Carbon Pricing Instruments: Carbon tax

Technical Training on Carbon Pricing
September 26th, 2018

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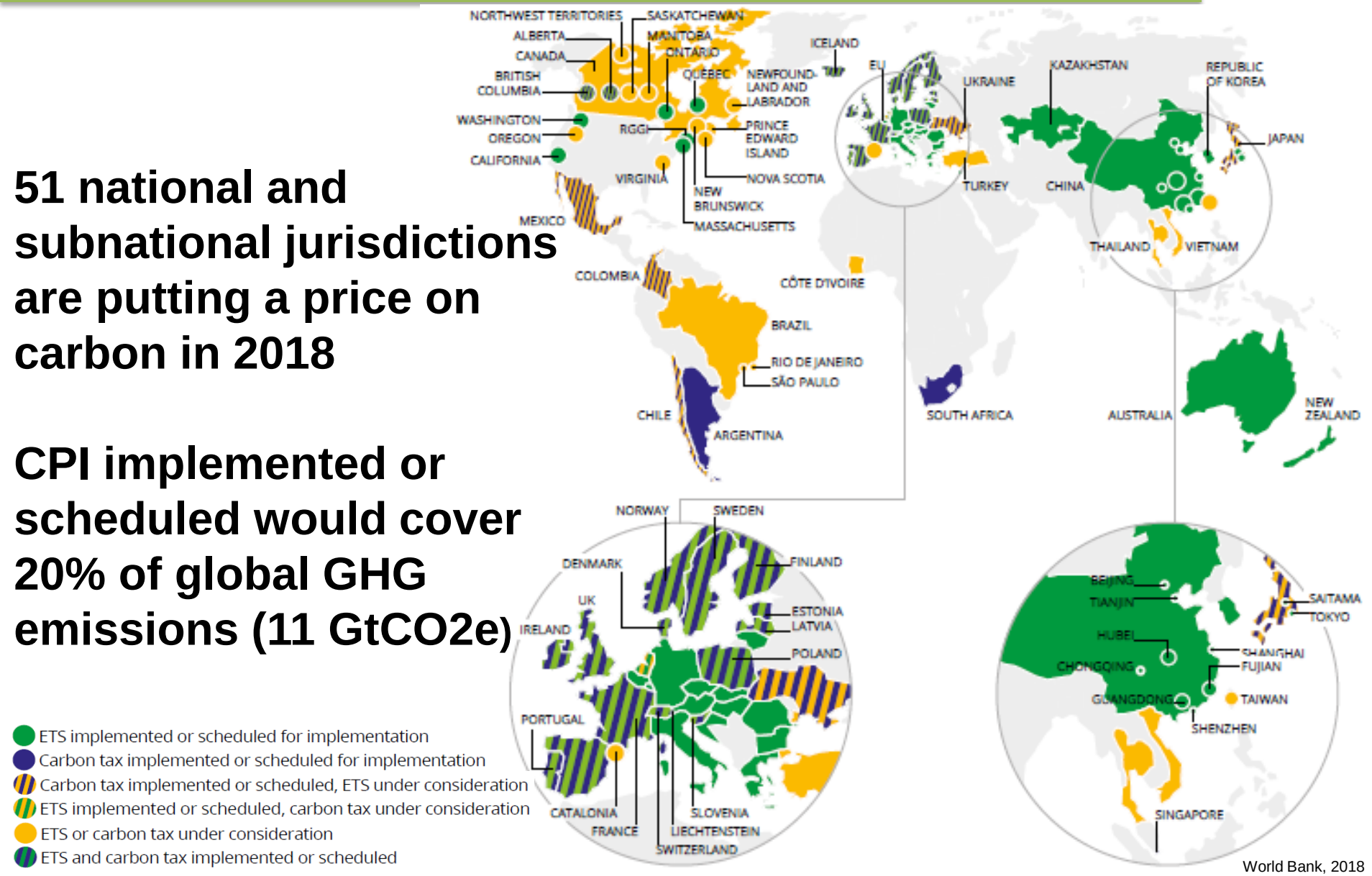
WORLD BANK GROUP

PMR PARTNERSHIP FOR MARKET READINESS

INTRODUCTION: GLOBAL OVERVIEW OF CARBON PRICING INITIATIVES

51 national and subnational jurisdictions are putting a price on carbon in 2018

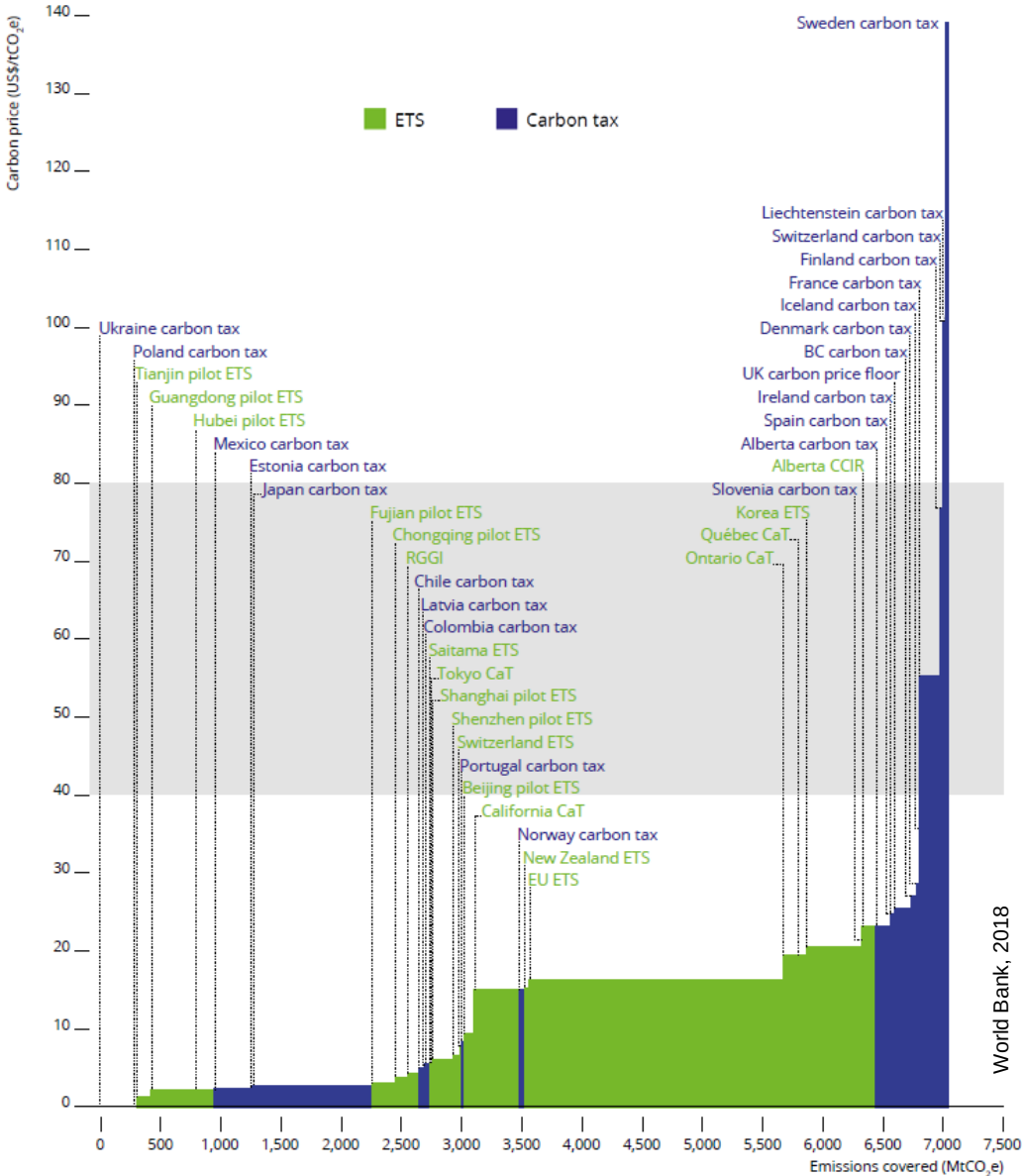
CPI implemented or scheduled would cover 20% of global GHG emissions (11 GtCO2e)



