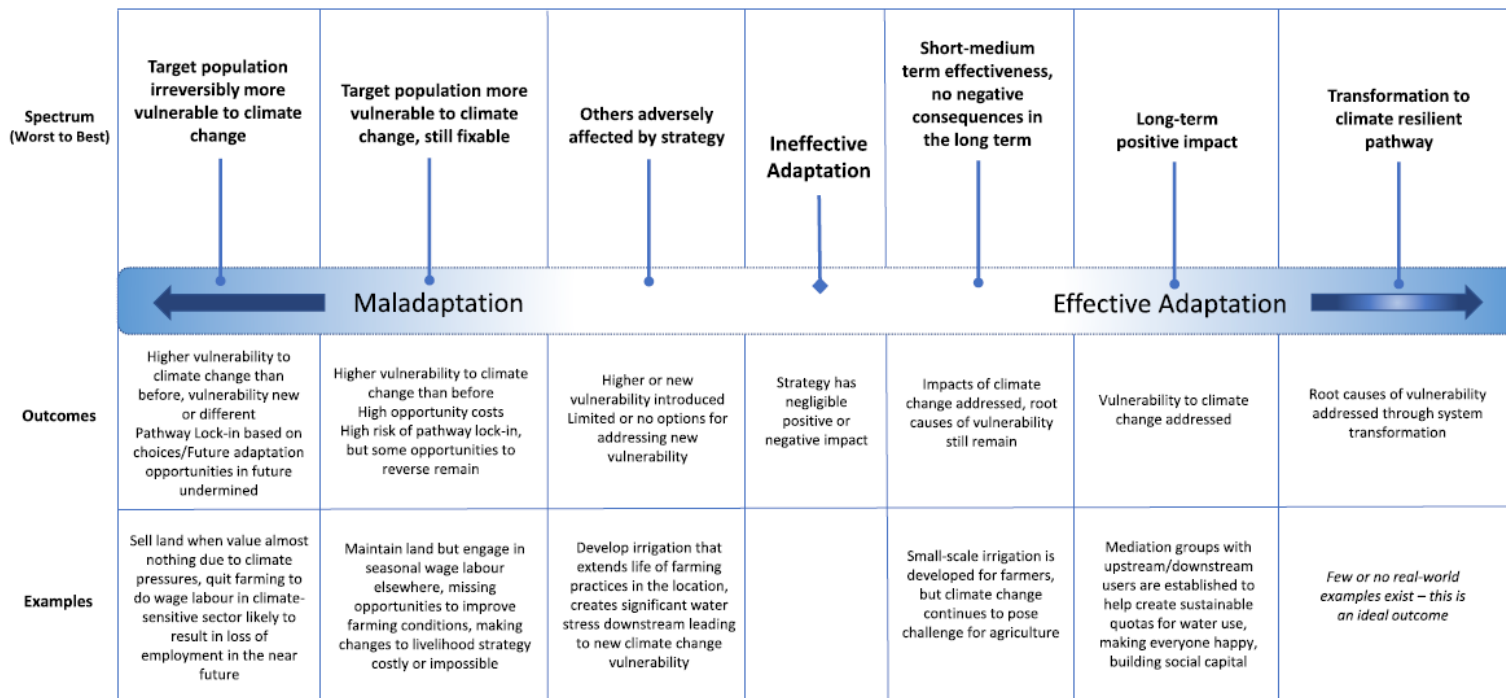


Figure 2. A Spectrum of Responses from Adaptation to Maladaptation

Source : Environmental Change Institute, University of Oxford



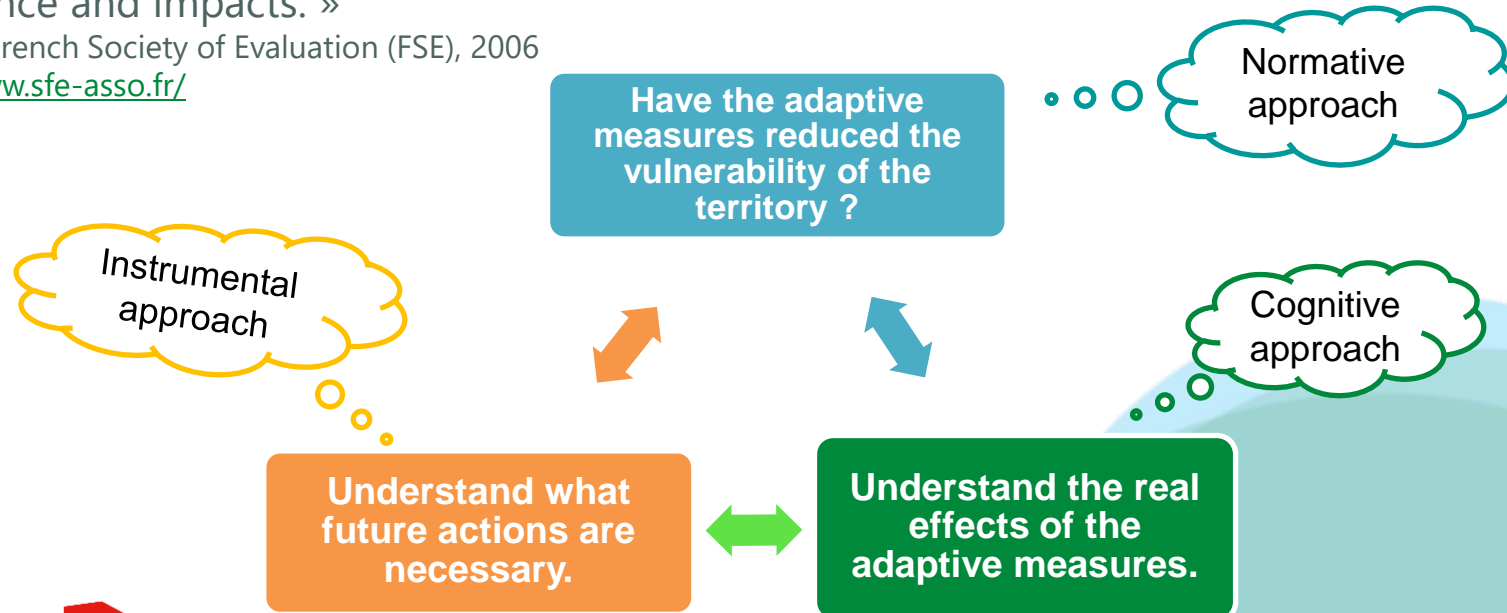
Fundamentals of assessment

What is the purpose of a public policy evaluation ?

« Evaluation aims **to generate knowledge** on public actions, especially regarding their effects, with a double objective of allowing citizens to **understand their value** and **helping officials to improve** their relevancy, effectiveness, efficiency (or cost effectiveness), coherence and impacts. »

Source : French Society of Evaluation (FSE), 2006

<http://www.sfe-asso.fr/>



Evaluation of climate change adaptation strategies

Evaluation is essential to adaptation to climate change for two major reasons :

- Adaptation strategies are developed under uncertainty. Thus, adaptation initiatives must be gradually stepped up as the effects of climate change become more evident and more information becomes available.
→ Evaluation of the results of each phase, informs the adjustment of the next phase.
- Evaluation is crucial to identify risks of maladaptation : *"the ability to catch maladaptation before it happens is inherently connected to the challenge of evaluating adaptation"*.

"...determining whether a specific adaptation strategy has been effective or even whether it has been a complete success is often difficult."

(Environmental Change Institute, University of Oxford)

Differences between public policy monitoring and evaluation

	Monitoring	Evaluation
Targets	Observe the implementation of the policy	Evaluation, improve future policy programming
Main activities	Definition of indicators, compiling of regular information, analysis of progress and results	Appreciation, measurement, impact analysis, causality search
Frequency	Continuous process (annual, trimestral)	Episodic review (midway, at the end of the program, afterwards)
Actors involved	Internal exercise	Participative exercise with stakeholders and citizens

Example of a Logic Impact Diagram

MONITORING

EVALUATION

Planned action

Implementa-tion

Means (€)

Expected result

Direct effect

Indirect effect

Plan to transform school yards

Renovation of school yards with the least vegetation

Budget

Reduce summer temperatures on school grounds

Improve thermal comfort for students and staff & reduce the heat island effect

Effect of educating staff/parents about greening, urban heat, etc.

