factorCO2 10years

A new climate for change

Mainstreaming climate adaptation into sectoral decision making: case studies from energy and transport

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What is Factor CO_2

factorCO2 ideas

factorCO2 trading

factorCO2 ennova

factorCO2 climate

Climate change adaptation Portfolio

	Public	Private
Top - down	**National** (Ecuador, Trinidad and Tobago). **Regional** (Yucatan, Campeche - México; Navarra, Extremadura - Spain) **Local** (Ciudad de Mexico – Mexico, Bilbao, Malaga, Valencia – Spain)	**Endesa** (Energy, 8 countries) **FCC Group** (Infrastructure, several countries) **OECC** (Multisector, Spain) **BBVA** (Finance, Spain)
Bottom - up	**Trinidad and Tobago** (Energy) **Bolivia, Ecuador** (Water) **Basque Country** (Energy, Industry and Tourism, Spain) **Segittur** (Tourism, Spain)	**Petrotrin** (Energy, Trinidad and Tobago) **Renfe** (Transport, Spain) **Meliá Hotels** (Tourism, Spain) **Bodegas Torres** (Agriculture, Spain) **Endesa** (Energy, Spain) **Ferrovial** (Infrastructure, Spain)

Case Study: ADAPTA Project

Methodology on Integrating Climate Change Adaptation into Business Strategy.

OBJECTIVE.

To enhance public-private collaboration through the promotion of dialogue between organizations and the development of tools that allow Spanish enterprises to undertake activities in risk management and adaptation to climate change.

RESULTS.

- ✓ Five sectors: food and agriculture, construction, energy, tourism, and transport.
- ✓ Several workshops with enterprises in each sector.
- ✓ Methodology to analyze vulnerability in the private sector.
- ✓ Test in eight pilot cases (a winery, three hydroelectric plants, a desalination plant, two hotels, and a railroad line).
- ✓ Discuss in workshops in each sector.
- ✓ Publication.

Source: OECC, 2014.

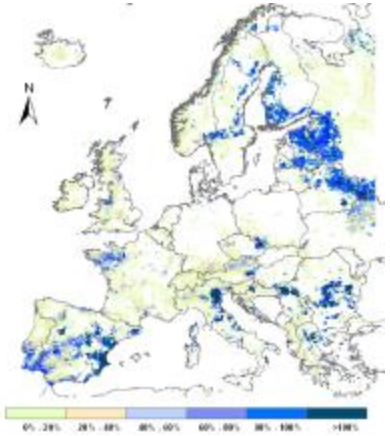
Transport Sector: Renfe Case Study

Climate change could result in physical impacts for the transport sector and could significantly affect user preferences on the type of transport they select.

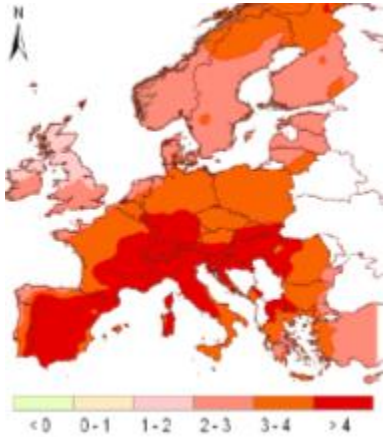
According to studies associated with the development of the European Strategy for Adaptation to Climate Change:

- **30% to 50% of the maintenance costs** associated with road transport in Europe are linked to climate impacts.
- **Supply chains may be affected**, mainly due to extreme weather events, causing disruptions and economic losses.
- **Infrastructure damage** to roads, bridges and/or coastal infrastructure I expected, especially in those with longer use-life.

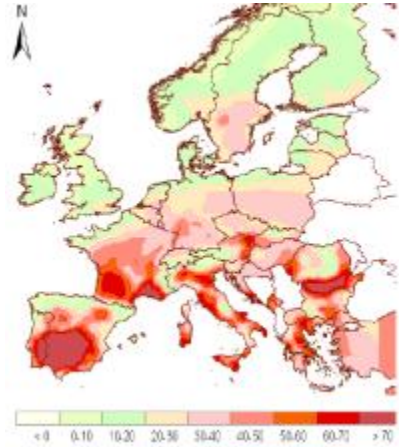
Vulnerability of bridges to floods (blue areas show channels at risk)



Vulnerability of the road network to increased temperatures



Vulnerability of rail transport to increased temperatures



Source: Proyecto Peseta, 2012.