World Bank, 2018

INTRODUCTION: GLOBAL OVERVIEW OF CARBON TAXES

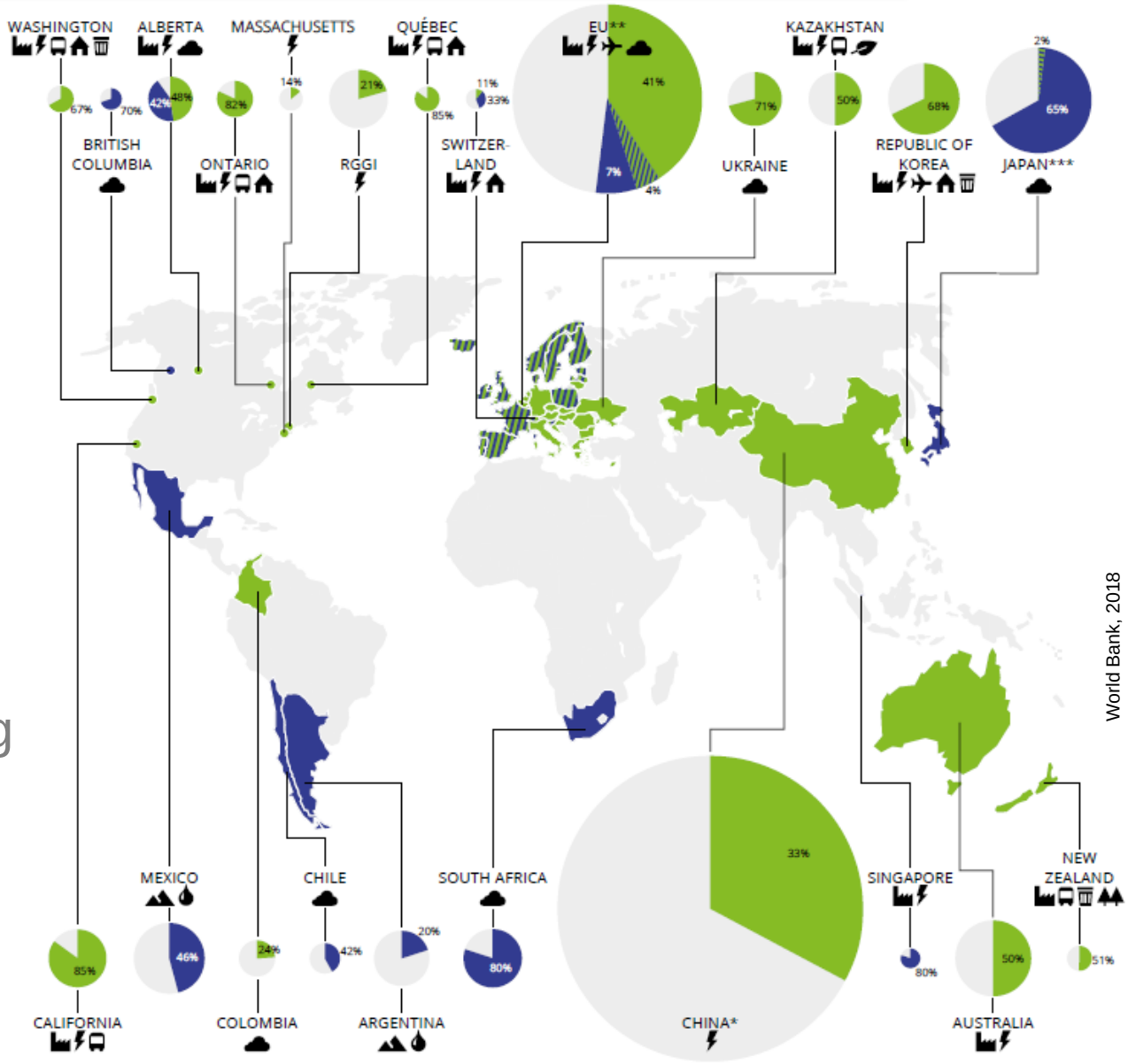
- **23 carbon taxes implemented**
  - 21 carbon taxes implemented at national level
  - 2 carbon taxes implemented at subnational level
- **2.2 GtCO2e covered**
- **3 carbon taxes scheduled for implementation (national level)**
  - Argentina
  - Singapore
  - South Africa



INTRODUCTION: GLOBAL OVERVIEW OF CARBON TAXES

SECTORAL COVERAGE AND GHG EMISSIONS COVERED **differ from one country to another**

- **Mexico:** covers coal and petroleum
- **France:** covers all fossil fuels for heating and transport
- **Spain:** covers fluorinated GHGs (F-gases) – all sectors

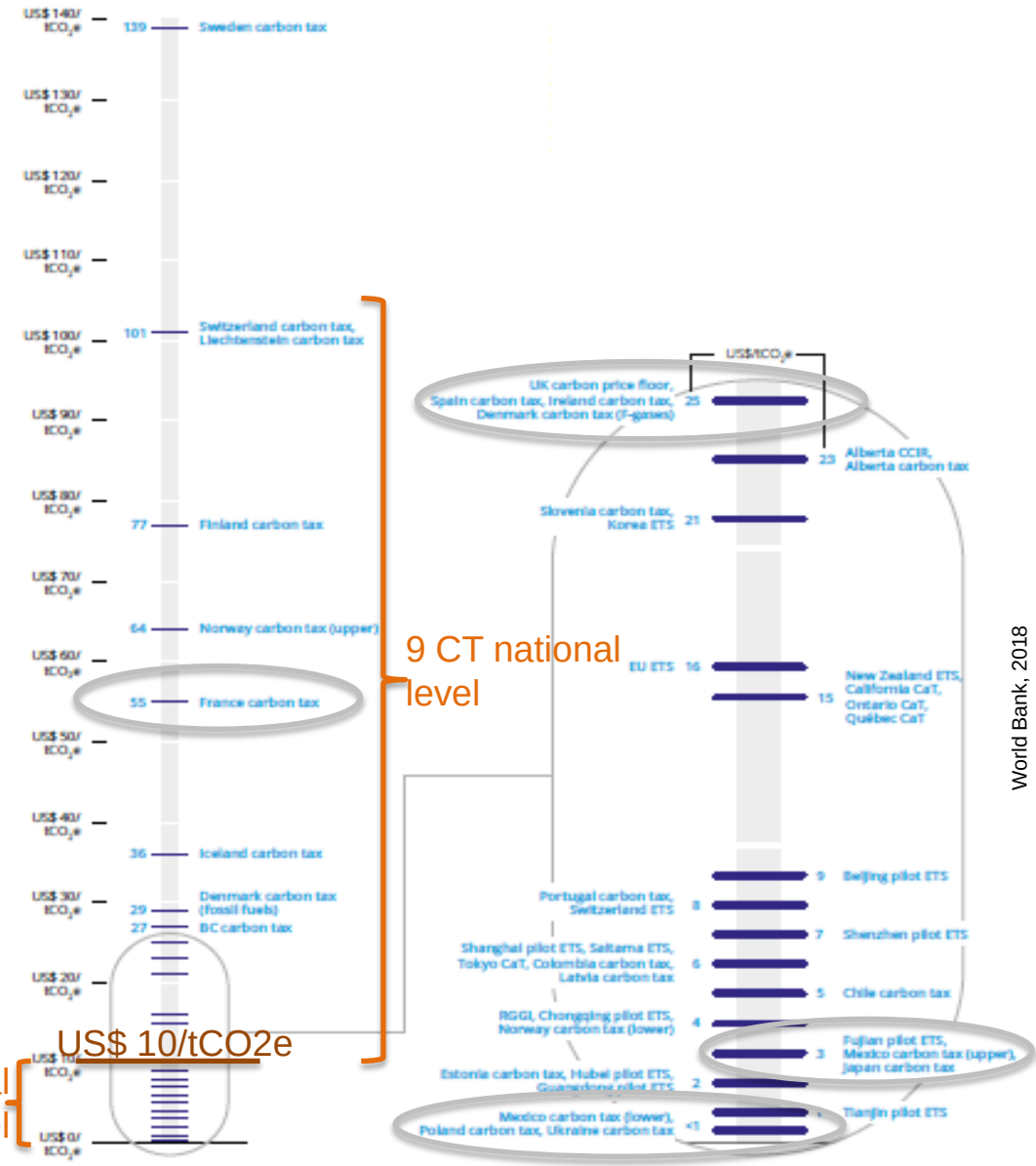


INTRODUCTION: GLOBAL OVERVIEW OF CARBON TAXES

CARBON PRICING

uneven depending of local contexts

- **Mexico:** US$ 3 tCO2eq (upper) to US$ 1 tCO2eq (lower)
- **France:** US$ 55 tCO2eq
- **Spain:** US$ 25 tCO2ea