Indicators for monitoring & evaluation

Indicator
Nr of renovated school yards

Indicator
Cost per school

Indicator
Temperature measured during a heat wave (before and after)

Indicator
Number of sick days (before and after)

Indicator
Satisfaction rate by survey (staff, parents) before and after

Fixed objectives

Goal : 5 yards renovated / year

Goal : projected cost per school

Goal : extreme temp. -5°C

Goal : reduce by 20%

Goal : increase by 20%

► Scope of assessment and monitoring

- Action / project
- Adaptation strategy
- Territorial energy and climate approach / sustainable territorial approach

► Typologie of evaluation questions

- To appreciate **the progress** of the projects and territorial approaches
« Where are we compared to our initial plans? »

. *And identify the levers and the obstacles*

. *And assess whether the actions/measures are effective: Do they achieve the objectives? Do they need to be adjusted?*

- To assess our **level of vulnerability**
« Have we become less vulnerable? »

. *To assess the level of vulnerability of a territory, a combination of indicators is needed*

. *To appreciate a more precise approach / at the scale of actors / sectors: " in the tourism sector, what number of buildings accommodating visitors are adapted to summer temperatures?"*



► Typologie of evaluation questions

- To understand the **links between mitigation and adaptation**
« Are adaptation actions/strategy not jeopardizing mitigation actions?", "Does monitoring/evaluation of adaptation markers allow me to understand interactions with mitigation? »
. e.g. Understanding the sensitivity of the forest to climate factors (fire, water stress, pests) in relation to its function as a carbon sink
- To understand the **adaptive capacities**
« Do we have the knowledge and studies to assess our vulnerability to climate risks? », « Do we have enough human resources to carry out adaptation measures? », « Is the territory sufficiently equipped with health facilities and services? »
. And underlying, the link with efficiency of adaptation measures

Evaluation : how to articulate adaptation and mitigation ?

- One choice to make when designing the evaluation process of an adaptation strategy is **whether adaptation should be evaluated separately or in combination with mitigation.**
- Both possibilities have their merits, but the choice may depend on the characteristics of your organisation (level of awareness, political objectives, human means available, etc.)
- Priority sectors for adaptation (e.g. urban planning, managing nature areas, etc.) differ from the priority sectors for mitigation (energy, mobility): **stakeholders and indicators are not necessarily the same.**

	Evaluating adaptation separately	Combining evaluation for adaptation and mitigation
Benefits	The actions for adaptation gain visibility Increase the learning on adaptation and raise awareness	Makes it easier to understand reciprocal effects between adaptation and mitigation Can be an option if few human means are available to carry out the evaluation process
Risks	Not identifying negative impacts on greenhouse gas emissions	Excluding indicators and stakeholders specific to adaptation and focusing only on mitigation

Convergent points and differences

Mitigation	Adaptation
<ul style="list-style-type: none">• Actions articulated on different time scales	<ul style="list-style-type: none">• Actions articulated on different time scales
<ul style="list-style-type: none">• Actions with immediate effects	<ul style="list-style-type: none">• Actions with progressive effects
<ul style="list-style-type: none">• Convergence of fields of action in particular in regard to energy (urban planning, buildings, mobility)	<ul style="list-style-type: none">• Diversity of fields of action concerned: e.g. urban planning, building sector, economy, biodiversity, health...
<ul style="list-style-type: none">• Specific objectives to reduce energy consumption and greenhouse gas emissions	<ul style="list-style-type: none">• Diversity of objectives (economic, social...)
<ul style="list-style-type: none">• Universal indicator	<ul style="list-style-type: none">• A combination of indicators to qualify adaptation and resilience• To some extent, indicators will be valid for a limited time, have to evolve as progress is made in the adaptation initiative

Conclusion on the contribution of evaluation

Adaptation pathway-like approach in place?

- Adaptation goals?
- Consideration of synergies and trade-offs across actions?
- Action sequencing over time?

Evidence on actual climate risk reduction?

- Evidence of risk reduction?
- Minimization of the risk of maladaptation?
- Societal awareness?

Knowledge on current and future climate risk?

- Current climate hazards?
- Natural systems: drivers of exposure and vulnerability?
- Human systems: drivers of exposure and vulnerability?
- Future climate risks?

Adaptation plans in place and implemented ?

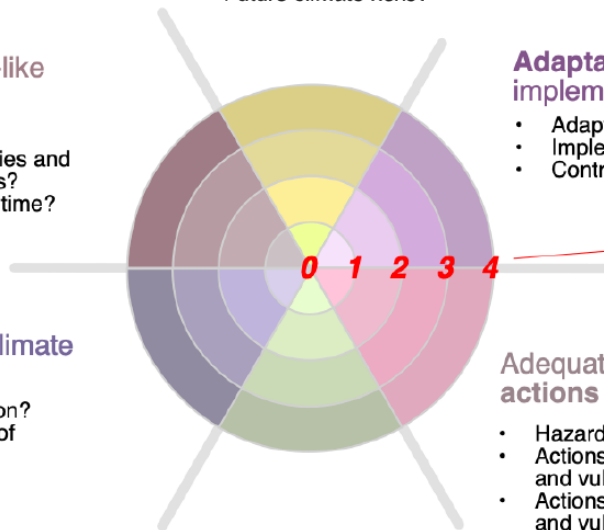
- Adaptation plans?
- Implementation of plans?
- Contribution of non-state actors?

Adequate adaptation-related actions in place?

- Hazard-oriented actions?
- Actions addressing the drivers of exposure and vulnerability in natural systems?
- Actions addressing the drivers of exposure and vulnerability in human systems?

Institutional, technical (expertise) & financial capacities?

- Governance arrangements?
- Expertise and technical capacities?
- Specific and sustainable funding?



Scoring system used to estimate the contribution of each (sub-)question to adaptation progress



Establishing a diagnosis

Climate change adaptation process



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Preliminary work

Existing strategies in territory?

Motivation of the adaptation process?

Pilot ? Mobilized team?

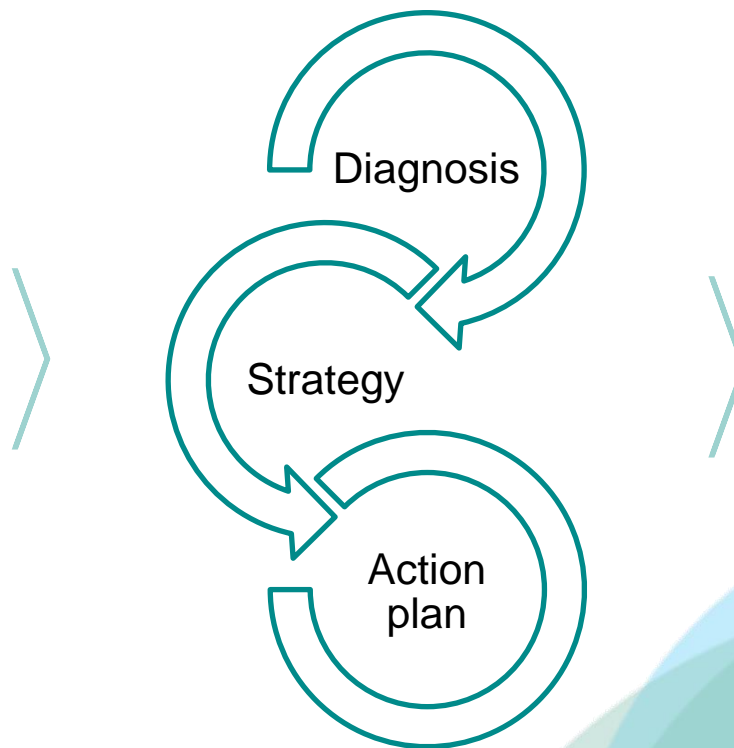
Financial means?

Territorial actors involved?

Level of awareness about adaptation (in your organization / at territorial level)

Vulnerable communities and assets?

...



- Different types of data to consider
- Monitoring and assessment processes must be organized in advance and sustained over time > organize a project unit dedicated to this work

Climate change adaptation process



Examples of Visions, Goals and Policy Statements

City of Laguna Woods
Climate Adaptation Plan (2014)

Summary	
GOAL 1	Increase resilience to climate change-related hazards.
Policy Objective 1.1	Maintain low levels of heat-related illness and death.
Policy Objective 1.2	Reduce wildfire impacts.
GOAL 2	Increase resource independence.
Policy Objective 2.1	Maintain electricity reliability and affordability through energy conservation, efficiency, and independence.
Policy Objective 2.2	Maintain potable water reliability and affordability through water conservation, efficiency, and independence.
Policy Objective 2.3	Demonstrate sustainable resource leadership.
GOAL 3	Sustain and advance climate adaptation efforts.
Policy Objective 3.1	Institutionalize climate adaptation as a citywide priority.
Policy Objective 3.2	Develop regional, state, national, and private climate adaptation partnerships.
Policy Objective 3.3	Continually monitor and update this Climate Adaptation Plan.

City of Los Angeles
Resilient Los Angeles March (2018)

TURNING L.A. INTO THE STRONGEST AND SAFEST CITY IN THE WORLD

Resilient Los Angeles focuses on the pressing challenges and opportunities that will shape our city today and for future generations. The City will address our preparedness for disasters, the economic security of all Angelenos, the threats of climate change, and our aging infrastructure. The City will advance this work through initiatives and measurable targets that include:



Climate Adaptation

- Prepare for the impacts of climate change by developing a comprehensive city-wide climate risk and vulnerability assessment by 2019.
- Accelerate reductions in greenhouse gas emissions and meet or exceed climate resilience outcomes consistent with the Paris Climate Agreement by 2020.
- Develop and implement urban heat island reduction plans and demonstration projects in our most vulnerable neighborhoods by 2022.
- Increase access to green space and open space through investments along the Los Angeles River system and in underserved neighborhoods by 2028.
- Increase equitable tree canopy coverage by 2028.

