

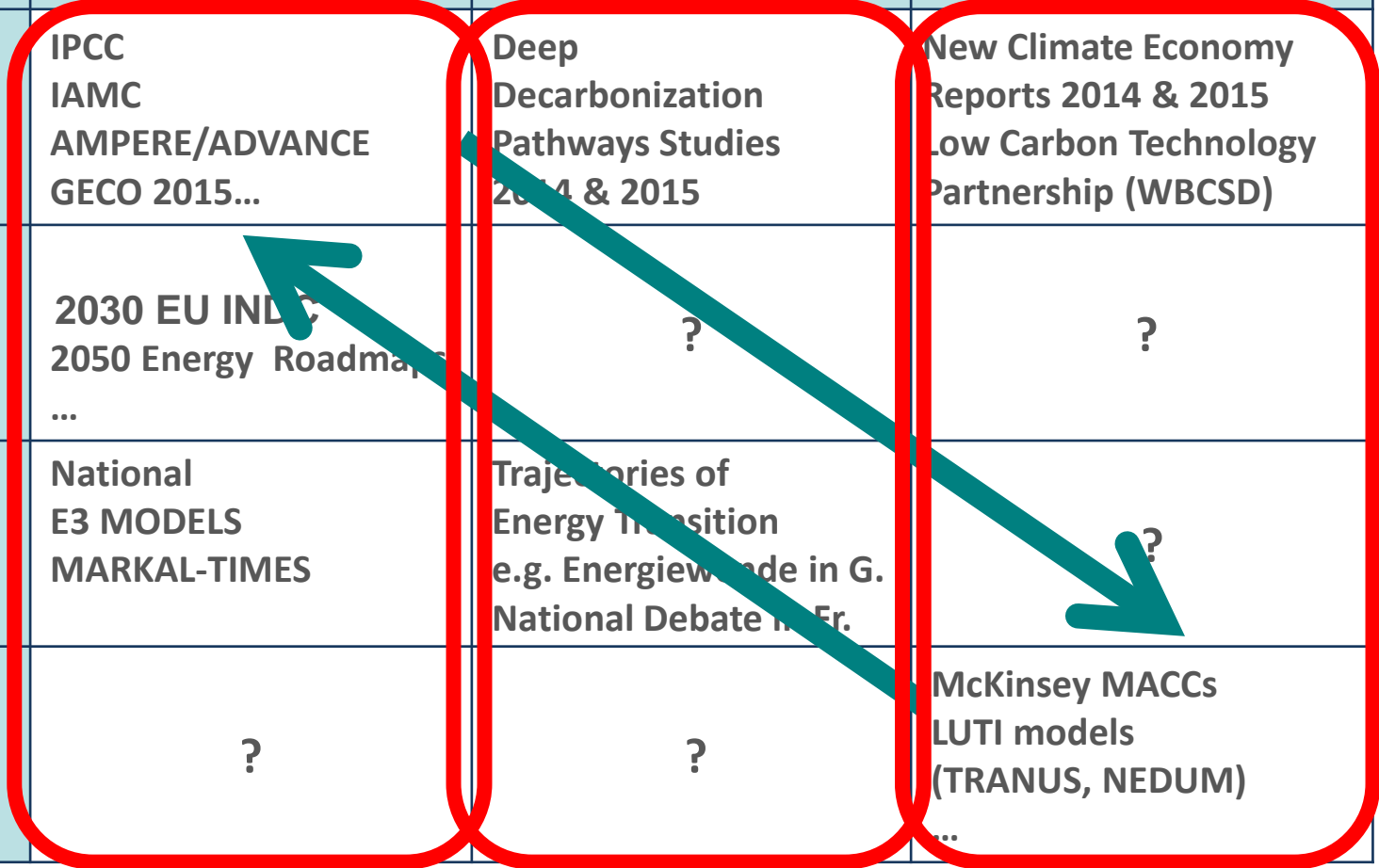
*Governance levels,  
scientific paradigms  
and policy instruments  
for Deep Decarbonization Pathways*

***P. Criqui***  
**UGA-CNRS**

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# 4 governance scales x 3 research paradigms

	IAMs - Integrated Assessment Models	NATIONAL DECARBONIZATION SCENARIOS	SECTORAL & URBAN TRANSITION STUDIES
GLOBAL/ INTERNATIONAL	IPCC IAMC AMPERE/ADVANCE GECO 2015...	Deep Decarbonization Pathways Studies 2014 & 2015	New Climate Economy Reports 2014 & 2015 Low Carbon Technology Partnership (WBCSD)
REGIONAL/ EUROPEAN LEVEL	2030 EU INDC 2050 Energy Roadmap ...	?	?
NATIONAL	National E3 MODELS MARKAL-TIMES	Trajectories of Energy Transition e.g. Energiewende in G. National Debate in Fr.	?
SUB-NATIONAL / COMMUNITY	?	?	McKinsey MACCs LUTI models (TRANUS, NEDUM) ...