AGENDA

1. DEFINING A CARBON TAX
2. CARBON TAX DESIGN
3. UNWANTED EFFECTS: THE MITIGATION MEASURES

AGENDA

1. **DEFINING A CARBON TAX**
2. CARBON TAX DESIGN
3. UNWANTED EFFECTS: THE MITIGATION MEASURES

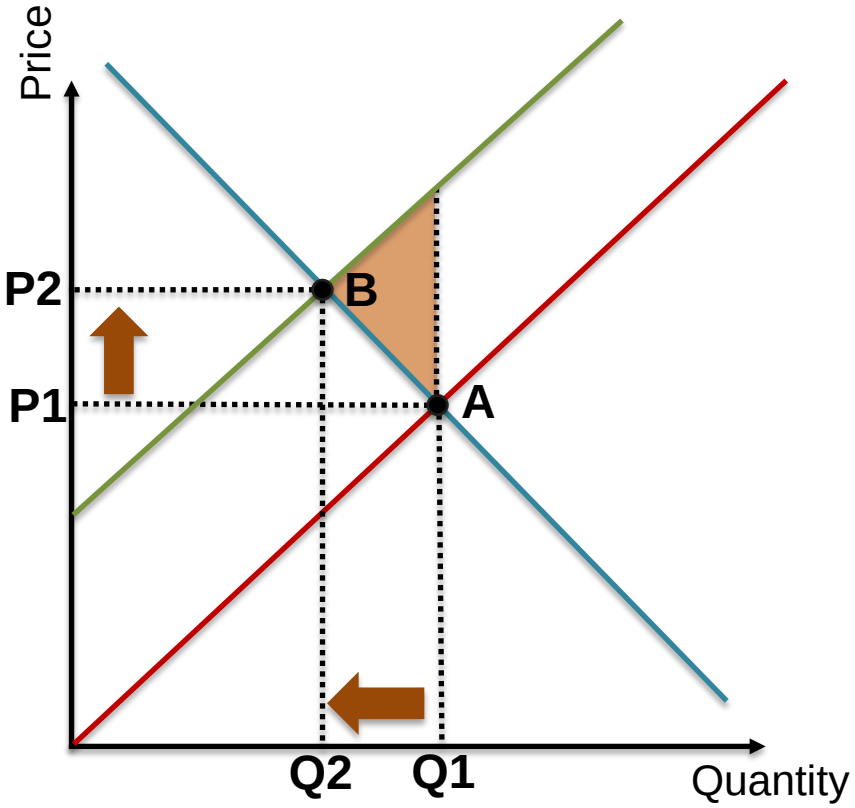
DEFINING A CARBON TAX

WHAT IS A CARBON TAX?

- **Environmental policy instrument (standards/CAC, subsidies, and market) to regulate pollution**
  - Set a price to negative environmental (and social) externality
  - Send a signal price to the economic agents (private sector, consumers etc.)
- **Equal the marginal damage costs (Pigouvian tax)**

DEFINING A CARBON TAX

CARBON TAX EFFECTS



Point A: Market is efficient – Supply meets demand.
Market is not socially efficient because negatives externalities cost is not accounted for.

⇒ Tax introduced to compensate for the negative effects

Price raises from **P1 to P2** affecting the consumer behavior

Quantity demanded decreases from **Q1 to Q2** reducing the overall externalities generated

Revenue generated can be used to remediate environmental damage or invest in low-impact technologies

Point B: Market is socially efficient – External costs have been internalized using the tax.

=> **Deadweight loss** in the market is eliminated.

DEFINING A CARBON TAX

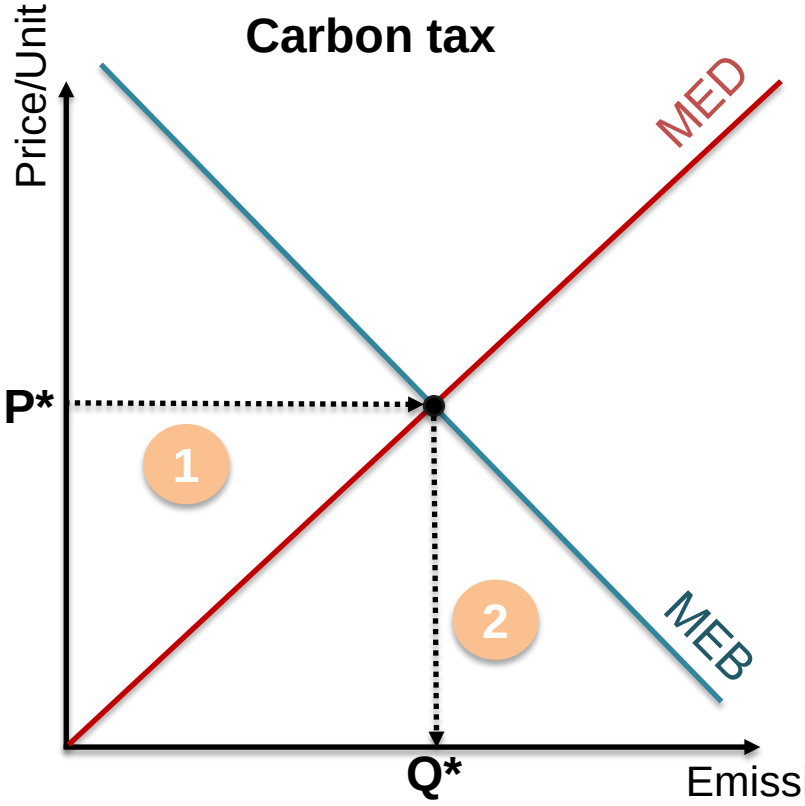
WHY A CARBON TAX?

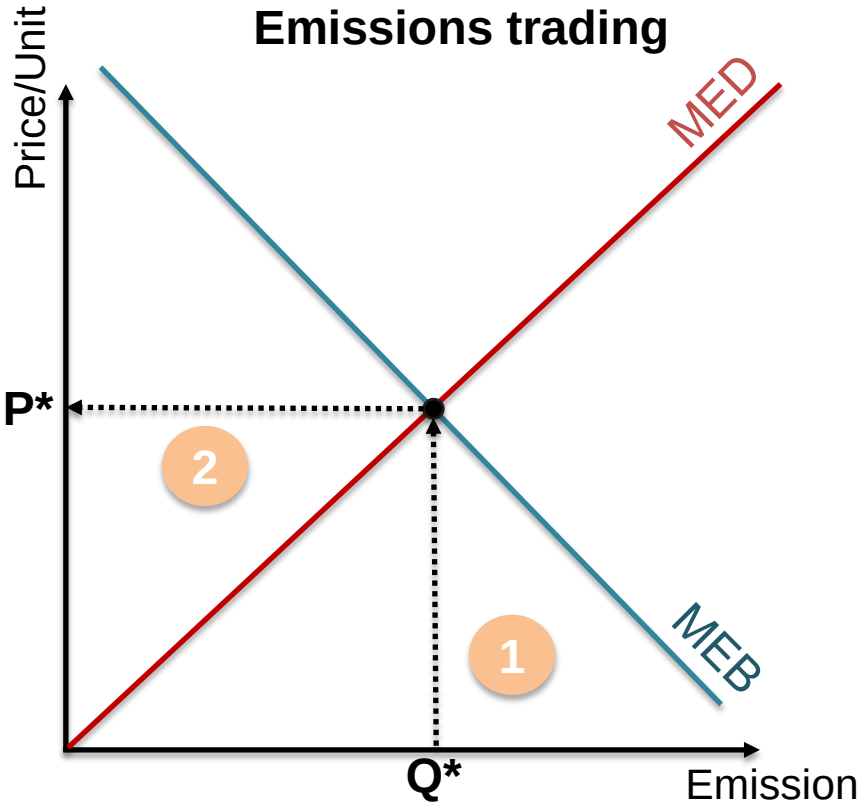
- **Incent economic agents to internalize negative environmental (and social) externality cost associated with the good's production.**
- **Create a financial incentive to lower the volume of environmental externalities released**

  - **Flexible / High discretion:** CT based on the actual level of emission and not on the means
  - **Certainty** regarding the carbon price over a given period
  - **Government revenue generation:** revenues from CT can be recycled.

DEFINING A CARBON TAX

CARBON TAX AND EMISSIONS TRADING





MED: Marginal Emissions Damage to the environment

MEB: Marginal Emissions Benefit – mirror image of the Marginal Abatement Cost Curve (MACC)

DEFINING A CARBON TAX

WHEN SELECT A CARBON TAX?

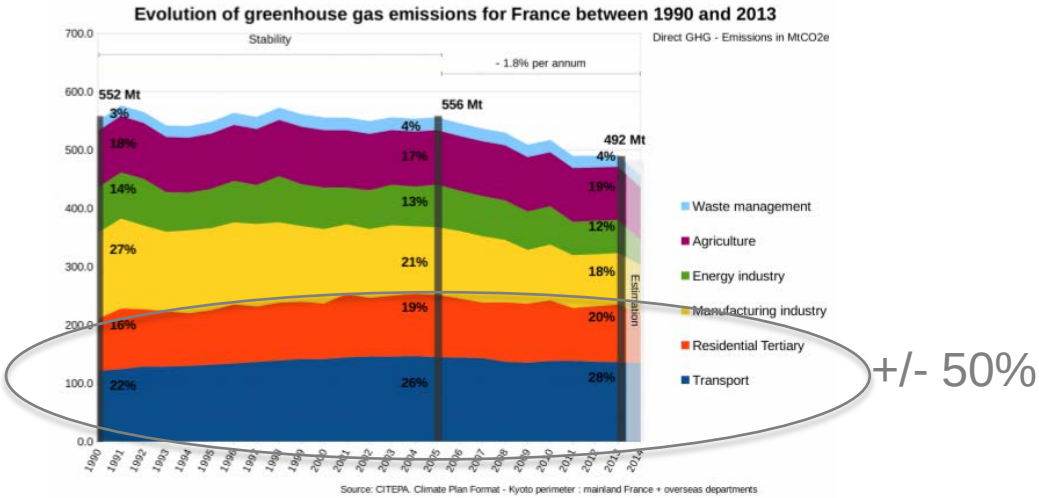
- **LOCAL CONTEXT HIGHLY RELEVANT FOR SELECTING AND ADOPTING GHG POLICY INSTRUMENT**
  - **Economic context**
  - **Emissions profile**
  - **Political feasibility and state of public opinion**
  - **Government capacity and rule of law**