Vulnerability assessment



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1 Hazard

Potential source of harm for human and/or natural systems

2 Exposure / sensitivity

Presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social or cultural assets in places and settings that could be affected; **the characteristics of the considered areas make the territory more or less sensitive to the hazard**

3 Adaptive capacity

Ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences

1 X 2 X 3

*Vulnerability: degree of fragility of a human and/or natural system, resulting from a **cross-analysis** of its exposure, its sensitivity and public policies to weight this degree of fragility*

Vulnerability assessment



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1

Hazard

X

2

Exposure
/ sensitivity

X

3

Adaptive
capacity

- Identify the **climatic parameters** that may be specific to your territory/region:
 - Heat / cold waves (e.g. temperature)
 - Humidity / dry weather (e.g. precipitation)
 - Wind (e.g. speed, storm)
 - Snow and ice (e.g. snow cover, hail)
 - Coastal (e.g. sea level, erosion)
 - High seas (e.g. acidification)

“Physical” data is essentially linked to the climate to appreciate the amplitude of these climatic phenomena

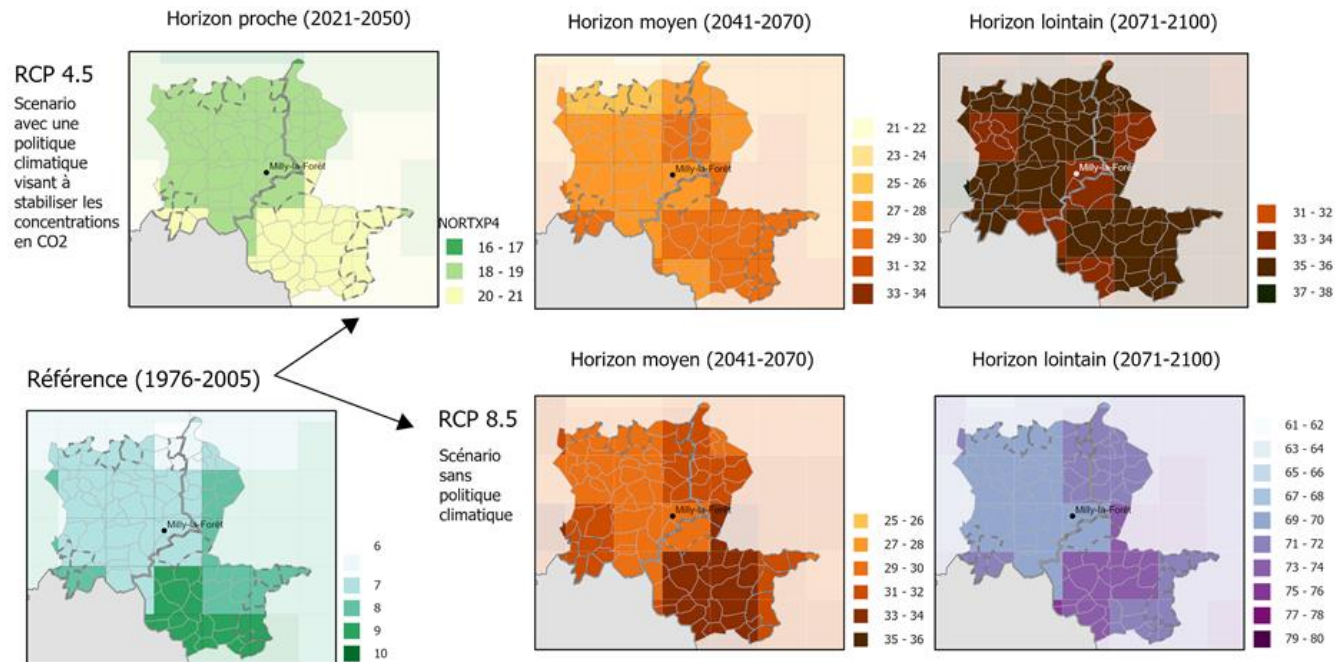
- These different hazards generate **induced phenomena**, such as drought, forest fires or shrinkage and swelling of clays

- The question arises of the location of these climatic impacts of the perimeters considered

Vulnerability assessment

Example of cartographic representation of climate hazards
Number of heat wave days at the scale of a territory

Indicateurs DRIAS 2020 - Simulations climatiques atmosphériques (modèle ALADIN63_CNRM_CM5), DRIAS 2022 indicateur NORTXHHWD, selon les Scenarii RCP 4.5 et 8.5, en jour(s)



Vulnerability assessment



ENERGee Watch

1 Hazard

X

2 Exposure / sensitivity

X

3 Adaptive capacity

- Consider the study area and the components likely to be affected by the hazards:
 - On a territorial scale (urban/rural areas, population, economic activities, water use...)
 - At the scale of an economic sector
 - At the scale of an organization (company, community)



- Determine the consequences associated with climatic events on this perimeter
- Assess the level of sensitivity (e.g. age of the population)



- The question arises as to what policies and actions are in place to moderate climate impacts

Crossing of multiple socio-economic data linked to demographics, economic sectors, housing development, etc., as well as data on projection forecasting

Vulnerability assessment



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Example of questions to determine the level of sensitivity with stakeholders

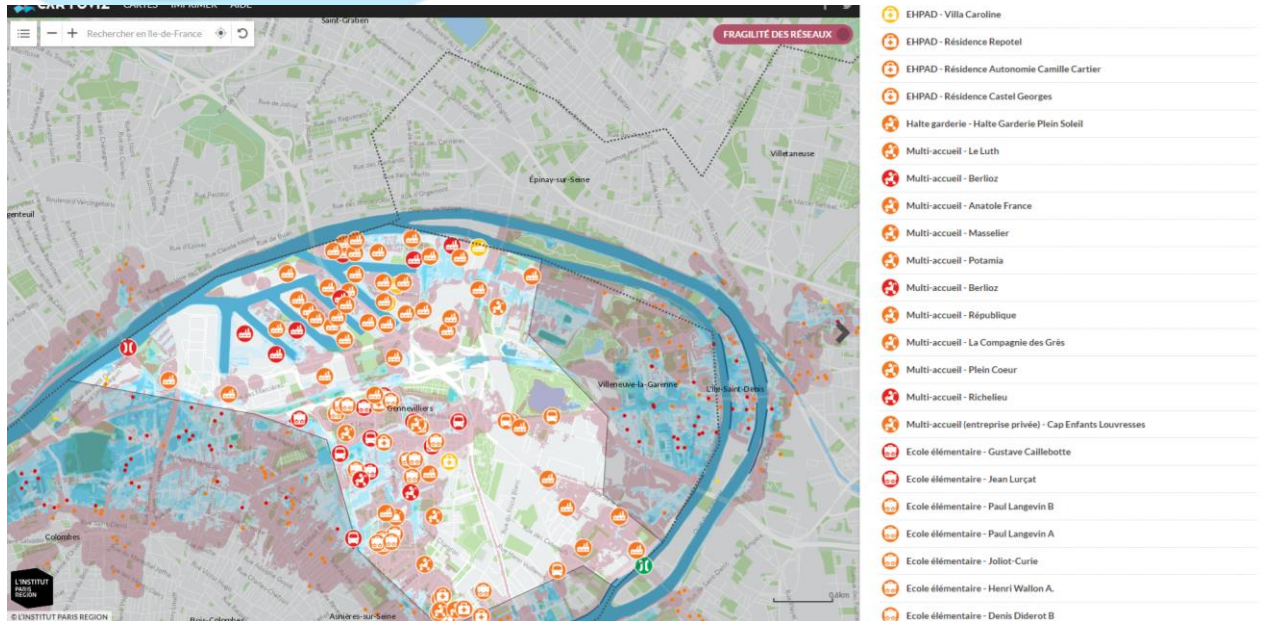
1. What services have been impacted by the climate hazard? Are these services disrupted? How might impacts to services change given projected changes in climate?
2. What facilities have been damaged, destroyed or otherwise impacted by the climate hazard? How might impacts to facilities change given projected changes in climate?
3. Have populations been impacted physically or mentally by the climate hazards? How might impacts to populations change given projected changes in climate?
4. Have there been additional downstream disruptions that result from the loss of critical services (e.g., electrical disruptions impacting hospital services)? How might impacts arising from interdependencies change given projected changes in climate?
5. How have impacts varied across your community? Which populations have been most affected? Which populations might be most impacted in the future?
6. Did the climate hazard create economic losses? How might economic losses change given projected changes in climate?
7. Have community ecological or cultural resources been impacted? How might impacts to these resources change given projected changes in climate?