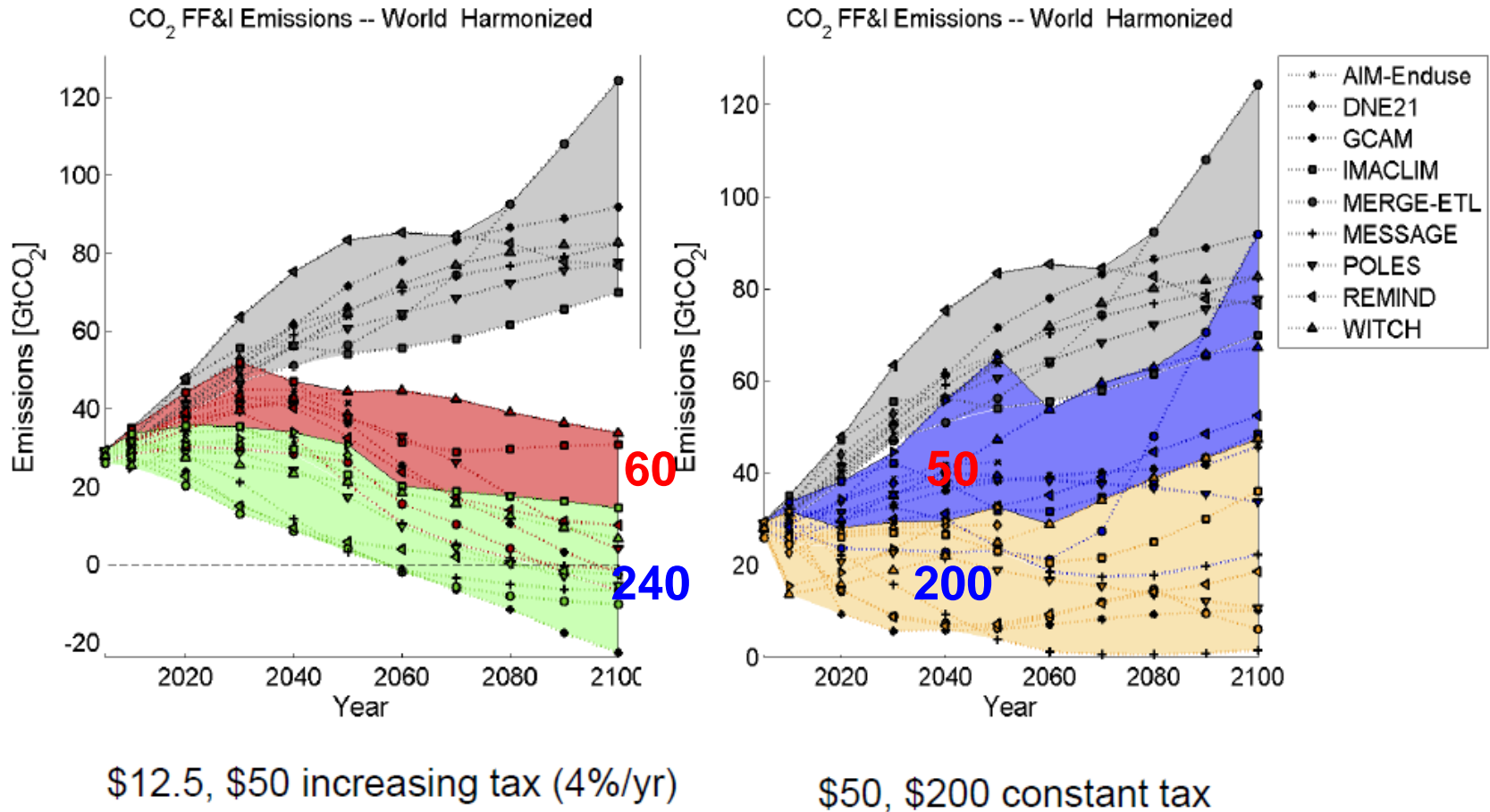
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# FP7 AMPERE: diagnostics and validation



## CO<sub>2</sub> Fossil Fuel and Industry Emissions



Source: Elmar Kriegler PIK, AMPERE Venice meeting, 23-25 May 2012

# Climate goals and delay:

Delayed action results in the need for unprecedented mitigation in the following decades



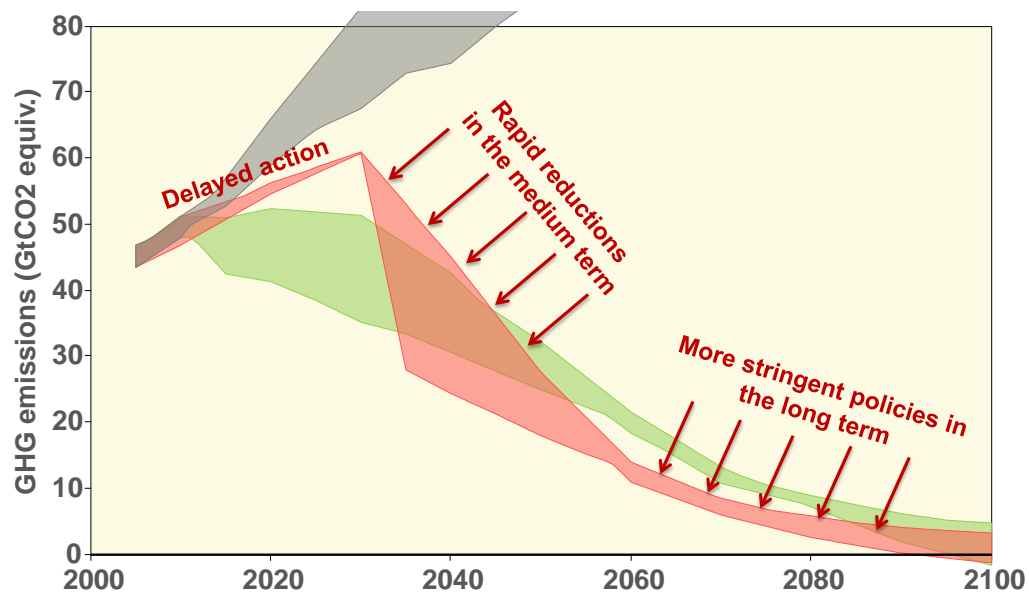
Near-term climate action by 2030 will be critical:

- ◆ Continuation along current pledges exhausts ~70% of the emissions budget by 2030
- ◆ The lack of near-term mitigation needs to be compensated by massive emissions reductions later in time

The findings suggest global GHG emissions targets of less than 50 GtCO<sub>2</sub> by 2030

⇒ EU -40% GH in 2030

## Implications of delayed action for reaching 2°C



# 4 governance scales x 3 research paradigms

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# The National Council for Energy Transition (2012-2013):

7 x 16 members

1. Environmental NGOs
2. Consumer Associations
3. Trade-Unions
4. Industry
5. Local authorities
6. Parliament
7. Administration