CONSIDERATIONS PARTICULARY RELEVANT FOR CARBON TAX ADOPTION:

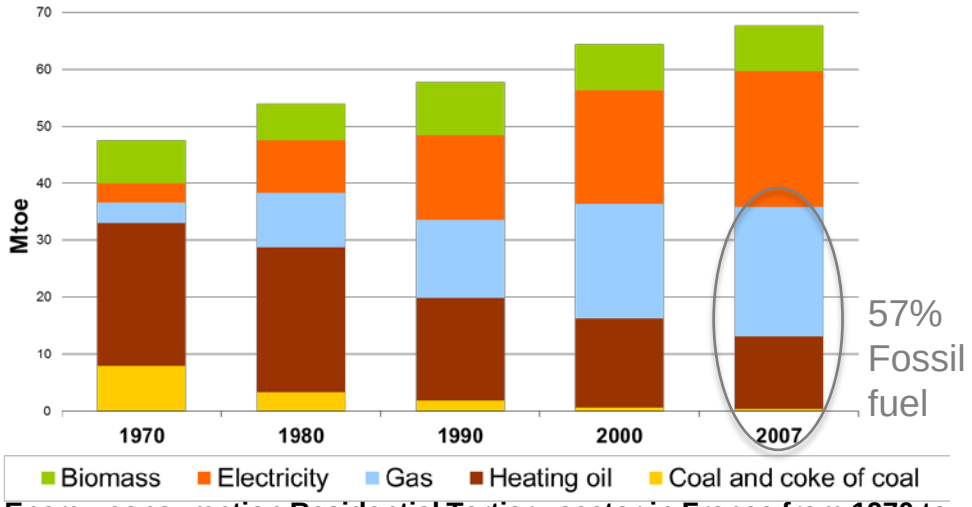
- **Market-driven economies**
- **Elastic markets**
- **Benefits generated by revenue's recycling**

DEFINING A CARBON TAX

EMISSIONS PROFILE - RESIDENTIAL SECTOR IN FRANCE



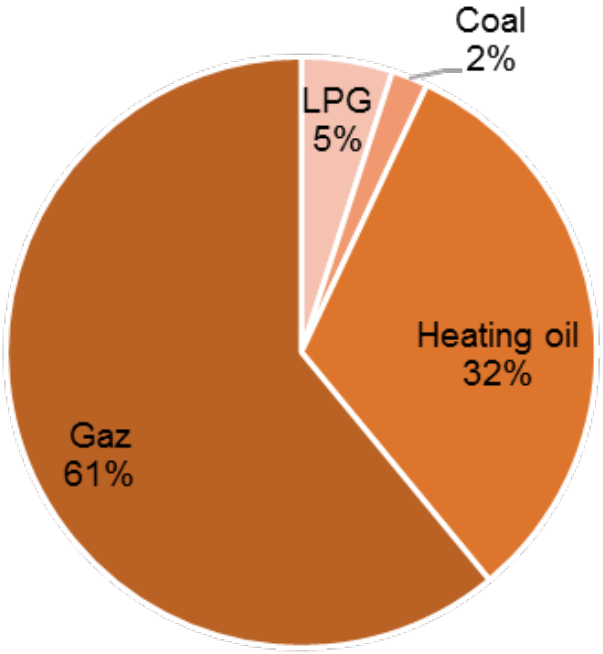
+/- 50%



57% Fossil fuel

65% for space heating

Energy consumption Residential Tertiary sector in France from 1970 to 2007 (SOeS, 2016)

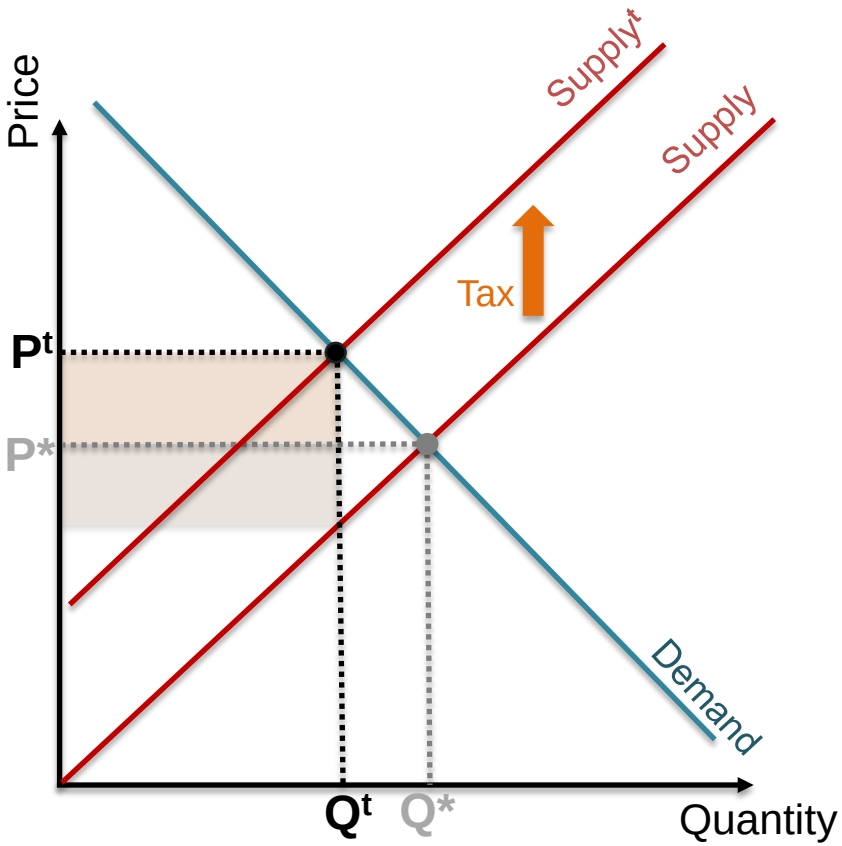


Breakdown of the GHG emissions generated by residential sector in France in 2015 (SOeS, 2016)