Vulnerability assessment



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Example of cartographic representation of flood impacts
City of Genevilliers (near Paris)



- Representation of impacts associated with a major flood of the Seine (i.e. a water height of 8.12m at the reference station, similar to a major flooding, which occurred in January 1982)
- On the scale of the region: 535,000 people flooded and 1,707,000 people impacted but not flooded
- The map highlights areas particularly exposed: public buildings, schools, retirement homes, railway stations, fragile areas of energy networks

1 Hazard

X

2 Exposure
/ sensitivity

X

3 Adaptive
capacity

- Have an overview of policies, measures, means deployed to cope :
 - Existence of a policy dedicated to adaptation;
 - Identification of technical referents within the organization;
 - Mobilization of financial resources for the implementation of actions;
 - Establishment of a system to alert the population during climatic events;
 - Raising awareness among the population;
 - Setting up a business continuity plan in companies;
 - ...

Data related to
planning,
organisational and
financial
capacities...

1 Hazard

X

2 Exposure
/ sensitivity

X

3 Adaptive
capacity



- Ability to collect data for "a given point in time" and to make projections (demographics...) to determine current and future vulnerabilities
- An evaluation system to put in place to characterise the degree of vulnerability linked to the articulation of these three components (by grades, by colours...)
- The need to involve all stakeholders for a shared vision of the issues

Vulnerability assessment



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Table 1. Matrix to determine the class of vulnerability of receptors

Class of vulnerability		Capacity to adapt		
		Low	Medium	High
Sensitivity/ Exposure	High	High	High	Medium
	Medium	High/Medium	Medium	Medium/Low
	Low/No	Low	Low	Low

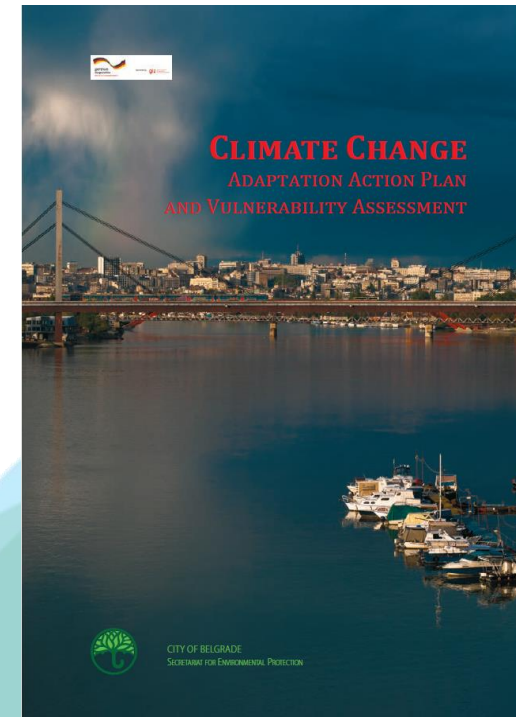
The example of the City of Belgrade

Population

	VULNERABILITY				
	Heat wave	Extreme cold	Drought	Heavy precipitation / floods	Storms
Public health / vulnerable groups	High	High	Medium	High	Medium

Infrastructure

	VULNERABILITY				
	Heat wave	Extreme cold	Drought	Heavy precipitation / Floods	Storms
Transport	Medium	High	Low	High	Medium
Electricity and heating services	Medium	High	Medium	High	High
Water supply and sewage	High	Medium	High	High	High
Social infrastructure	Medium	Medium	High	Low	Low



Type of data / indicators



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A broad component approach to 'vulnerability' entries (extracts)

Hazard	Exposure / sensitivity	Adaptive capacity
<ul style="list-style-type: none">• Cumulative annual rainfall• Number of days with heavy rainfall • Average temperature difference• Number of summer days• Number of days with frost• Number of heat wave days • ...	<ul style="list-style-type: none">• Share of the population aged over 65• Number of people exposed to climate risks • Volume of claims / exposed economic sectors• Disruption of public services • Monitoring degradation of buildings and infrastructures• Monitoring of density, rate of mineralised surfaces • Water quality monitoring and sampling• Monitoring of phenology / flowering dates• Monitoring of bird migration patterns• Monitoring of threatened areas and species • ...	<ul style="list-style-type: none">• Commitment to an adaptation strategy/action plan • Greening rate of cities • Supply of health services (number of doctors/number of facilities, equipment/inhabitants) • Dedicated budget by the local authority • ...



- Articulation of internal and external sources
- A need to collect data from a wide variety of actors
- Need to rely on local knowledge / feedback

Climate-energy observatories
(at all scales)

Consular chambers

National meteorological services

Water agencies

Observatory for natural disasters

National statistics

Forest and Nature Agency

Health observatory

Research / Universities

Insurance field

Trade associations

...



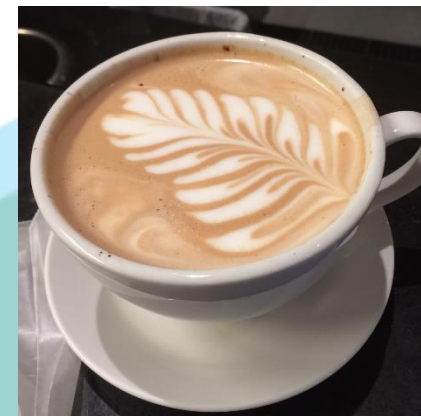
SHARING ADAPTATION
INFORMATION
ACROSS EUROPE



! Refer to tutorial
videos on climate-
adapt



Take a break !



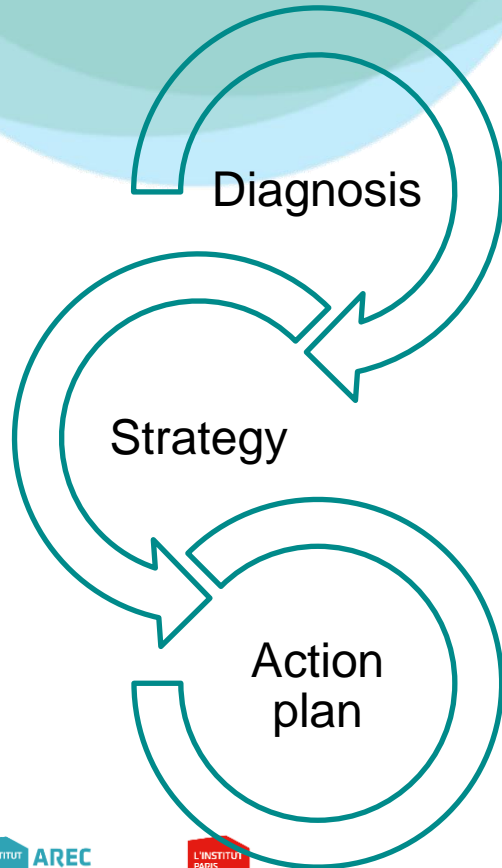


Strategy development / action plan

Climate change adaptation process



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- At the level of your organization: prefiguration achieved with a view of the project team, the schedule and the expected works
 - At the level of the territory: first mobilization of the territory actors: in order to get to know each other, sharing works, supporting the collection of data, sharing a vision of the risks for the territory
 - An identification and understanding of the main public policies at the different levels (local, regional, national, international) for the establishment of your adaptation strategy
 - A compilation of different knowledges and scientific data to the diagnosis
- ↓
- A complete diagnosis with a vision of the main stakes
- ↓
- **An initial portfolio of actions** developed during the workshops within your organization and with the territory actors

An initial actions portfolio (adaptation options)



- Different ways to classify / organize this first portfolio

Stakes	Thematic categories	Types of actions	Adaptation process (intensity of change)	Types of objectives
<ul style="list-style-type: none"> • Health stakes for vulnerable population • Increased damages on infrastructure and housing • Losses in agricultural sectors • Forest dieback • Sustainability of the insurance system • ... 	<ul style="list-style-type: none"> • Urban planning • Mobility • Biodiversity • Governance • Building • ... 	<ul style="list-style-type: none"> • Soft adaptation measures (e.g. mapping of urban heat islands, climate criteria integration in urban planning policies) • Technical / "grey" (e.g. refurbish building; enhance physical flood defenses, increase capacity of sewage systems), • Ecological / "green" (e.g. implementing or expanding green infrastructure for water runoff management or microclimate moderation) 	<ul style="list-style-type: none"> • Incremental adaptation • Transformational adaptation 	<ul style="list-style-type: none"> • Enhance adaptation capacity • Reduce the exposition / sensitivity

Assessing and selecting adaptation options

**Initial
actions
portfolio**

- Temporality of the actions
- Degree of deliverability and feasibility
- Cost-benefit of adaptation options

**Tiered
actions
portfolio**

Cost and benefit of adaptation options



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3 common methods

Cost-Benefit Analysis (CBA)

Economic analysis that assigns a monetary value to the measure of effect

Cost-Effectiveness Analysis (CEA)

Economic analysis that compares the relative costs and outcomes (effects) of different courses of action

Multi-Criteria Analysis (MCA)