Increasing temperature may contribute to:

- ✓ Infrastructure damage to rail lines
- ✓ Higher probability of wildfires

Extreme events will cause the major portion of the sector's vulnerability, causing:

- ✓ Delays due to strong winds
- ✓ Increased chances of overhead lines being downed by strong winds
- ✓ Collapse of drainage systems in situations of intense rainfall.
- ✓ Floods
- ✓ Landslides

Source: OECC, 2014.

Case Study: Alicante– Barcelona Rail Line

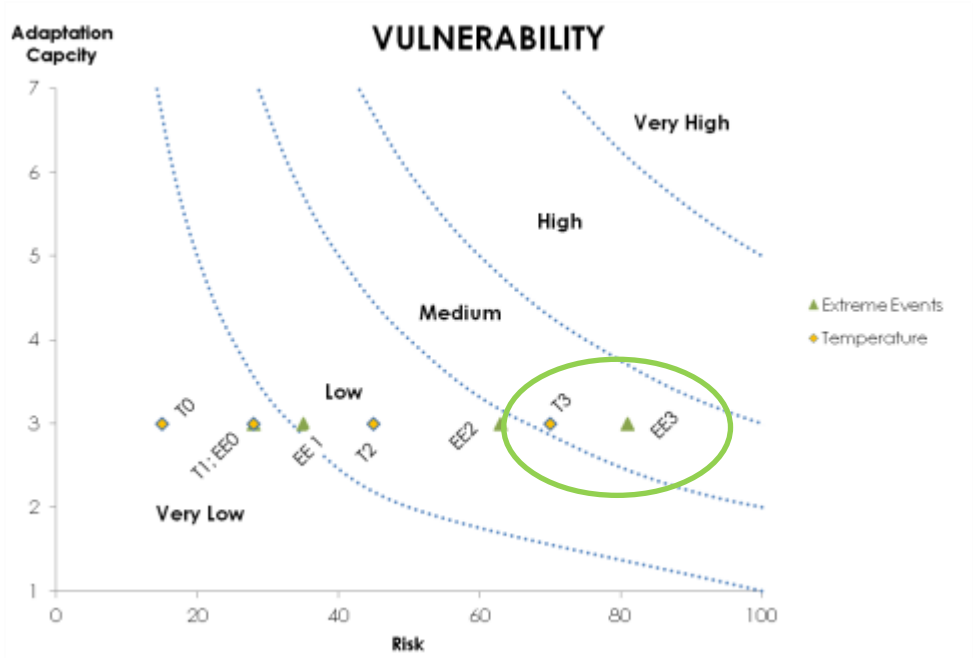
Probability	Consequence						
	Negligible	Minimum	Low	Significant	Important	High	Very High
Improbable							
Very unlikely							
Unlikely		T0					
Probable			EE0T1	EE1			
Likely				T2	EE2	EE3	
Very Likely					T3		

Key:

T: Temperature
EE: Extreme Events

0: Current
1: 2010 - 39
2: 2040 - 2069
3: 2070 - 2099

Risk = Probability x Consequence



Vulnerability = Risk x Adaptation Capacity

Source: OECC, 2014.

Energy Sector: Electric Company Case Study

- ✓ Existence of risks throughout the value chain (electricity demand, generation and transport infrastructure).
- ✓ Lower flexibility due to the large investments with relatively long use-life.

Increased Temperatures:

- ✓ Loss of efficiency in thermal and nuclear power plants
- ✓ Problems with central cooling
- ✓ Temperatures over the optimal thresholds for photovoltaic systems
- ✓ Increased demand in summer, lower demand in winter
- ✓ Increased resistance in electrical conductors

Decreased Precipitation:

- ✓ Reduced availability of water for cooling
- ✓ More stringent discharge limits
- ✓ Inability to meet current discharge limits in rivers and streams
- ✓ Reductions in hydroelectric generation
- ✓ Reduced availability of water in solar thermal power plants