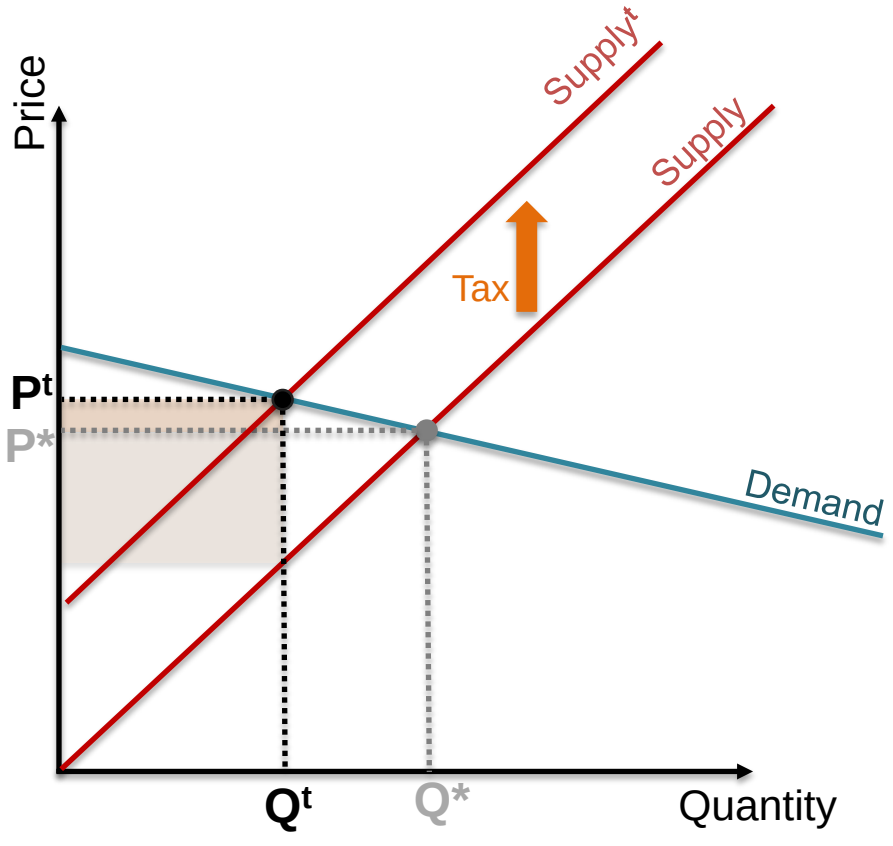
DEFINING A CARBON TAX

ELASTICITY DEMAND

Low elasticity of demand

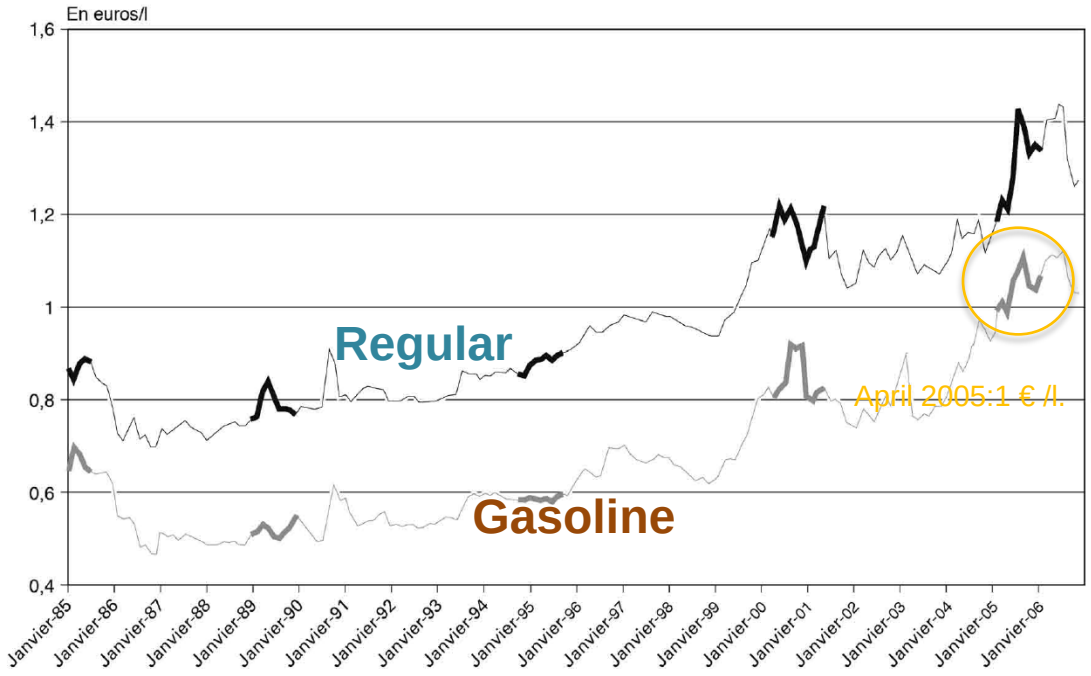


High elasticity of demand



DEFINING A CARBON TAX

ELASTICITY DEMAND - ROAD TRANSPORT FUEL IN FRANCE



SHORT TERM

Estimation ST elasticity price in 2006 (Source: INSEE)	Regular	Gasoline	Overall
Excluding seasonal variation adjustment	- 0.46 (0.44)	- 0.17 (0.34)	- 0.36 (0.34)
Including seasonal variation adjustment	- 0.35 (0.45)	- 0.11 (0.34)	- 0.26 (0.27)

LONG TERM

Estimation LT elasticity price in 2006 (Source: INSEE)	Rural HH	Urban HH
Fuel (€/L)	- 0.74 (0.16) / -0.78 (0.14)	- 0.91 (0.11) / - 0.93 (0.12)

In Short Term: +10% of fuel price leads to -3% [-2.6 to -3.6] of household fuel consumption
In Long Term: +10% of fuel price leads to (i) between -7% to -8% of rural household fuel consumption and (ii) between -8% to -9% of urban household fuel consumption.

AGENDA

1. DEFINING A CARBON TAX

2. **CARBON TAX DESIGN**

3. UNWANTED EFFECTS: THE MITIGATION MEASURES

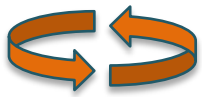
CARBON TAX DESIGN

STAGES OF CARBON TAX DESIGN

1. **POLICY OBJECTIVES & NATIONAL CIRCUNSTANCE / CONTEXT**

2. **DESIGN OF THE TAX CARBON**
   - **TAX BASE**
   - **TAX RATE**
   - **INSTITUTIONS**
   - **REVENUES USE**
   - **AVOIDING UNWANTED EFFECTS**

3. **EVALUATION & IMPROVEMENT**



CARBON TAX DESIGN

POLICY OBJECTIVES & NATIONAL CIRCUNSTANCE / CONTEXT

Determine policy objectives

GHG emissions trajectory

Revenue raising etc.

Understand national/local context:

- Emissions profile (overall, sectoral etc.)
- Analyze economic structures
- Analyze governance constraints
- Identify areas of resistance etc.

CARBON TAX DESIGN

POLICY OBJECTIVES – FRANCE (1/3)

2007: EU ENERGY AND CLIMATE PACKAGE: 3x20%

2007-2010: GRENELLE DE L'ENVIRONNEMENT

- -38% of energy consumption in existing housing by 2020
- -20% of GHG emissions released by transport sector by 2020
- +23% of renewable energy in final energy consumption by 2020
- Ambition factor 4 by 2050
  - Local climate and energy action plan **[TOP DOWN approach]**
  - **Climate Energy Contribution (Carbon tax)**

2014: 2ND EU ENERGY AND CLIMATE PACKAGE: -43% by 2030 (2005 baseline) for sectors covered by EU ETS & -30% for other sectors

2014: CARBON TAX ADOPTED AND IMPLEMENTED

2015: ENERGY TRANSITION FOR GG ACT

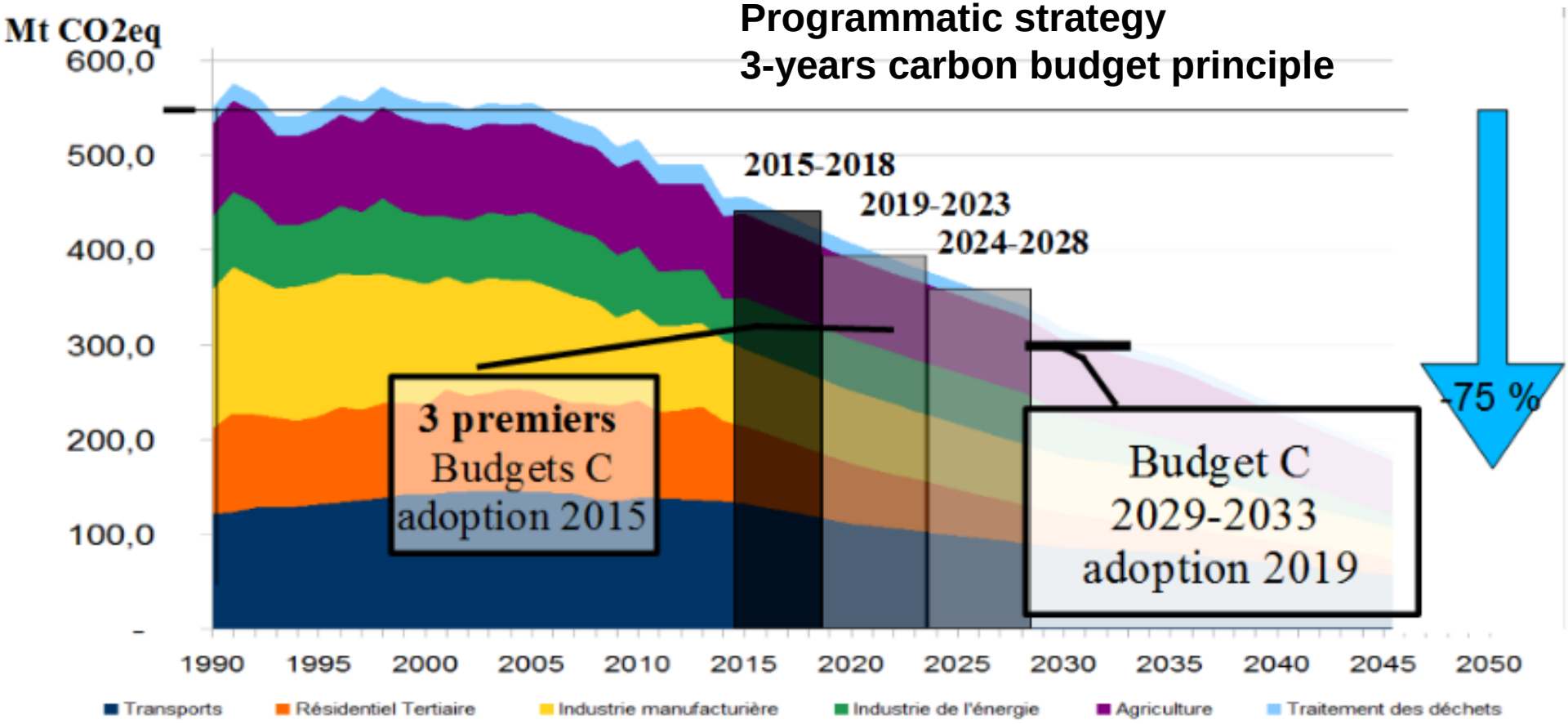
- -40% of GHG emissions by 2030 (baseline 1990) and factor 4 by 2050
- -50% of final energy consumption by 2050 (baseline 2012)
- 32% of renewable energy in final energy consumption by 2030

2017: NATIONAL STRATEGY LOW CARBON: -73% by 2050.