Evaluation of multiple conflicting criteria in decision-making

Table 1: Adaptation action evaluation criteria

Category	Criteria	1 (low)	2 (medium)	3 (high)
Sustainability	Mitigation co-benefits	Result in increased GHG emissions	Would not affect GHG emissions	Would reduce greenhouse gas emissions
	Equity	Benefits to few people	Benefits to many people	Significant benefits to many people
	Implementation Cost	Cost is high relative to cost of inaction	Cost is moderate relative to cost of inaction	Cost is low relative to cost of inaction
Effectiveness	Robustness	Effective for a narrow range of plausible future scenarios	Effective across many plausible future scenarios	Effective across a wide range of plausible future scenarios
Risk and Uncertainty	Urgency	Risks are likely to occur in the longer term	Impacts are likely in the near to mid term	Impacts are already occurring
Opportunity	Ancillary benefits	Will contribute little if not at all to other City goals and programs	Will contribute somewhat to other City goals and programs	Will contribute significantly to other City goals and programs
	No Regret	Will have little or no benefit if climate change impacts do not occur	Will have some benefits regardless of actual climate change impacts	Will result in significant benefits regardless of actual climate change impacts
	Window of Opportunity	There is no window currently	A window of opportunity could be created	A window of opportunity exists to implement
Implementation	Funding Sources	External funding sources are required but have not been identified	External funding sources are required and likely to be secured	Funding is available externally or internally
	Institutional	Implementation requires coordination with, or action by other jurisdictions	Implementation requires external approval	Implementation is within local control

Regarding the Multi Criteria Analysis (MCA), a set of criteria could be:

- / urgency with respect to already existing threats
- / early preparatory action (to avoid future damage costs)
- / range of effect (options covering multiple risks might be favoured)
- / cost-benefit ratio
- / efficiency and effectiveness of the measures to deliver adaptation
- / time-effectiveness
- / robustness under a broad range of likely future impacts
- / flexibility for adjustments or reversibility in case of diverging developments
- / political and cultural acceptability
- / enhancement of learning and autonomous adaptive capacity, etc.



Counteract the uncertainty , the « maladaptation » by selected:

- / "No-regrets adaptation options" that are worthwhile whatever the extent of future climate change will be
- / Low-regret actions are relatively low cost and provide relatively large benefits under predicted future climates.
- / "Win-Win options" are adaptation options that deliver the desired result in terms of minimising the climate risks or exploiting potential opportunities but also have significant contribution to another social, environmental or economic goal

Examples:

- / Reducing leakage from water utility infrastructure; Building/designing property and buildings to minimise over-heating in summer months
- / Building extra climate headroom in new developments to allow for further modifications (e.g. increased ventilation, drainage) consistent with projected changes in temperature and precipitation
- / Flood management that includes creating or re-establishing flood plains which increase flood management capacity and support biodiversity and habitat conservation objectives

Structuration of the action plan



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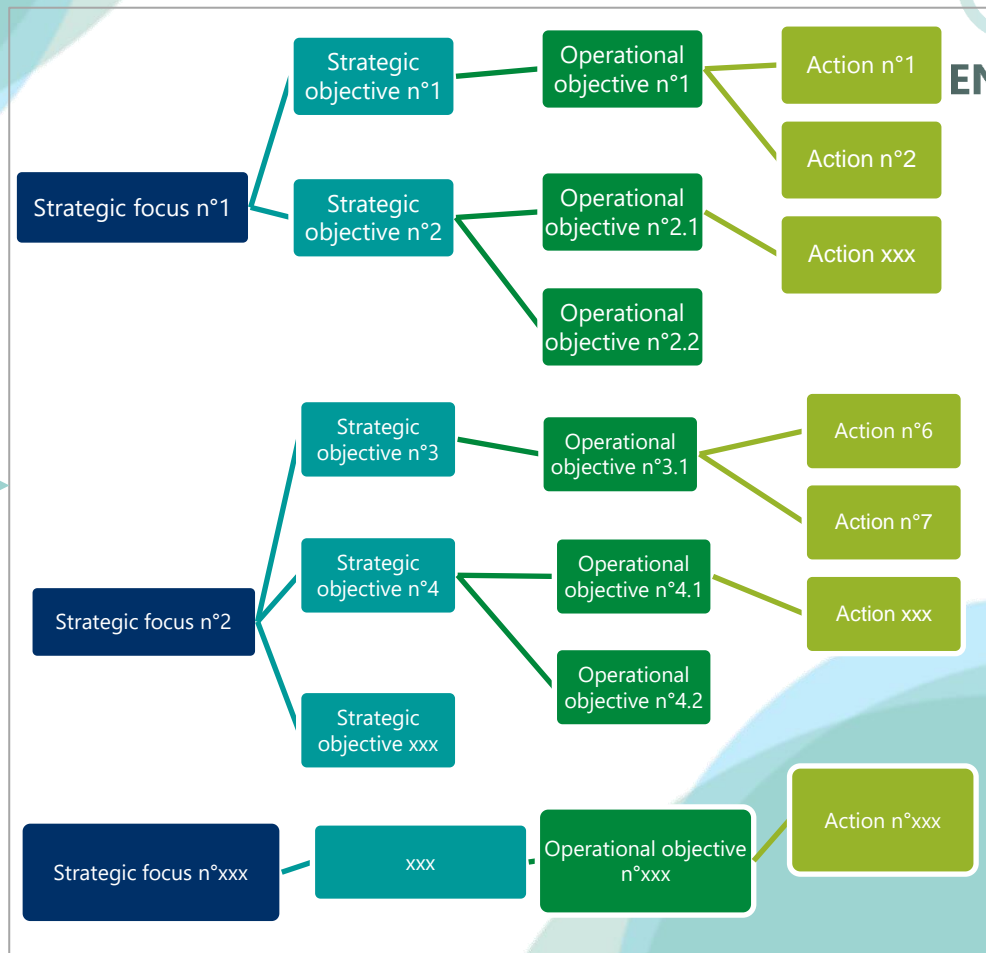
Diagnosis /
main stakes

+

Ambition of
the local
authorities

+

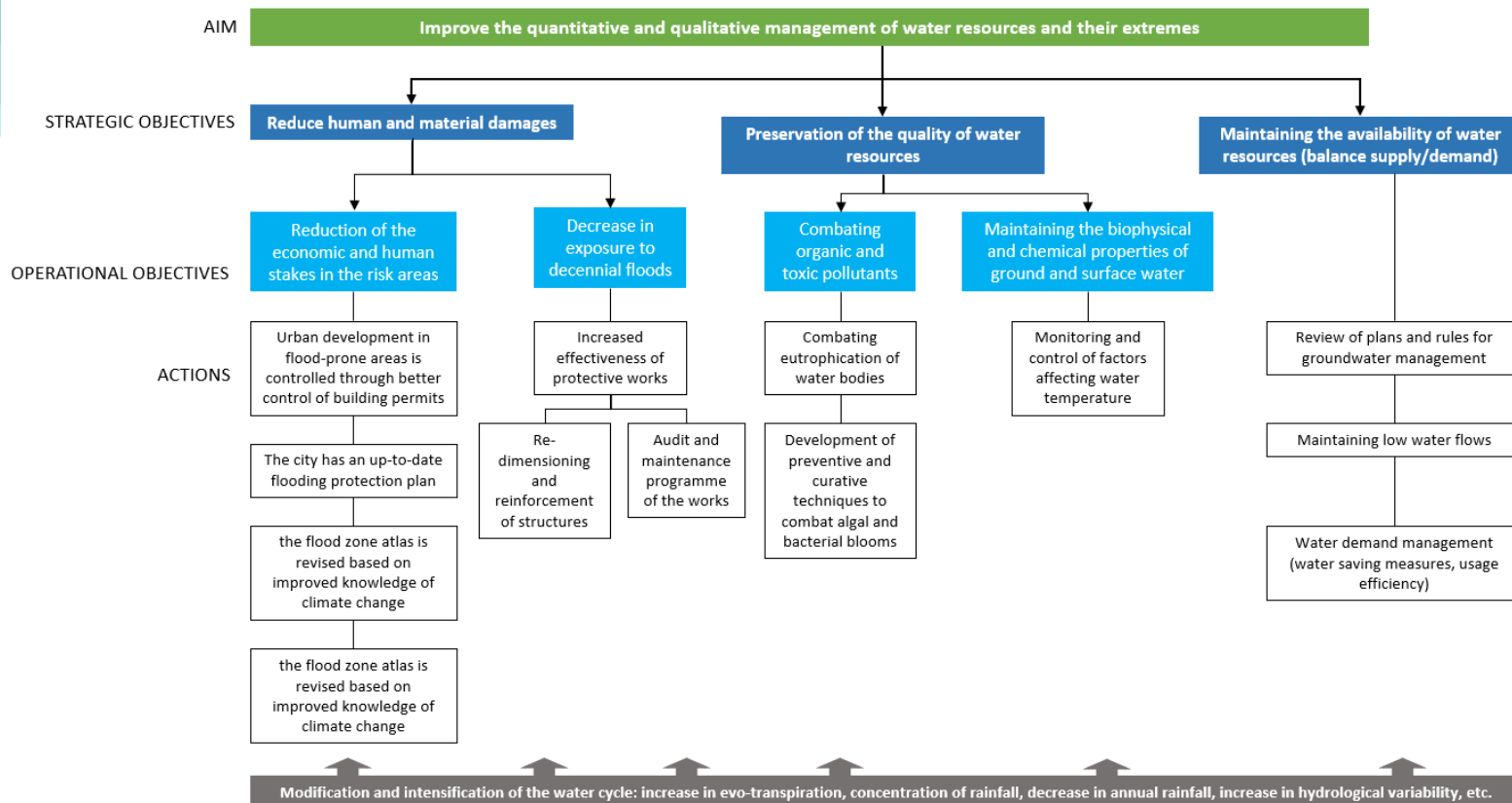
Concertation
– CO-
construction
workshop