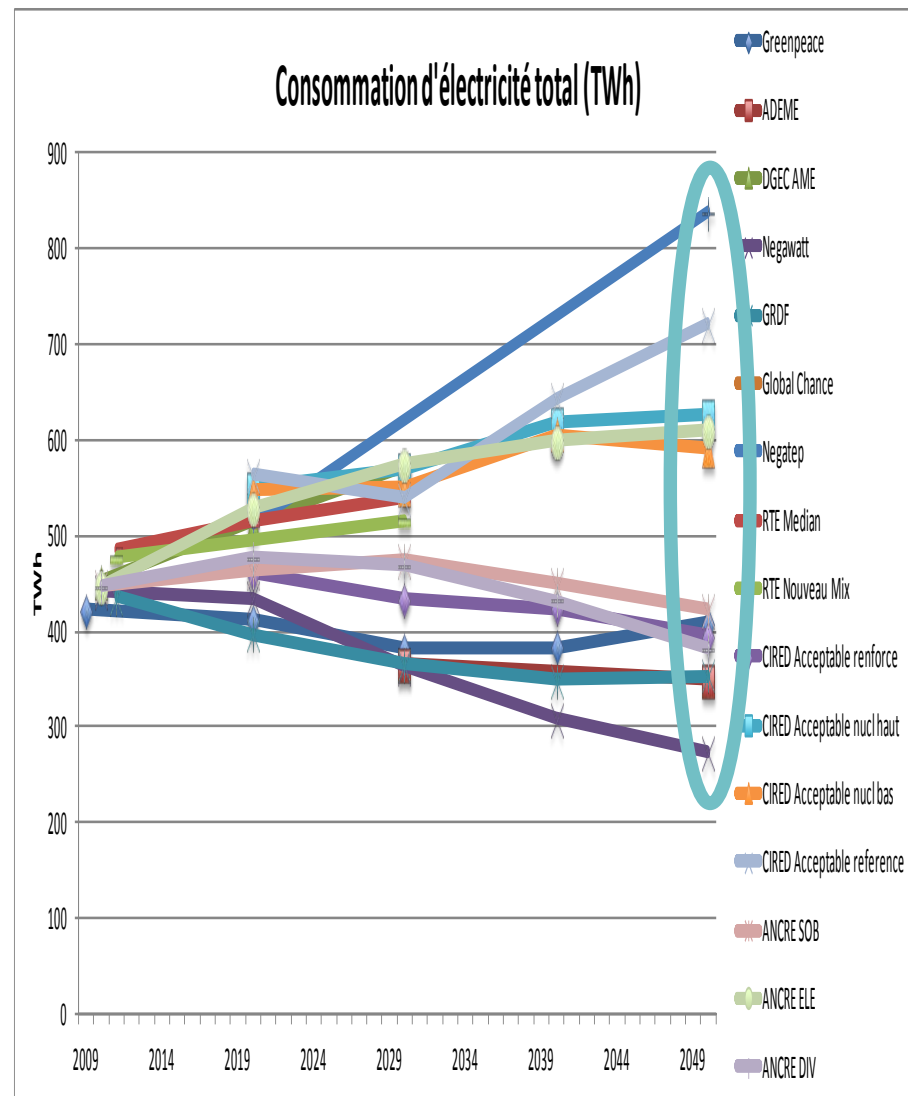
+ Expert Group

+ Citizen Group



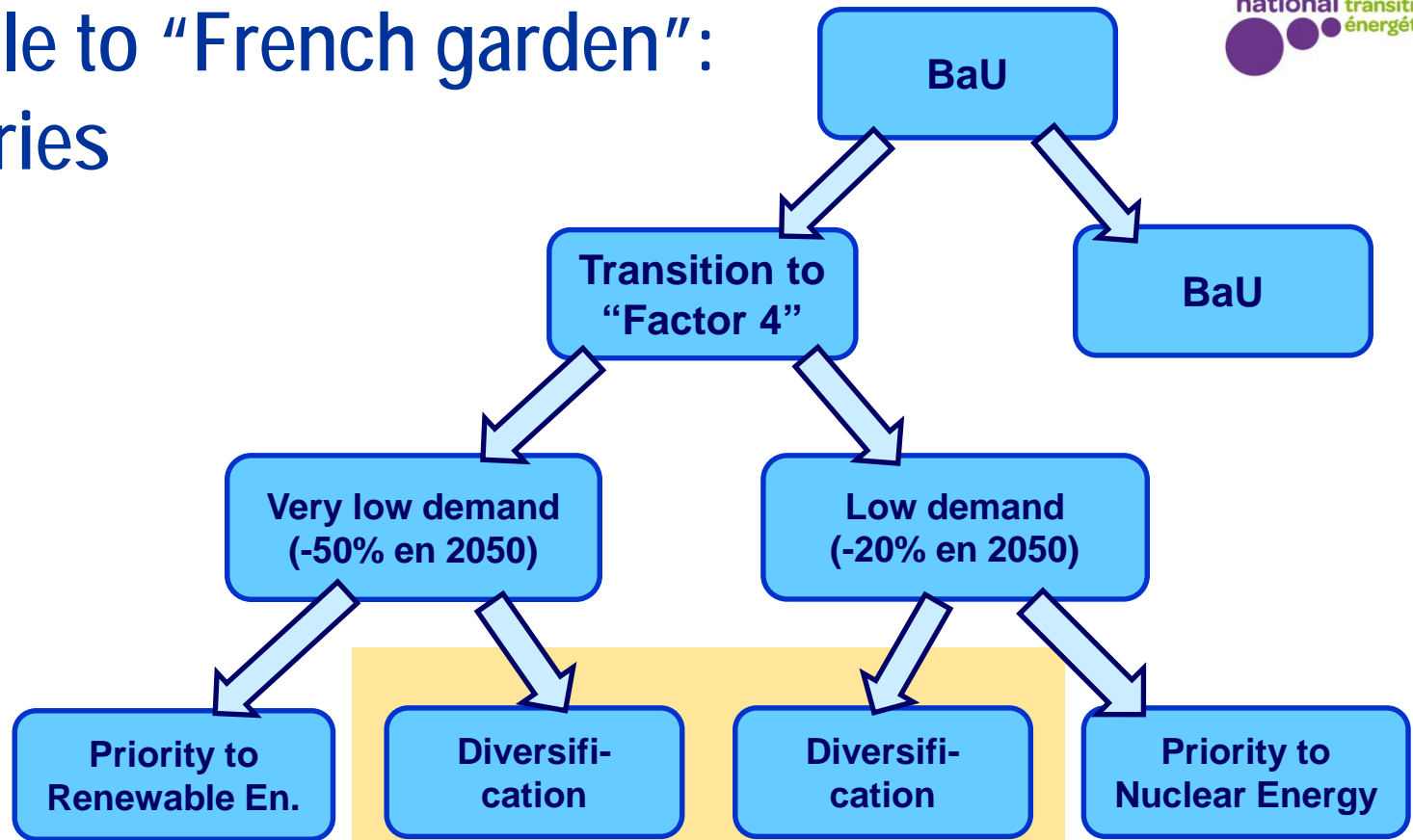
# The diversity of energy scenarios to 2050 for France