CARBON TAX DESIGN

POLICY OBJECTIVES – FRANCE (2/3)

FRENCH NATIONAL STRATEGY LOW CARBON: -73% of GHG emissions by 2050



Source: National Strategy low-carbon

CARBON TAX DESIGN

POLICY OBJECTIVES – FRANCE (3/3)

Aims and instruments of public policies for a low-carbon strategy

Integrating carbon pricing in decision-making	*Removing obstacles to the decarbonisation of the economy*
Establishing true carbon prices: eco-tax or emissions trading below an overall limit	**Ensuring the acceptability of policies:** compensation and support measures
Removing harmful subsidies	**Developing information:** nudges, labels and CSR
Encouraging green decision-making: - standards - subsidies and tax credits - energy savings certificates - calls for tender	**Enabling the transformation of the economy** - R&D, infrastructure, networks - professional training - quality of regulations - finance instruments

Source: National Strategy low-carbon

CARBON TAX DESIGN

TAX BASE

- **Scope of taxation**
- **Points of regulation**
- **Legal entity responsible for tax payment**
- **Thresholds**
- **MRV & Administration**
  - Affect the degree of GHG emissions reduction achievable
  - Affect the amount of revenues raiseable
  - Affect sectors, industries concerned

CARBON TAX DESIGN

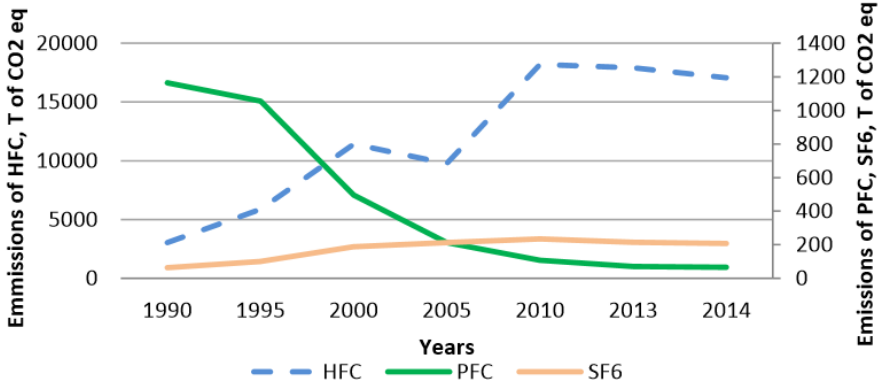
SCOPE OF THE TAXATION

- **Targeting fuels**
  - India: only coal
  - Mexico: coal and petroleum
- **Targeting direct emissions**
  - Chile: emissions from large boilers and turbines (≥ 50MW)
  - Singapore…
- **GHG emissions to cover**
  - Spain: fluorinated gases (F-gases)

GHG emissions in Spain in 2012 (UNFCC)
Total without LULUCF: 340.8 MtCO2-eq
+20.1% since 1990

- CO2: 81.2%
- CH4: 9.5%
- N2O: 7%
- HFCs/PFCs/SF6: 2.3%

Emission of F-GHGs in Spain 1995-2014 (Source: Ministry of Agriculture, Food and Environment)



CARBON TAX DESIGN

POINTS OF REGULATION

CRUCIAL FACTORS

- Actors responsive to the signal price
- Administrative and MRV

UPSTREAM

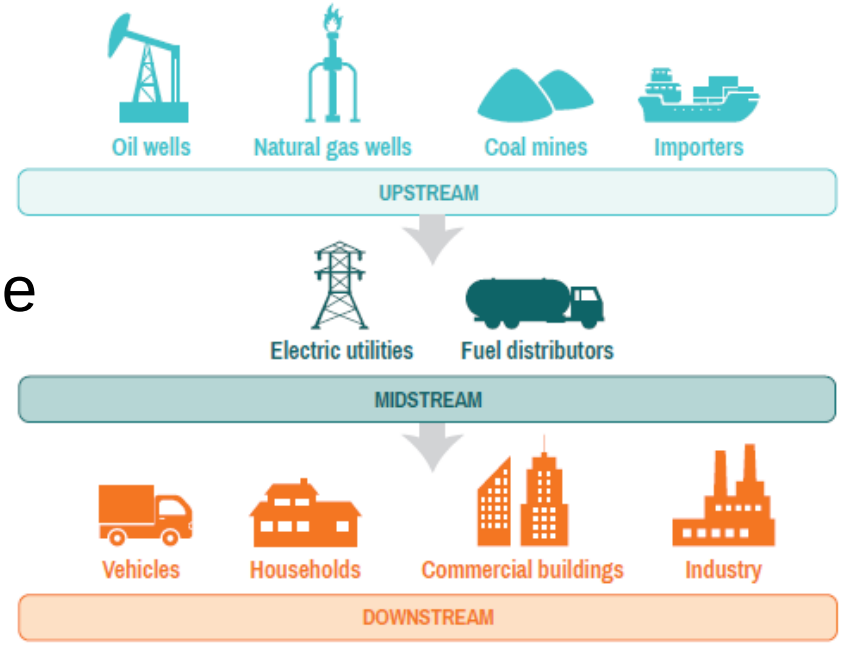
Producers and Importers: France | Ireland | Mexico | Norway…
Fuel refiners: South Africa
Mine mouth: India | Japan

MIDSTREAM

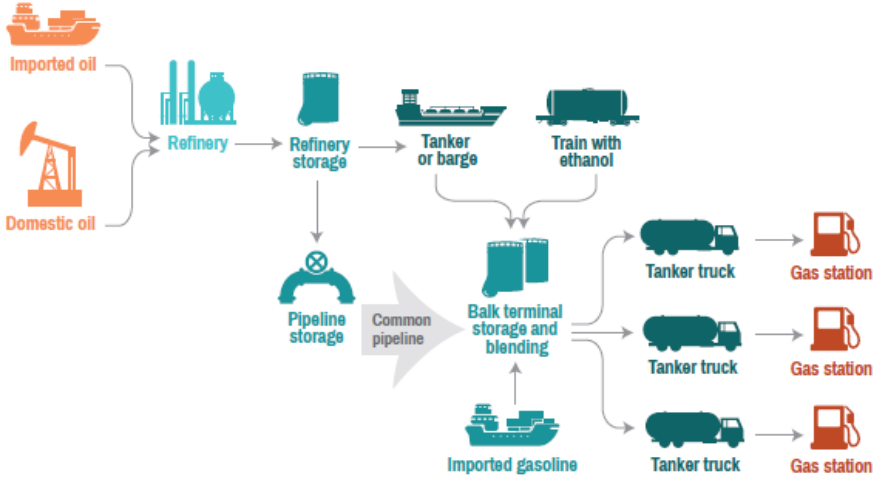
Distributors: France | Ireland | Spain (F-gases)
Fuel supplier: Norway
HFC, PFC importers: Norway | Spain
Electricity utilities: UK | South Africa

DOWNSTREAM

Industrial facilities: South Africa



Source: Ramseur and Parker 2009.



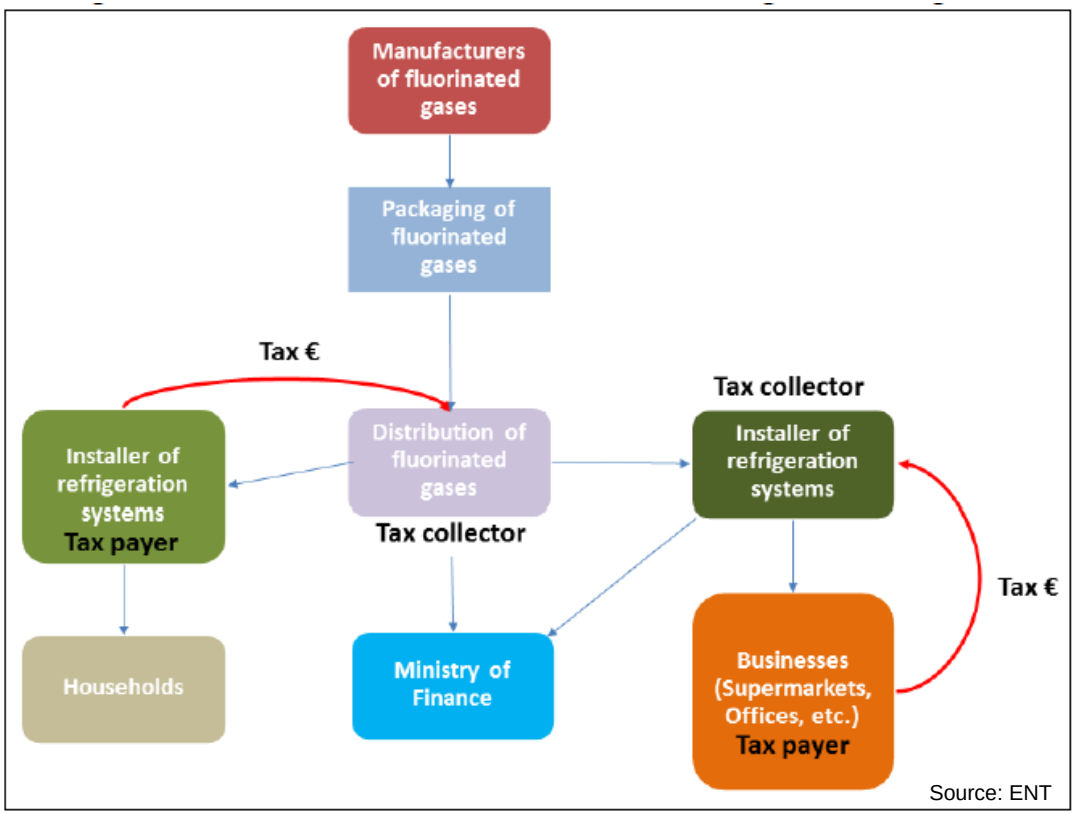
Source: United States Energy Information Administration, 2013