Structuration of the action plan



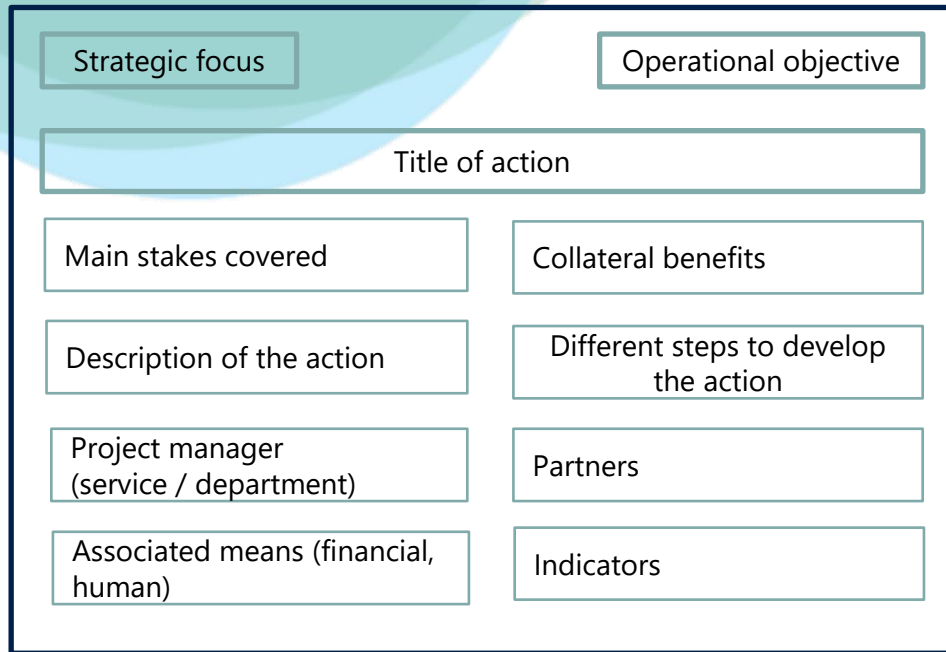
Match



Modification and intensification of the water cycle: increase in evo-transpiration, concentration of rainfall, decrease in annual rainfall, increase in hydrological variability, etc.

Source: ADEME

From action sheets to a final action plan



An example of the model action sheet

Action sheet model of a local authority in French


Axe Stratégique N°5 : Accompagner l'évolution des modes de production agricoles et d'alimentation et adapter le territoire aux changements climatiques			
Action 5.6 : Animer une démarche pour enrichir l'approche locale sur l'adaptation			
Volet	Atténuation	Adaptation <input checked="" type="checkbox"/>	Qualité de l'air
Contexte et enjeux			
L'adaptation aux effets du changement climatique est un enjeu planétaire et voit émerger de nouvelles solutions et pratiques, au niveau national comme international.			
Objectif			
Incorporer et diffuser des nouvelles connaissances et retours d'expériences Réaliser l'évaluation des connaissances et sensibiliser les élus ex-post			
Mode opératoire			
1. Réaliser une étude benchmark de solutions d'adaptation existantes, au niveau des régions françaises et à l'international 2. Mener une campagne de sensibilisation et de mobilisation des acteurs -> Organiser un séminaire pour sensibiliser fortement les élus. -> Faciliter les échanges -> Sensibiliser et communiquer autour des principaux résultats 3. Mettre en place un groupe de travail afin de capitaliser sur les ressources en ligne (facilité par la CU) -> Organiser un centre de ressource en ligne nourri par des retours d'expériences permettant d'optimiser les mesures à développer. -> Recenser les meilleures pratiques pouvant être développées sur le territoire			
Conditions de succès			
Porte d'entrée : PAPI, GP3eO, Plan climat			
Initiateur / Facilitateur		Partenaires	
Les constructeurs, la collectivité, les aménageurs		Bureaux d'études AESN DRIEE / DDT Région, CD Collectivités, Riverains	
Coût d'investissement		Coût annuel de fonctionnement (hors temps-homme)	
Coût d'une étude benchmark : 20-30K€			
Temps-humain nécessaire pour la mise en œuvre de l'action		Co-bénéfices	
0,5 ETP pour la réalisation de l'étude benchmark et la gouvernance			
Public ciblé		Calendrier prévisionnel	
Grand public, élus		Horizon de mise en œuvre : court -> 1 an pour la réalisation de l'étude benchmark -> 1 an pour la création du groupe de travail	
Indicateurs de suivi		Indicateur de résultat	
Comptes-rendus de ces recherches, incorporation d'études de cas et d'exemples dans les plans d'adaptations		Nombre de projets issus de l'étude appliqués au territoire	

Link with the indicators



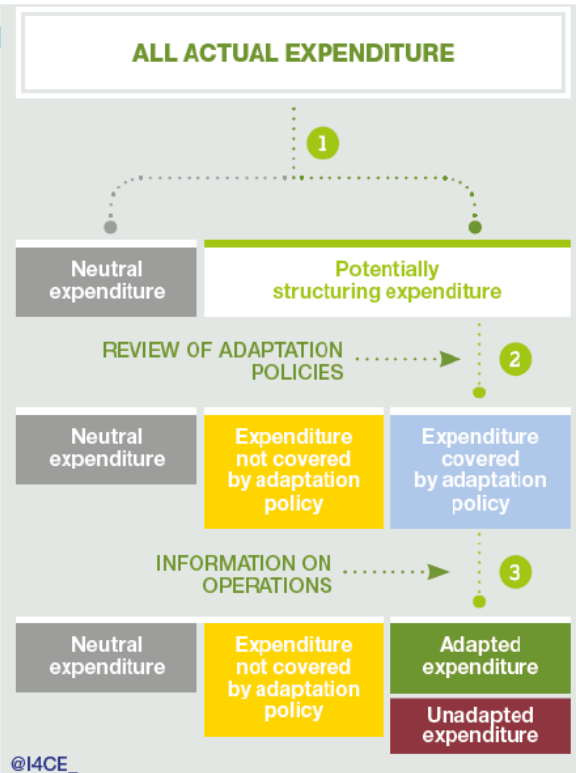
Level	Intervention logic	Description	Factors for success	Indicator per level
Strategy	Aim	<p>Describes the medium or long-term goal for adaptation to which the policy contributes at territorial and/or sectoral level</p> <p>Example: Promoting awareness on climate risk in a given region</p>	Stakeholders are convinced of the reality of climate change	<p>Impact indicator</p> <p>Example: Stakeholders' capacity for expertise and action on adaptation</p>
	Strategic objective	<p>Describes the strategic outcome(s) targeted by the policy</p> <p>Example: Raise awareness on adaptation issues among elected officials and territorial decision-makers</p>	Support from elected officials	<p>Indicators on the strategic impact of the policy</p> <p>Example: Number of people reached (by trainings or information campaigns)</p>
	Operational objective	<p>Describes the tangible elements that the policy must produce to achieve the strategic objective</p> <p>Example: Train government services and local authorities in management of climate risks when analysing and implementing projects</p>	Motivation and availability of target audiences	<p>Indicators for operational results</p> <p>Example: Number of people trained</p>
Action plan	Actions	<p>Describes the different tasks to be carried out to achieve the desired operational results</p> <p>Example: Carry out interdepartmental trainings, Carry out trainings across local authorities</p>	Adequacy of training content to needs	<p>Indicators for the implementation of actions</p> <p>Example: Number of trainings, Quality of trainings</p>
	Means / Resources	<p>Describes the human, technical and financial resources mobilised for the implementation of the actions</p> <p>Example: Budget available, external technical assistance</p>	<p>Approval of funding requests</p> <p>Availability of required expertise profiles</p>	<p>Indicators on means and resources</p> <p>Example: Amount in subsidies obtained, Number of trainers mobilized</p>

The purpose of the indicators

- Check the adaptation pathway
 - Understand the efficacy of the actions' implementation
 - Appreciate the needs for adjustment of the actions or the needs for new actions
 - Give a transparent framework to stakeholders and the population
- 
- Link to evaluative questions
 - Difficulties to assess the action plan in long term -> focus on the process
 - Mix of quantitative and qualitative indicators

An alternative approach > Budget Climate Assessment

Adaptation: quick view



Principles

- / Categorising all budget expenditures according to their climate impacts
- / Assessment based on climate expertise (no CO₂ quantification)