- ◆ Hypotheses and results have been gathered from 16 pre-existing scenarios to 2050
- ◆ A very wide range of energy futures: total electricity consumption varies from 450 TWh today to between 280 and 820 TWh in 2050
- ◆ The main goal of the scenario working group and of its experts has been to:
  - 1. identify a limited number of structural “trajectories”**
  - 2. evaluate them in a multicriteria approach**





# From jungle to “French garden”: 4 Trajectories



Four Trajectories: *SOBriety*      *EFFiciency*      *DIVersity*      *DECarbonization*

Explored by 15 scenarios:

**négaWatt**  
Greenpeace  
WWF  
Global Chance

**ADEME**  
GRDF  
ANCREsob  
ENCILOCARBrenf

**ANCREdiv**  
RTEnouvmix  
DGECams-o

**Négatep**  
RTEmed  
ANCREele  
UFE

# 4 governance scales x 3 research paradigms

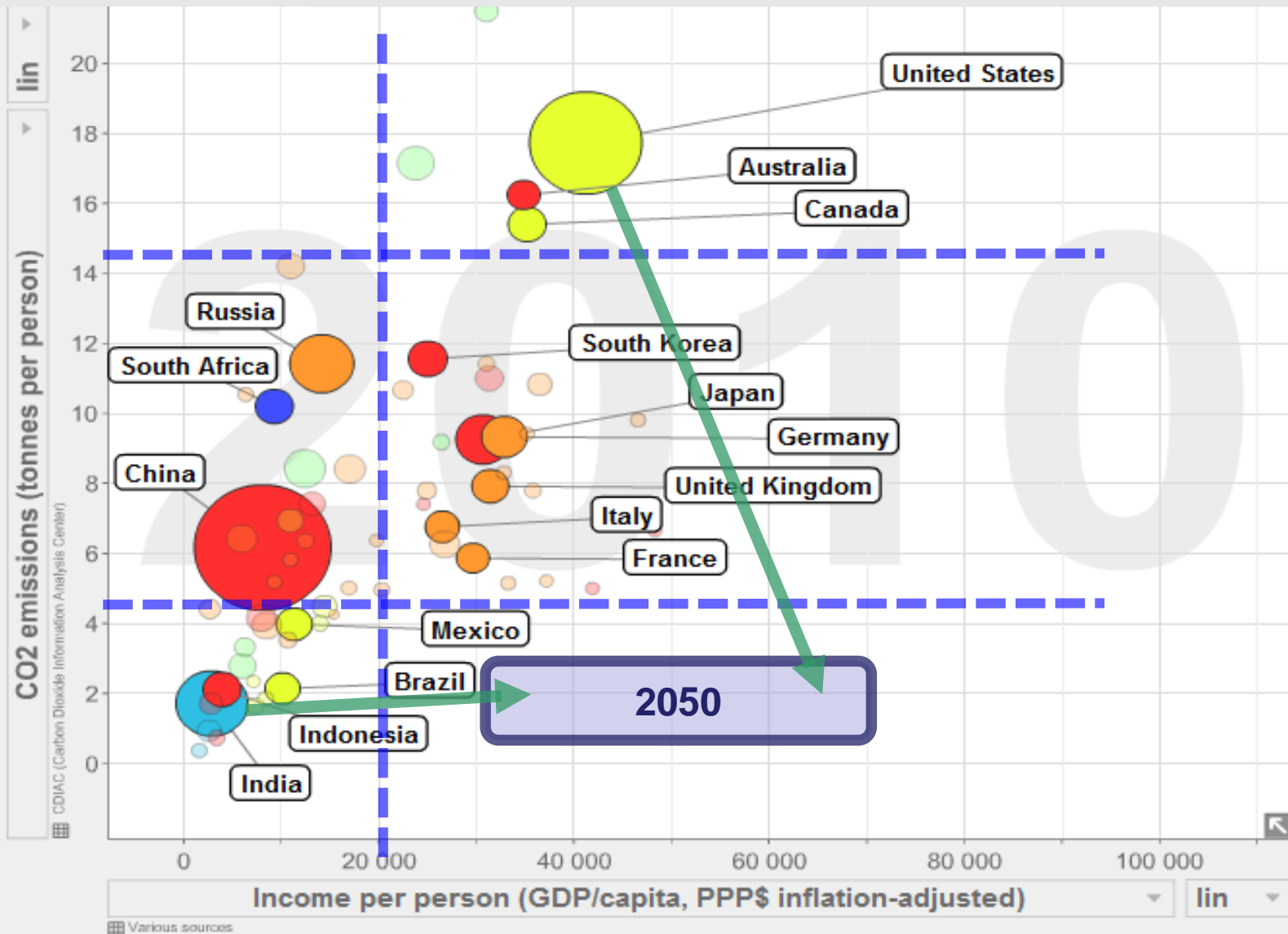
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## Launched in 2013 by Laurence Tubiana–IDDRI and Jeffrey Sachs–SDSN