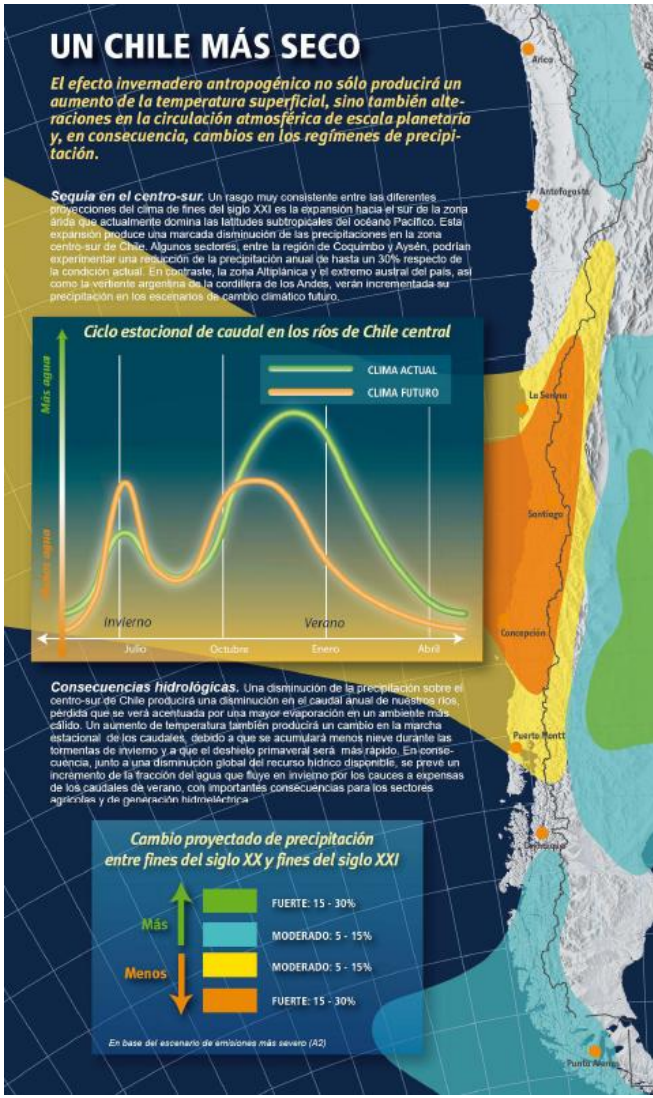
Increase in Probability of Extreme Events:

- ✓ Damage to central cooling towers
- ✓ Damage wind turbines, solar panels, inverters and solar thermal installations
- ✓ Damage to access routes to facilities
- ✓ Floods
- ✓ Landslides

Rising Sea Level:

- ✓ Damage to paths and facilities located on or near the coastline

Source: OECC, 2014.



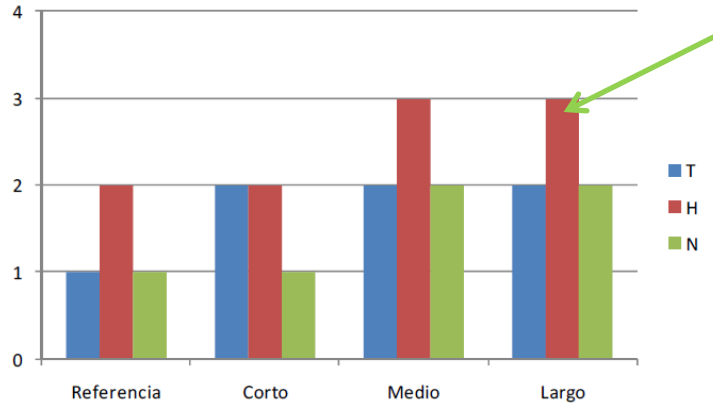
Source: Chile, 2008

Case Study: Power plants in Chile

Sequía		Consecuencias de los riesgos.					
		Mínima	Menor	Significativa	Importante	Crítica	Catastrófica
Probabilidad de riesgo	Muy probable						
	Bastante probable				H		
	Probable	T T		H			
	Poco probable			H			
	Muy poco probable		H				
	Improbable						

Tecnología	Referencia	Corto Plazo	Medio Plazo	Largo Plazo
Térmica	T	T	T	T
Hidroeléctrica	H	H	H	H
Nuclear	N	N	N	N
Eólica	E	E	E	E

Riesgos por tecnología a futuro: Sequía
Fuente: Elaboración propia.