Objectives

Evaluation on how the Local Authority (LA) is taking adaptation into account:

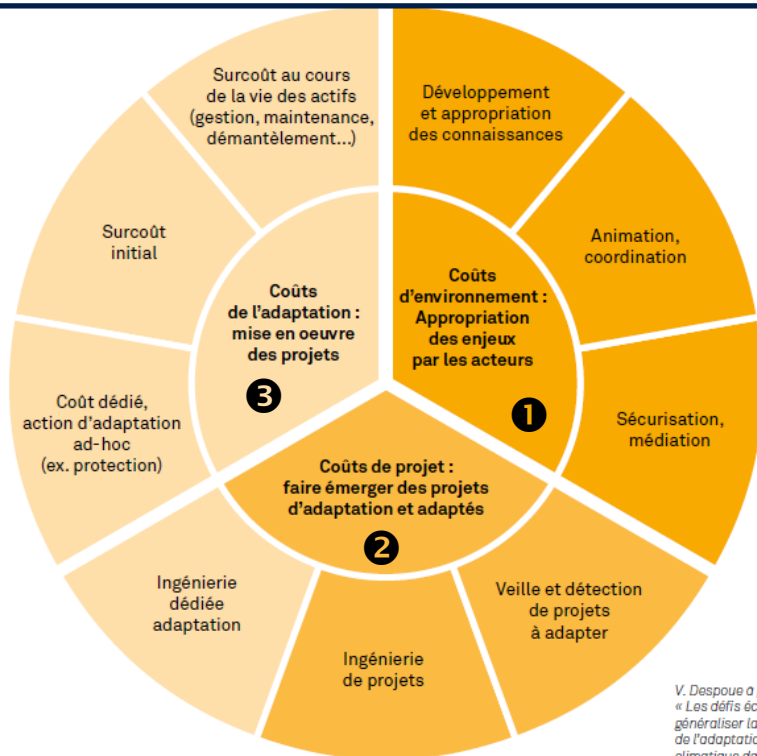
Has the LA implemented process and policies on adaptation? Is adaptation taken into account wherever it is necessary?

= evaluation based on implemented process

≠ evaluation based on the impacts of the adaptation actions already implemented

Zoom on the means

Typology of theoretical adaptation costs (I4CE, Ramboll 2021)



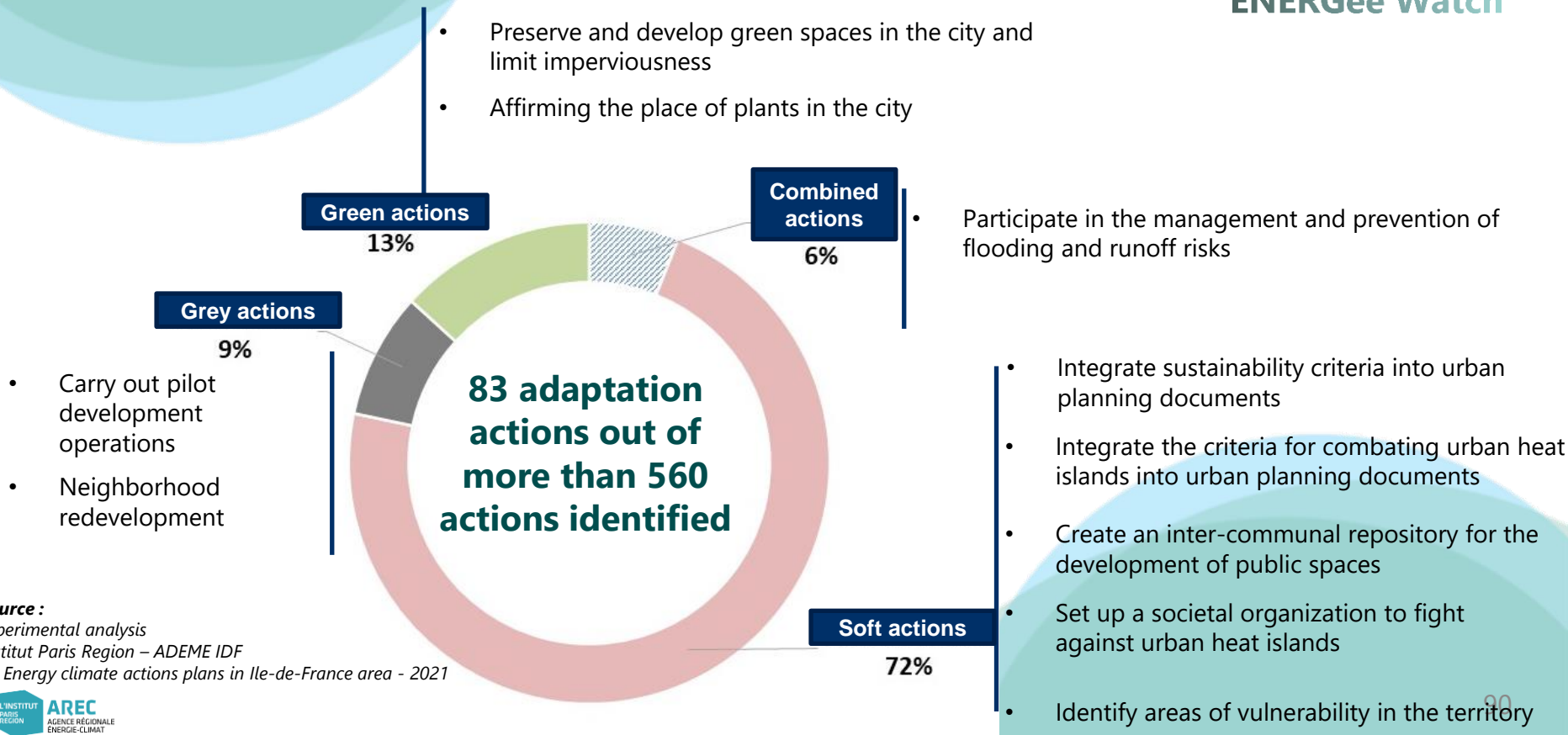
V. Despoue a partir de I4CE, 2021,
« Les défis économiques pour
généraliser la prise en compte
de l'adaptation au changement
climatique dans les territoires français ».

1. Environmental costs: ownership of issues by stakeholders
/ Knowledge development and appropriation
/ Animation, coordination
/ Mediation
2. Project costs: to bring out adaptive and suitable projects
/ Monitoring and detection of projects to be adapted
/ Project engineering
/ Engineering dedicated to adaptation
3. Costs of adaptation: project implementation
/ Dedicated costs, ad-hoc adaptation action
/ Initial extra cost
/ Additional costs during the life of the assets
(management, maintenance, dismantling, etc.)

"Investing \$1.8 trillion between 2020 and 2030 in five areas could generate total net benefits of \$7.1 trillion"
Global Commission on Adaptation

- The most important step is to start:
 - Develop some actions in line with the main stakes
 - For these actions identify responsible project managers /departments / services, as well as necessary means and partnerships
 - In complementarity with concertation workshops, a form of governance should be established for your local authority (from the diagnostic phase) which could be opened to some stakeholders
- Keep the philosophy of adaptation:
 - It's always in process (evolution of the climate and the risks), constant need to improve knowledge and need for studies regarding some phenomena
 - It's always a question of territory, and the solutions are established at this level
 - The vulnerability is not only a question of climate but also a question of social economical characteristics of the territory

A partial vision in the Ile-de-France region



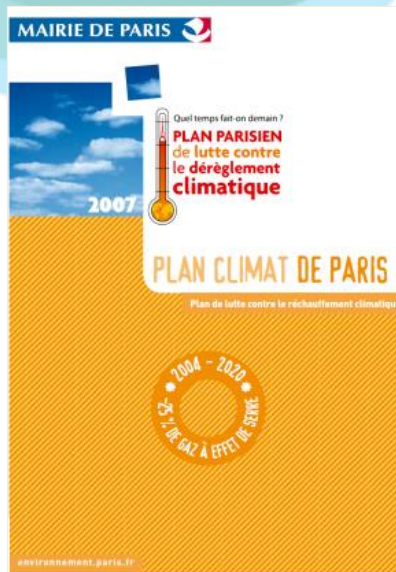
Source :
Experimental analysis
Institut Paris Region – ADEME IDF
11 Energy climate actions plans in Ile-de-France area - 2021



Building and implementing an action plan for adaptation : Examples of the Cities of Paris (FR) and Cascais (PT)

Adaptation to climate change in the City of Paris

2007-2012: first research on the urban heat-island effect



2007




2008-2012

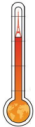


2012

2012-2015: Formalisation of a climate change adaptation policy

2012

MAIRIE DE PARIS  Direction des Espaces Verts et de l'Environnement
Agence d'Ecologie Urbaine - Division Climat-Energies



Paris face aux changements climatiques
et à la raréfaction des ressources :
robustesses et vulnérabilités

RAPPORT DE SYNTHESE
Conclusions et recommandations pour l'adaptation
du territoire

RAPPORT FINAL – Octobre 2012

2015

MAIRIE DE PARIS 



LE PLAN CLIMAT
Mairie de Paris

- Protect Parisians in the context of extreme climate events
- Garanty water, food and energy supply
- Live with climate change: Develop the city in a more sustainable way
- Support the new life styles and strengthen solidarity

2018: Climate change adaptation at the centre of the Paris Climate Plan



Global climate approach with a strengthened chapter on adaptation (+ than 150 actions) which serves the territorial resilience

What hazards and resources are analysed ?