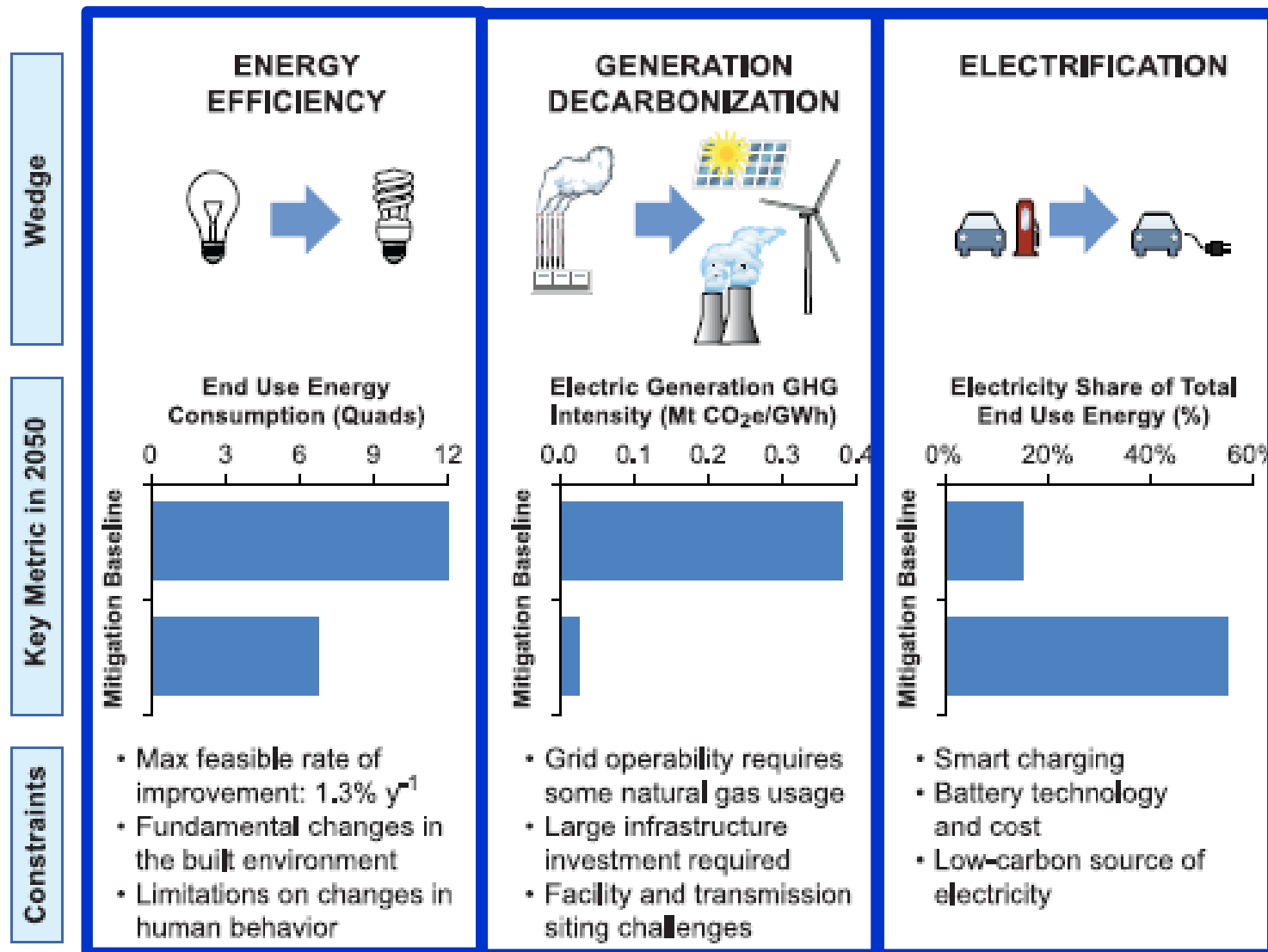
- ◆ 32 leading research institutions from 16 countries, covering more than 75% of global CO<sub>2</sub> emissions. The project aims to:
  1. Prepare transparent national deep decarbonization pathways to 2050 to help countries adopt policies to achieve deep decarbonization.
  2. Support a positive outcome of the UNFCCC COP21 by helping decision makers to understand what deep decarbonization implies for individual countries and regions.
  3. Review aggregate global emission reduction pathways prepared for AR5 by the WG III in light of the national decarbonization pathways.
  4. Build an on-going global network to facilitate learning and implementation of national of deep decarbonization strategies after 2015

# A double convergence process



# Les trois piliers de la décarbonisation

(Jim Williams, E3 San Francisco, Science 2012)



# 4 governance scales x 3 research paradigms

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# New Climate Economy Report (Stern-Calderon Commission)

## Low Carbon Technology Partnership (WBCSD)

## Fourth Industrial Revolution (WEF)

**BETTER  
GROWTH  
BETTER  
CLIMATE**

Charting a new path for low-carbon growth and climate.

> Explore 2014 Report

**SEIZING  
THE  
GLOBAL  
OPPORTUNITY**



Low Carbon Freight



Renewables



Carbon S...