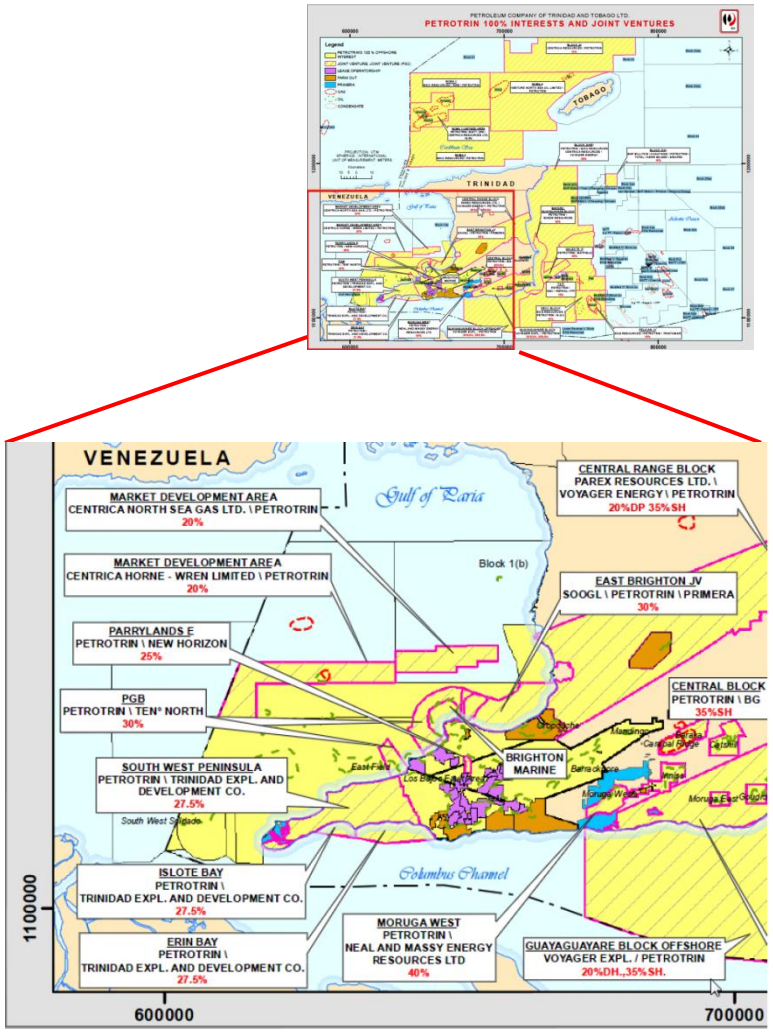


- Drought episodes will increase considerably, with potential impacts in hydroelectric plants in Chile (in the long term).