CARBON TAX DESIGN

LEGAL ENTITY RESPONSIBLE FOR TAX PAYMENT

- Depend on the scope
- Depend on the point of regulation

Schematic view of the carbon tax (F-gases) in Spain



CARBON TAX DESIGN

THRESOLDS

Minimum level of activity that will trigger responsibility for paying tax

CRUCIAL FACTORS:

- Proportion of emissions attributable to small emitters
- Cost of reporting / tax amount
- Capabilities of private actors and regulators
- Distortion of competition

- **Chile:** Midstream tax on electricity generators with min. capacity of 50MW.

CARBON TAX DESIGN

MRV & ADMINISTRATION

Key considerations:

- **Ability to measure, report and verify emissions**
- **Cost and efforts associated with MRV**

IDEAL SITUATION: CT applied to the sectors at the most environmentally effective point

- **Targeting fossil fuels:**
  - Advantage of allowing the CT to “piggyback” on existing customs and excise taxes
  - Number of entities: point of regulations in most cases upstream and/or midstream (downstream in case of large facilities that are registered taxpayers)
  - Management of exemptions
- **Targeting directs emissions:**
  - Ability to accurately monitor emissions
  - Number of entities involved
  - Capacity to M&R emissions
  - Availability of preexisting systems

CARBON TAX DESIGN

TAXE RATE DETERMINATION

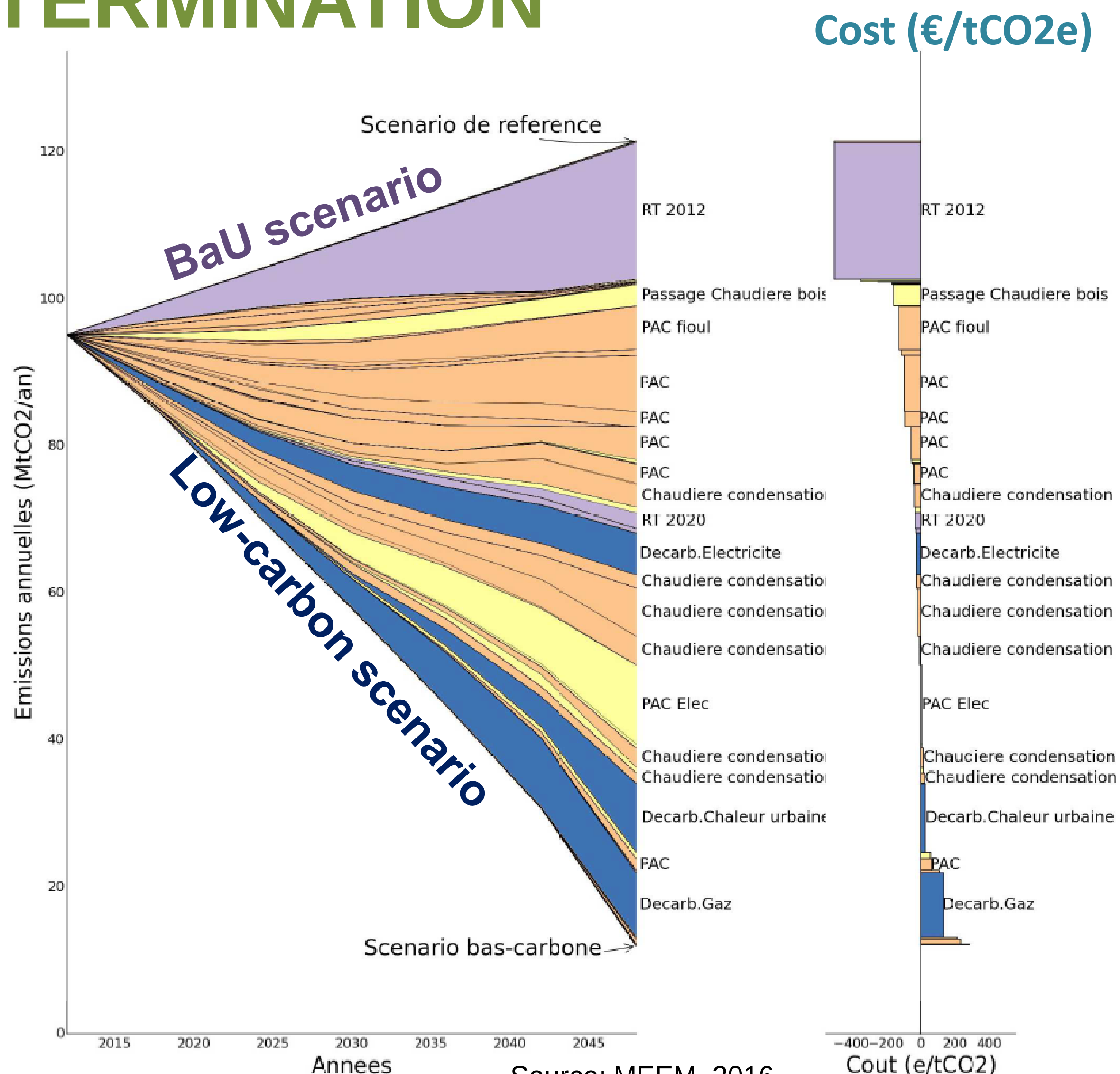
- **Approach to set the tax rate**
  - Social cost of carbon approach
  - Abatement target approach (Australia)
  - Revenue target approach (Chile/ Education reforms funding)
  - Benchmarking approach
  - **Political negotiation**

- **Tax rate adjustment in the years following the initial implementation**
  - Static carbon tax rate
  - Gradually increasing carbon tax rate
  - Matching with social cost of carbon
  - Adjustment formula
  - Periodic review
  - Ad hoc political approach

CARBON TAX DESIGN:

TAXE RATE DETERMINATION

Dynamic curve of abatement costs with a long term objective – residential sector in France



Source: MEEM, 2016

CARBON TAX DESIGN: TAXE RATE

CARBON TAX RATE IN FRANCE (1/2)

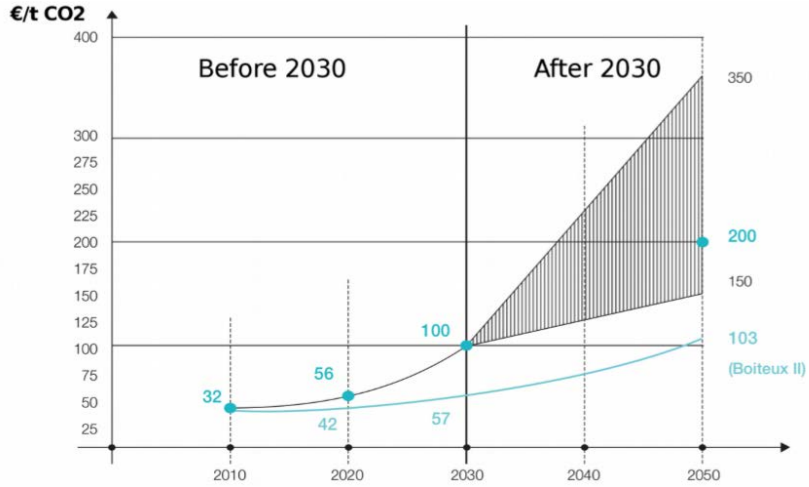
2001: Commission chaired by M. Boiteux €100 (2008 euros) per ton by 2030

2008: Commission chaired by A. Quinet decided upon a CO2 price of €100 (2008 euros) per ton by 2030, adopting a adopting a **cost-efficient approach** to hitting emissions reduction targets by 2050.