Low Carbon Transport Fuels







Climate Smart Agriculture



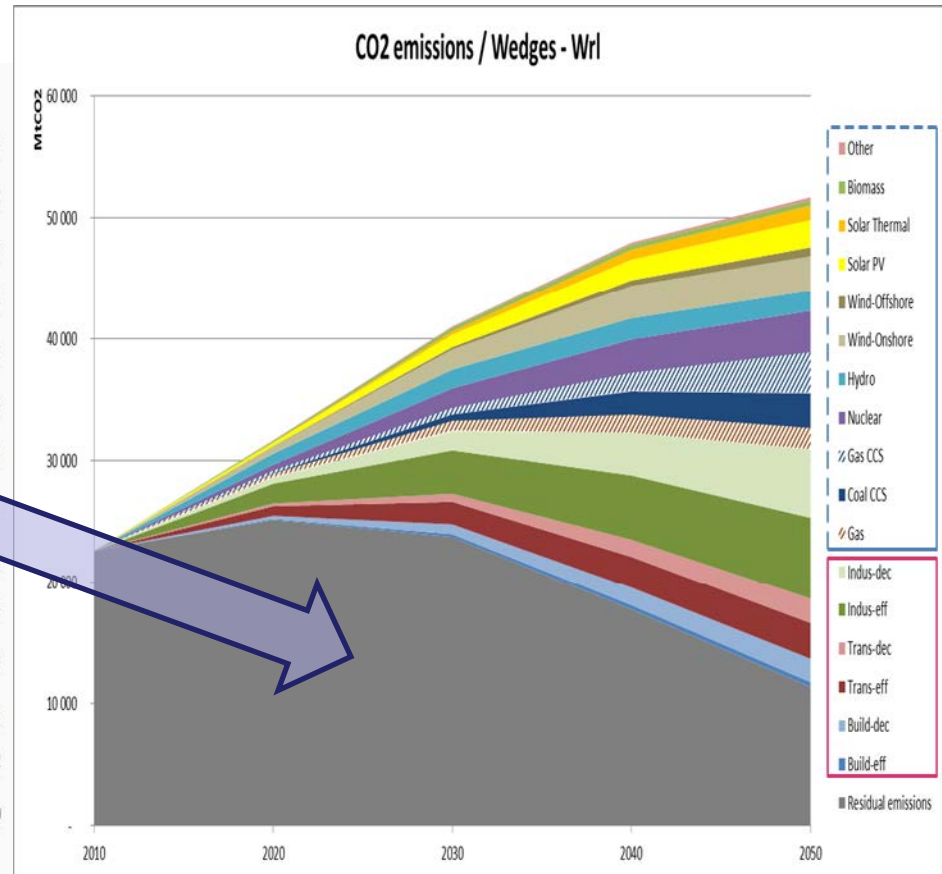
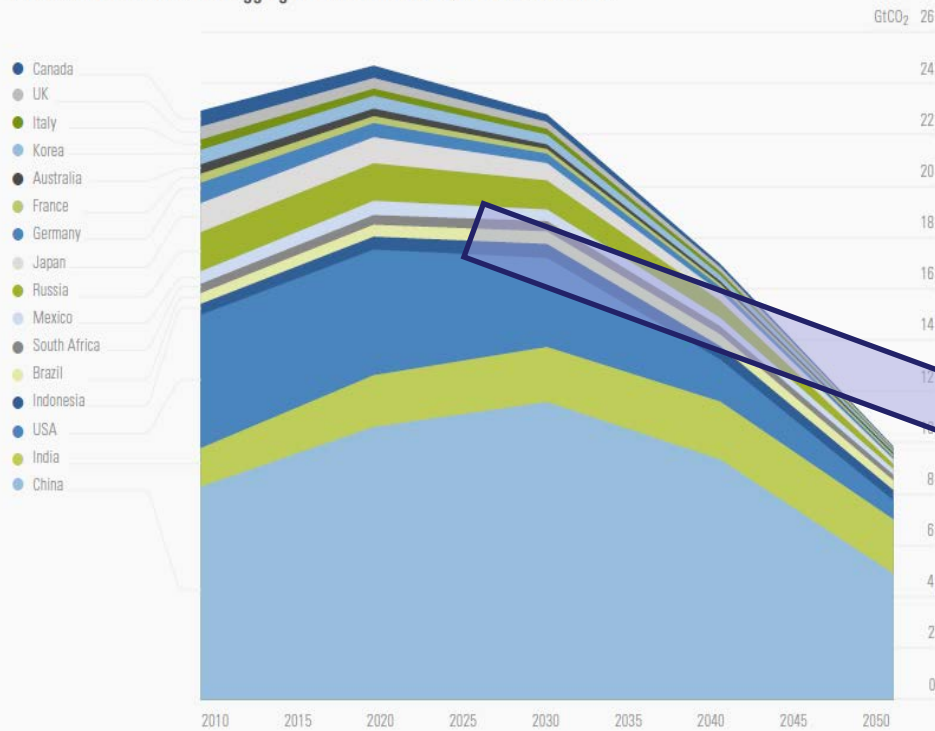
### Navigating the next industrial revolution



Revolution	Year	Information	
	1	1784	Steam, water, mechanical production equipment
	2	1870	Division of labour, electricity, mass production
	3	1969	Electronics, IT, automated production
	4	?	Cyber-physical systems

# Decarbonization Wedges from DDPP: from country wise to technology wise

Figure 1. Emissions trajectories for energy CO<sub>2</sub>, 2010-2050, showing most ambitious reduction scenarios for all DDPP countries. 2050 aggregate emissions are 57% below 2010 levels.





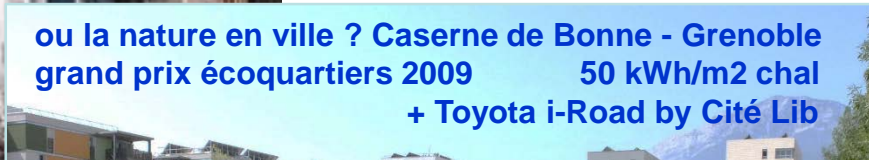
# 4 governance scales x 3 research paradigms

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# The transformation of cities:

## from "urban canyons" to smart cities

Le cauchemar du CATO Institute

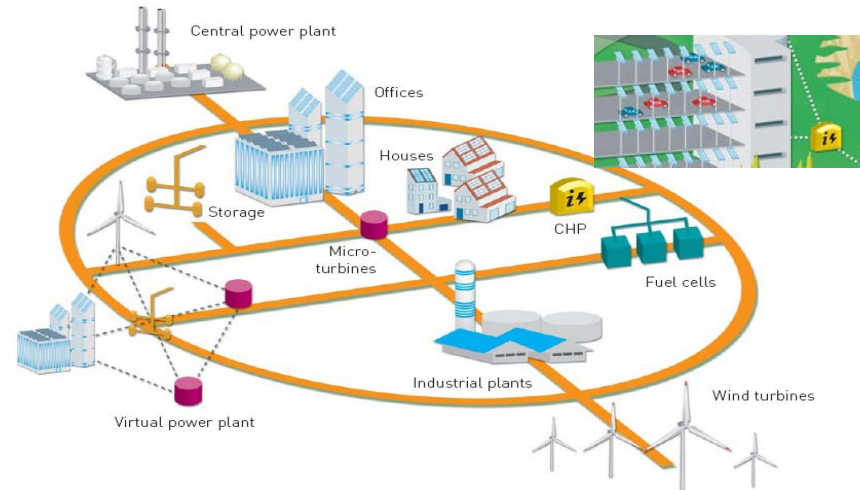


ou la nature en ville ? Caserne de Bonne - Grenoble  
grand prix écoquartiers 2009      50 kWh/m<sup>2</sup> chal  
+ Toyota i-Road by Cité Lib

Bâtiments, îlots à énergie positive: HIKARI à Lyon 2015  
100 kWh/m<sup>2</sup> chal+elec, 80% local      (PV 180 kWh/m<sup>2</sup>)  
+ SunMoov