Aléas climatiques



Températures moyennes



Canicules



Neige et verglas



Grands froids



Tempêtes



Précipitations moyennes



Fortes pluies



Sécheresse sol



Inondations



Mouvement de terrain



Energie



Eau



Alimentation



Biodiversité



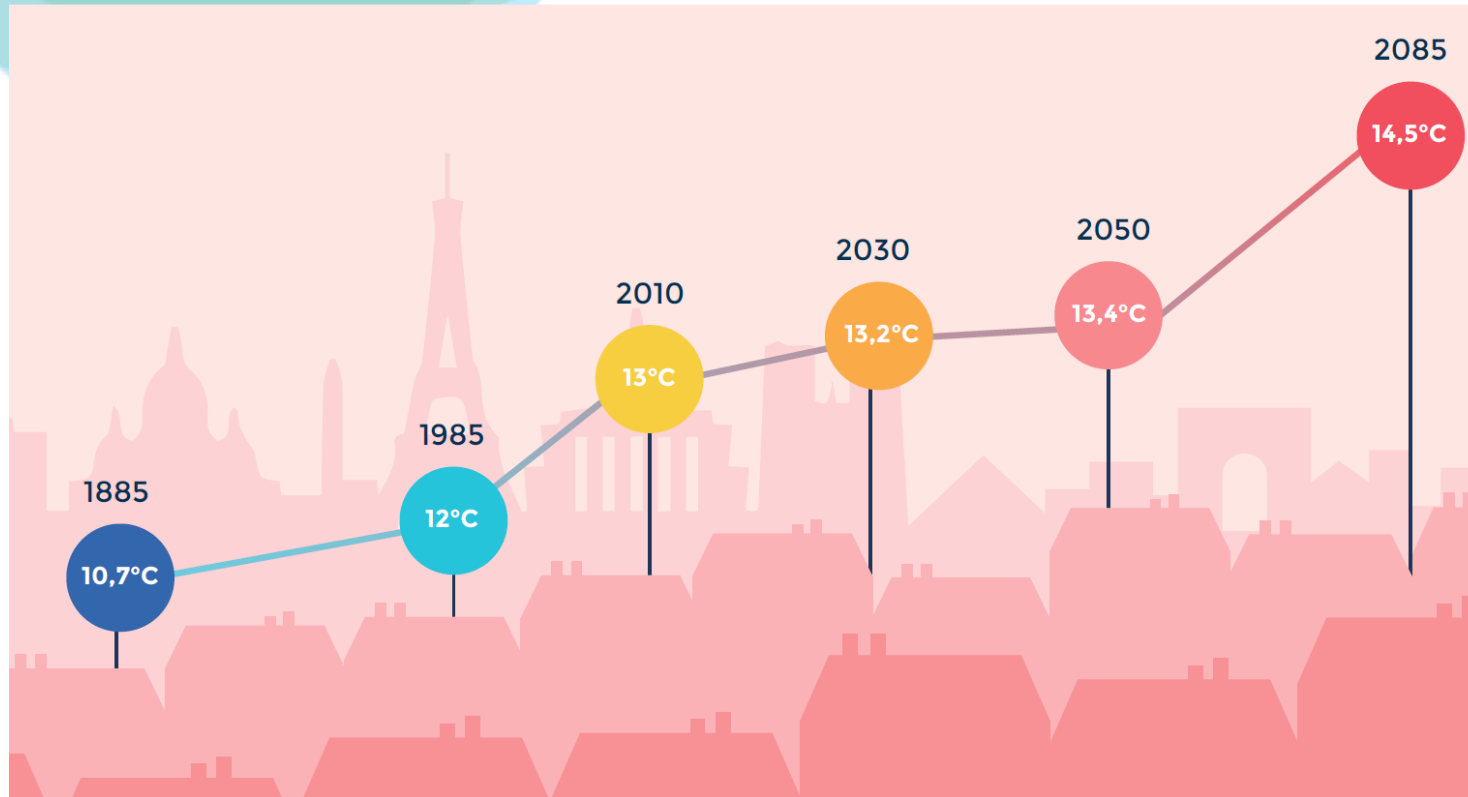
Air

TEMPERATURE TRENDS



ENERGee Watch

TEMPÉRATURE MOYENNE : CHAQUE DEGRÉ COMPTE



The average, maximal and minimal temperatures are increasing

The threshold of + 2°C is already exceeded in Paris

Confirmation & acceleration of the risks identified in 2012



La ville en
surchauffe



Les inondations



La raréfaction de
la ressource en eau



L'altération de
la Biodiversité

~~2050~~

2030

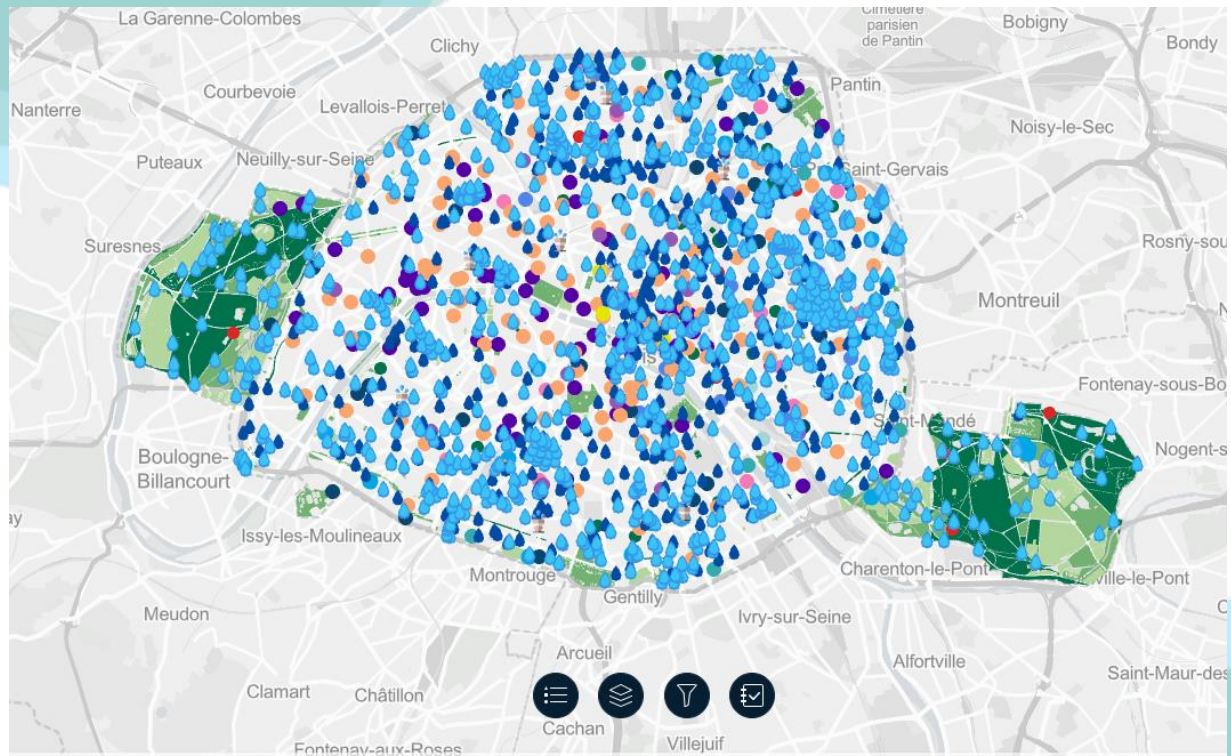
Fight against the urban heat island effect



Interactive map of locations where Parisians can find shade and cool down during heat waves



:h



Equipements / Activités

- Brumisateur
- Ombrière
- Banc climatique
- Bains-douches
- Piscine
- Baignade extérieure
- Terrain de boules
- Bibliothèque climatisée
- Cour d'école Oasis
- Musée
- Lieu de culte
- Mairie d'arrondissement
- Découverte et Initiation

Espaces verts

- ### Part végétation haute
- Très exposé au soleil donc plutôt chaud (moins de 25% de végétation haute)
 - Partiellement ombragé donc modérément frais (de 25 à 50% de végétation haute)
 - Très ombragé donc frais (plus de 50% de végétation haute)

→ Tool developed by the Agence Parisienne du Climat : <https://www.apc-paris.com/article-rubrique/ilots-parcours-fraicheur-a-paris-ou-se-rafraichir-cet-ete>

Green public spaces and buildings