Case Study: Oil and Gas in Trinidad and Tobago

1. Proposed actions for the pilot study

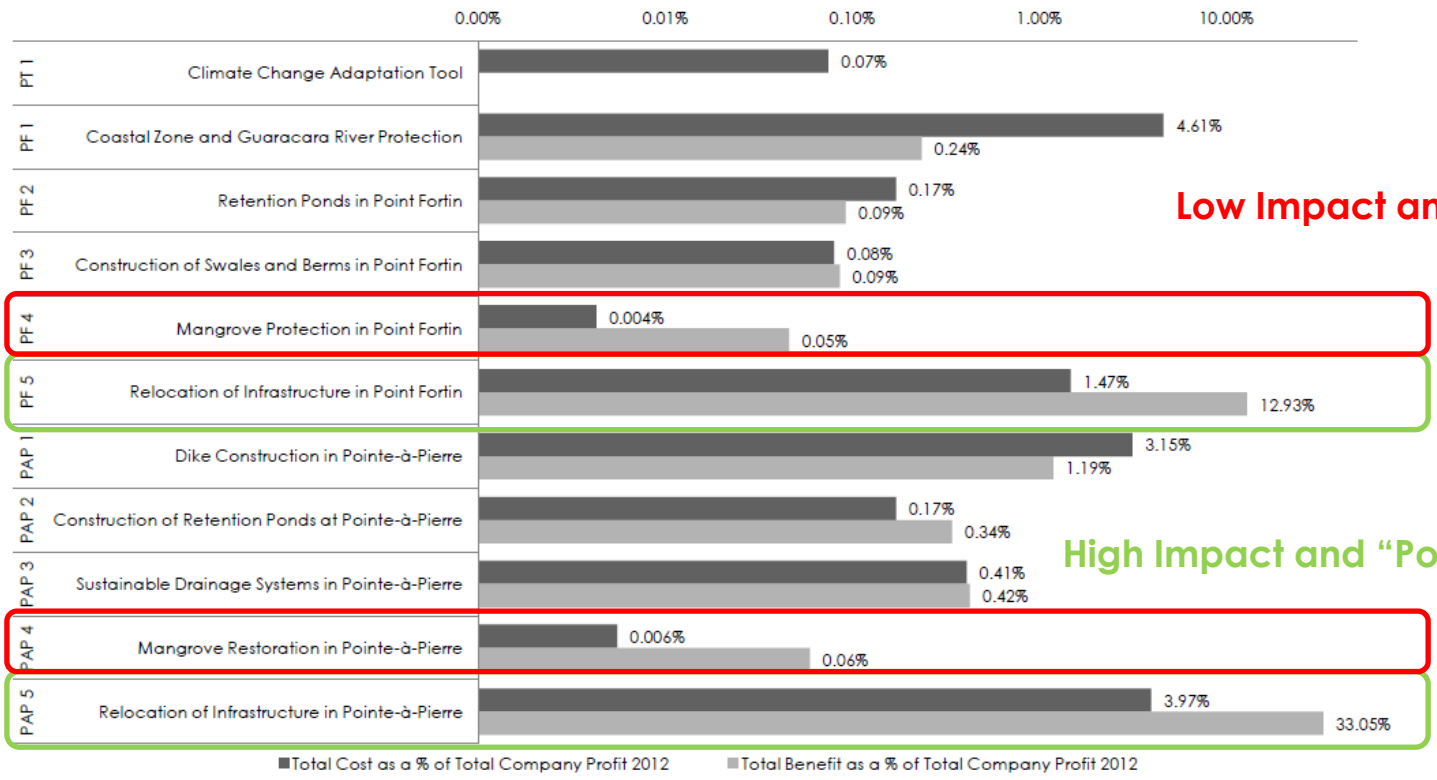
Action code	Title	Type of measure	Type of investment	Sector
PT 1	Climate Change Adaptation Tool	Technological/procedural optimisation responses	Private investment	Energy sector & industry
PF 1	Coastal Zone and Guaracara River Protection	Infrastructure and asset-based responses	Private investment	Energy sector & industry
PF 2	Retention Ponds in Point Fortin	Infrastructure and asset-based responses	Private investment	Energy sector & industry
PF 3	Construction of Swales and Berms in Point Fortin	Infrastructure and asset-based responses	Private investment	Energy sector & industry
PF 4	Mangrove Protection in Point Fortin	Infrastructure and asset-based responses	Private investment	Energy sector & industry
PF 5	Relocation of Infrastructure in Point Fortin	Infrastructure and asset-based responses	Private investment	Energy sector & industry
PF 6	Infrastructure Elevation in Point Fortin	Infrastructure and asset-based responses	Private investment	Energy sector & industry
PAP 1	Dike Construction in Pointe-à-Pierre	Infrastructure and asset-based responses	Private investment	Energy sector & industry
PAP 2	Construction of Retention Ponds at Pointe-à-Pierre	Infrastructure and asset-based responses	Private investment	Energy sector & industry
PAP 3	Sustainable Drainage Systems in Pointe-à-Pierre	Infrastructure and asset-based responses	Private investment	Energy sector & industry
PAP 4	Mangrove Restoration in Pointe-à-Pierre	Infrastructure and asset-based responses	Private investment	Energy sector & industry
PAP 5	Relocation of Infrastructure in Pointe-à-Pierre	Infrastructure and asset-based responses	Private investment	Energy sector & industry
PAP 6	Infrastructure Elevation in Pointe-à-Pierre	Infrastructure and asset-based responses	Private investment	Energy sector & industry



Source: BID, 2014.

2. Cost-Benefit Analysis

Graph 21: Total Cost and Total Benefits of each measure as a percentage of Petrotrin's Net Profit in 2012.
Source: Prepared by the authors.