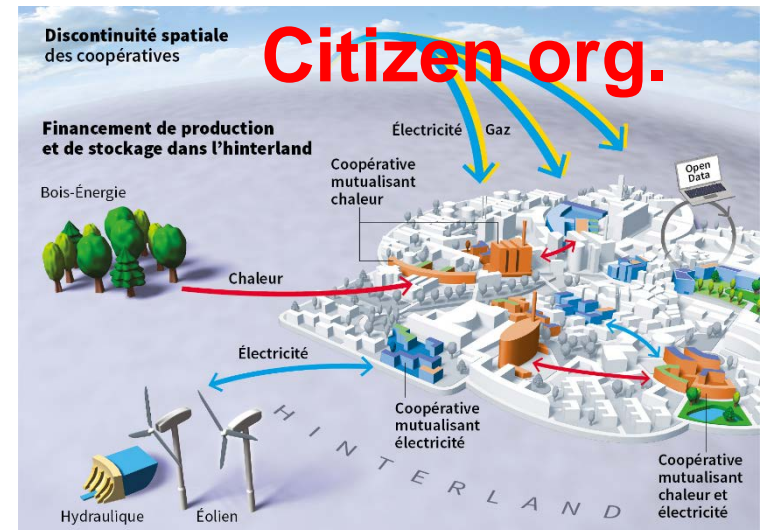
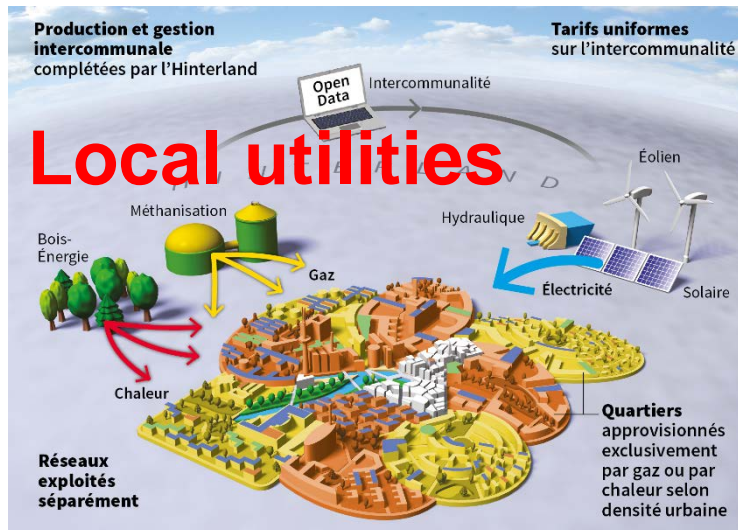
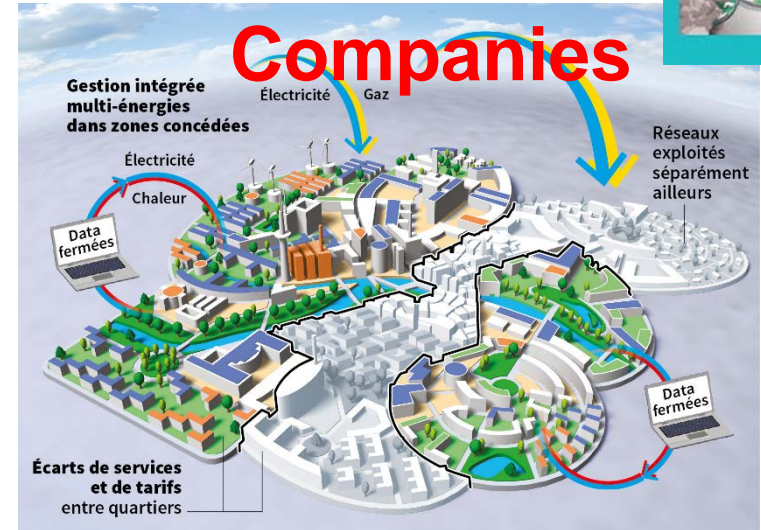
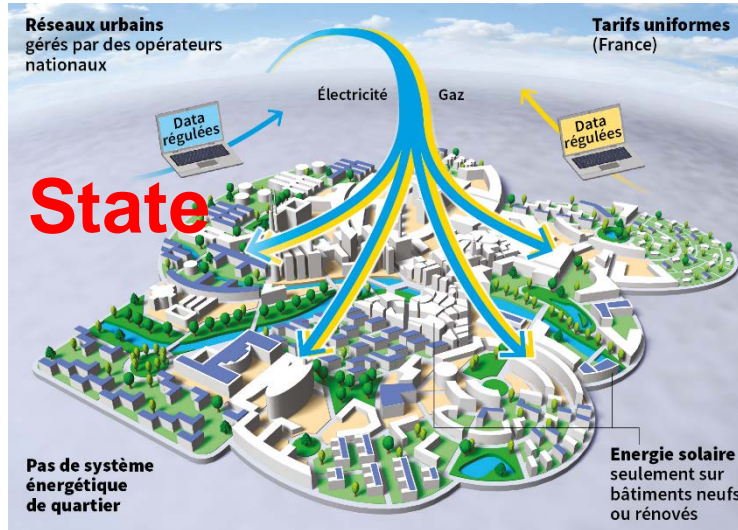
### Plateforme Technologique Smart grids



*Future: Operation of system will be shared between central and distributed generators. Control of distributed generators could be aggregated to form microgrids or 'virtual' power plants to facilitate their integration both in the physical system and in the market.*