Low Impact and "No Regret"

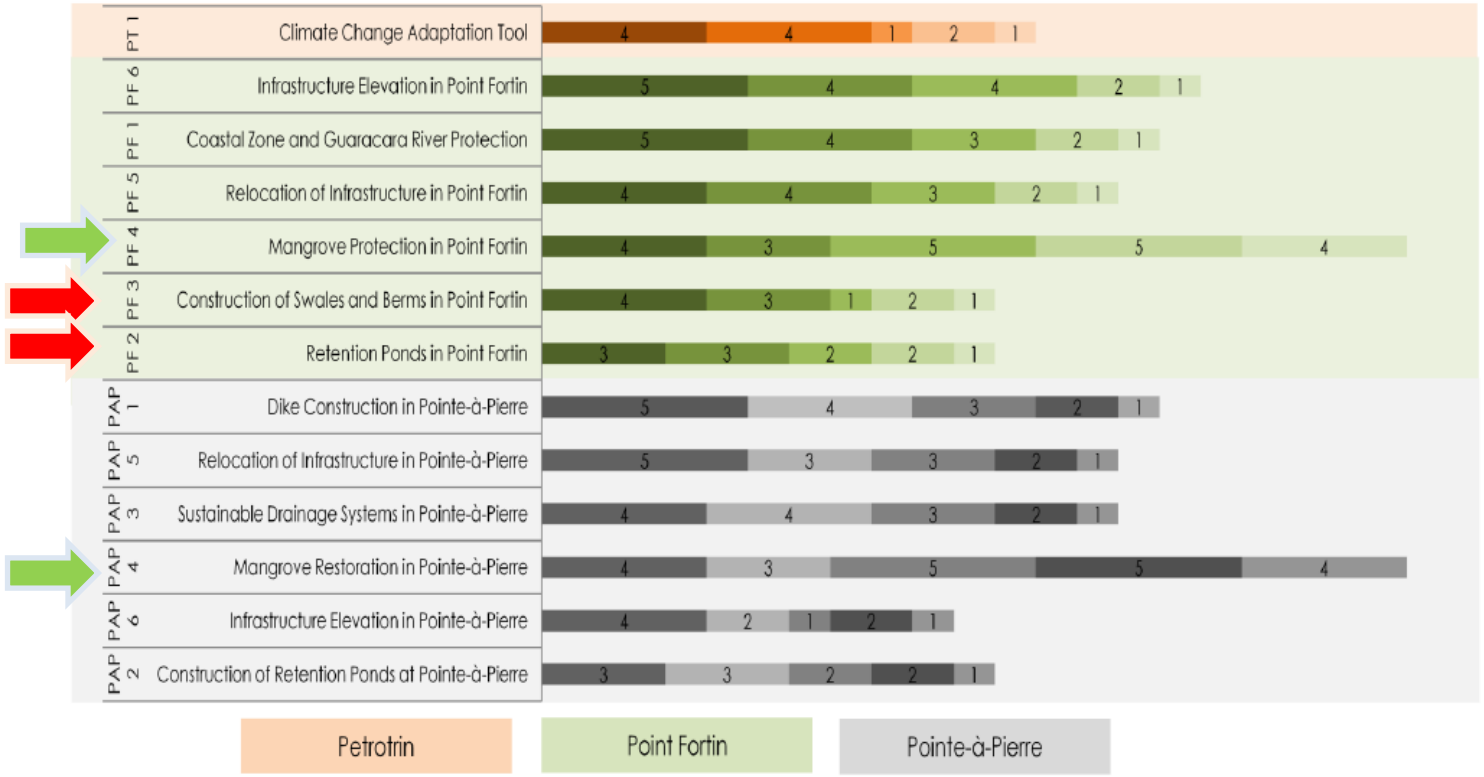
High Impact and "Potential Regret"

Please note, this graph is in logarithmic scale

Source: BID, 2014.

3. Multi-Criteria Analysis

Graph 24: Multi-Criteria Analysis of the pilot project actions by type of action
Source: Prepared by the authors.



The scores in each bar in order from left to right: Importance, Urgency, No-Regret, Secondary Effects, and Mitigation Effects.

Source: BID, 2014.

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