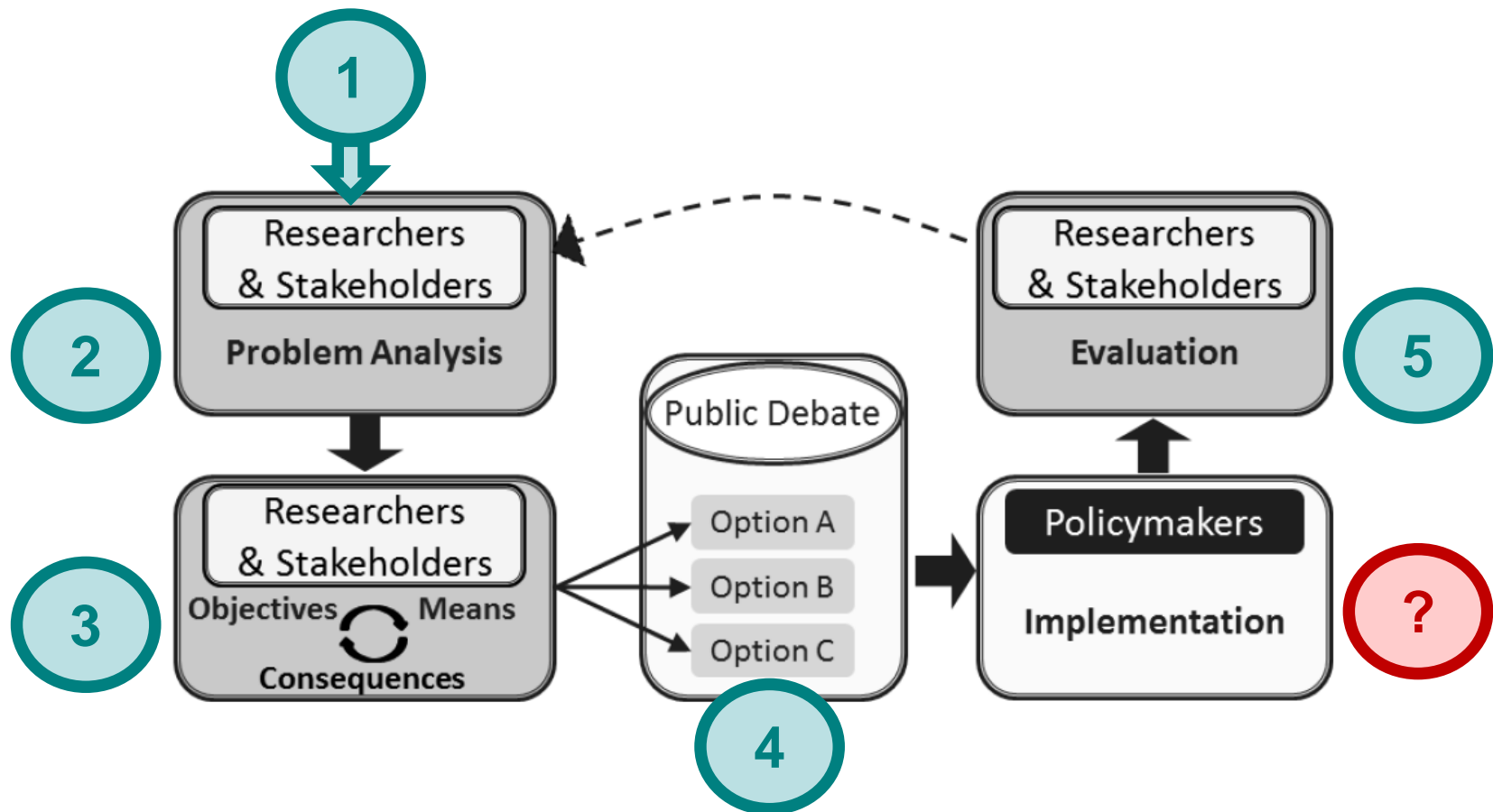
# 4 socio-technical futures for community systems

Source: G. Debizet



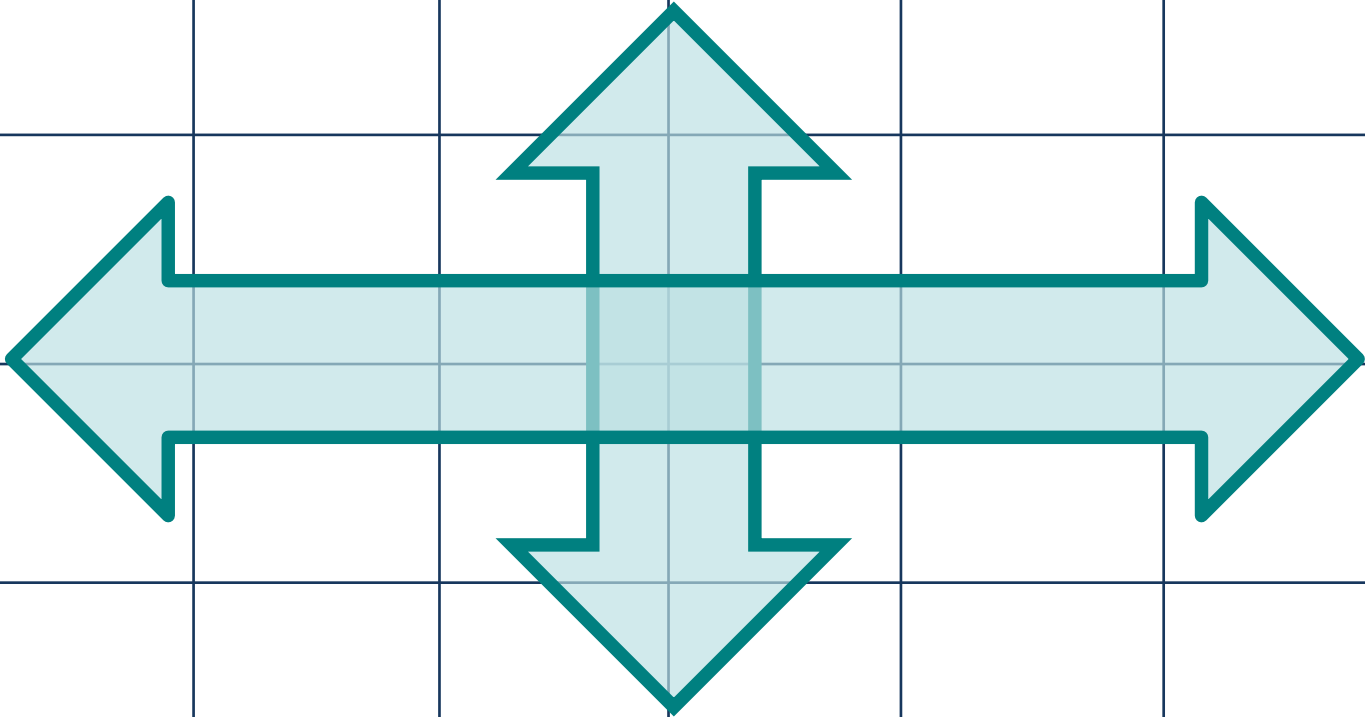
# Elements of conclusion

## ◆ The Pragmatic Enlightened Model (Edenhofer and Kowarsch, 2015)



# 4 governance scales x 5 instruments

	Carbon Taxation	Emission Trading Systems	Norms and Standards	R&D and innovation	Institutions	Citizenship
GLOBAL/ INTERNATIONAL						
REGIONAL/ EUROPEAN LEVEL						
NATIONAL						
SUB-NATIONAL / COMMUNITY						



# Multi-scale and multi-instrument governance...

- ◆ Of major importance is the capability of designing shared images of the future
- ◆ Economic models provide consistency but ignore real societies' imperfections and most often key dimensions of actor's behaviours
- ◆ Today a crucial research agenda lays in identifying the integration of policy instruments and their implementation at different scales
- ◆ The implementation of NDCs will provide massive opportunities for field studies in this domain