- Starting price €32 (2008 euros) per tCO2eq (consistent with the recommendation from the 2001 commission)
- From 2010 to 2030: +5.8%/year

2014: Carbon tax (incorporated into the domestic taxes on fossil fuels) adopted at €7/tCO2eq, €14.5/ tCO2eq in 2015 and €22/tCO2eq in 2016 [€ 30.5/tCO2eq in 2017]

2015: Energy Transition and Green Growth Act sets a carbon price target of €56 for 2020 and €100 by 2030 (2015 euros).



Trajectory for carbon pricing recommended by the commission chaired by A. Quinet (2008). Source : France Stratégie

2018: The 2018 Finance act revises the carbon pricing trajectory as follow:

2018	€44.6
2019	€55
2020	€65.4
2021	€75.8
2022	€86.2

CARBON TAX DESIGN

CARBON TAX RATE IN FRANCE (2/2)

€44.6/tCO2eq in 2018 (VAT ex.)

Domestic consumptions taxes on energy products refer to:

- Domestic consumption tax on energy products (TICPE)
- Domestic consumption tax on natural gas (TICGN)
- Domestic consumption tax on coal (TICC)

Domestic consumption taxes **collected by General Directorate of Customs and Excise** (DGDDI) when the products are made available for consumption on the domestic market.

Evolution of the Domestic consumption taxes on energy products between 2013 and 2017 (Source: MTES, 2017)

VAT excluded	2013	2014 (1er avril)	2015	2016	2017
Gaz naturel (€/MWh PCS)					
- ménages	exemption	1,27	2,64	4,34	4,88
- professionnels	1,19	1,27	2,64	4,34	5,88
Charbon (€/MWh)	1,19	2,29	4,75	7,21	9,99
Gazole (c€/l)	42,84	42,84	46,82	49,81	53,07
Essence E5 (c€/l)	60,69	60,69	62,41	64,12	65,07
Essence E10 (c€/l)	60,69	60,69	62,41	62,12	63,07
Fioul domestique (c€/l)	5,66	5,66	7,64	9,63	11,89
Fioul lourd (c€/kg)	1,85	2,19	4,43	6,88	9,54

CARBON TAX DESIGN

INSTITUTIONS

- **Institutional arrangements**
  - **Tax liability**
  - **Tax administration**
  - **Tax enforcement**
- **Procedures**
  - **MRV**
  - **Tax assessment and payment**
  - **Claiming rebates**
  - **Audit and inspection**
  - **Investigation and prosecution**
  - **Offsets and specific exemptions**
  - **Carbon tax rules revisions**

CARBON TAX DESIGN

REVENUES USE

- **Revenue neutrality**
  - **Rebates to households or businesses**
  - **Reductions in other taxes**

- **Expanded public spending**
  - **General budget**
  - **Earmarks**
  - **Debt reductions**

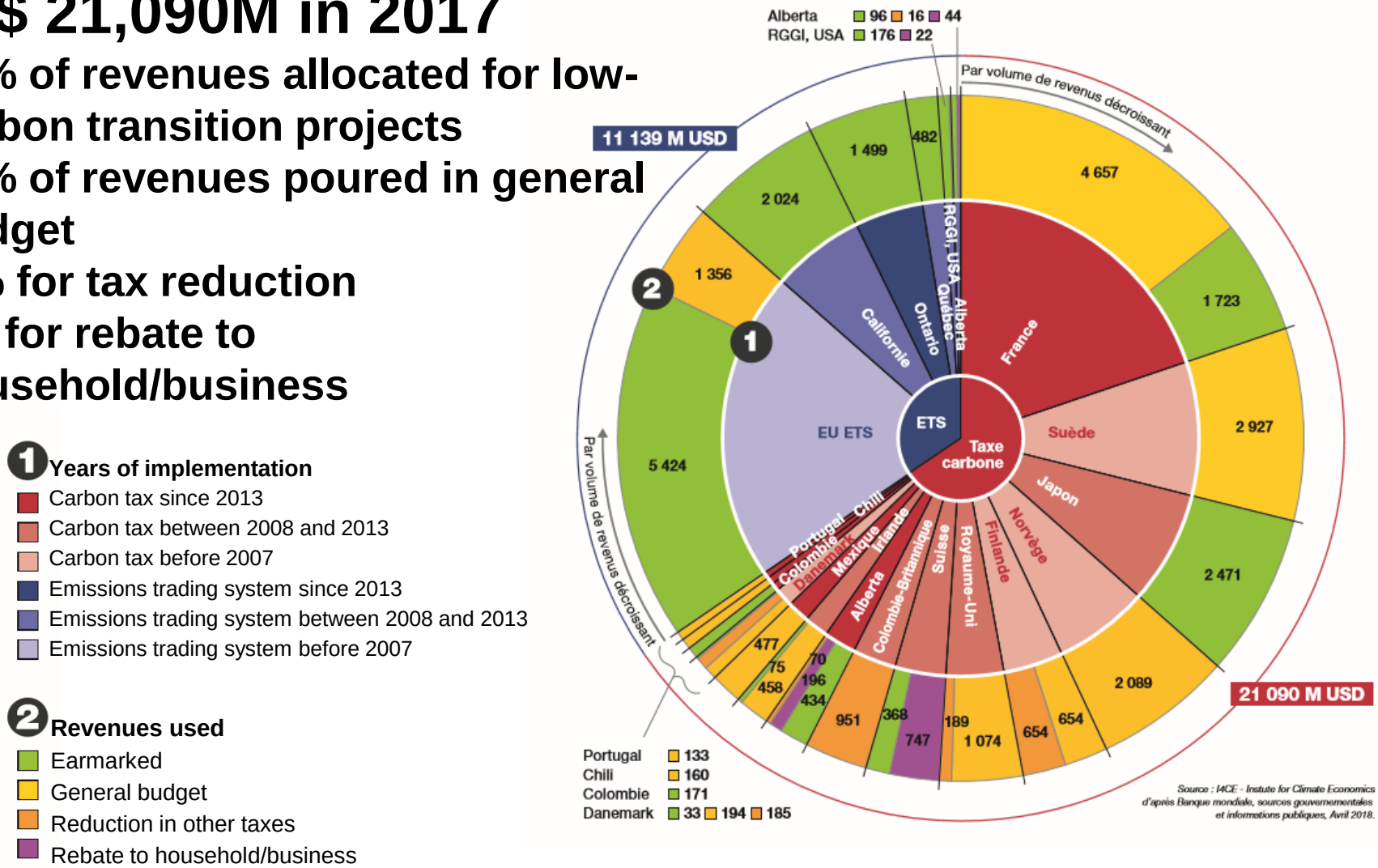
- **Other: finance offsets**

CARBON TAX DESIGN

REVENUES GENERATED BY CARBON TAX

US$ 21,090M in 2017

- 46% of revenues allocated for low-carbon transition projects
- 44% of revenues poured in general budget
- 6 % for tax reduction
- 4% for rebate to household/business



CARBON TAX DESIGN

REVENUE USE

FRANCE

2017: €5,600M (€300M in 2014)

- 3/4 of the revenues contribute to financing “tax credits for encouraging competitiveness and employment” (labor taxes)
- 1/4 used for specific renewable energy/low carbon purposes and tax-affected groups

SPAIN

2015: €66M (€31M in 2014)

- 100% general budget

JAPAN

2017: US$ 2,400M

- 100% used to promote low-carbon technologies, EE improvements and renewable energy

CHILE

2017: US$ 160M

- 100% general budget with the ambition to improve the education system

AGENDA

1. DEFINING A CARBON TAX

2. CARBON TAX DESIGN

3. **UNWANTED EFFECTS: THE MITIGATION MEASURES**

UNWANTED EFFECTS

Carbon tax designed to alter the economic costs of certain behaviors that produce GHG emissions.

- **Carbon leakage -** Increase in emissions in other jurisdiction that do not have equivalent emission-reduction policies.
- **International competitiveness** - increase inputs costs which put covered firms (or sectors) at a competitive disadvantage.
- **Distributional impacts -** unfair or uneven distribution of the carbon tax cost
  - **Income groups:** energy poverty / increase of energy share in low-income household budget, increase of transport budget in rural areas compared with urban areas.
  - **Geographic regions:** energy poverty in regions with harsh climatic conditions / decrease of competitiveness in regions with high concentration of emission-intensive industries.

⇒ **Understand the nature of the effects**
⇒ **Assess probability of materializing**
⇒ **Define and create effective policy to address**

UNWANTED EFFECTS

ADDRESS UNWANTED EFFECTS

Unwanted effect	Remedial measures
Leakage	• **Reducing carbon tax payments**: exemptions, reduced tax rates, rebates, offsets. • **Support measures**: reduce the overall financial burden of entities subject to the CT while leaving the signal price to reduce emissions unaffected. • **Border adjustments and consumptions-based taxation** • **Tax-coordinating measures**
Distributional risks	• **Reducing carbon tax payments**: exemptions, reduced tax rates, rebates • **Support measures**: flat payments, (non carbon) tax reductions
International competitiveness	• **Reducing carbon tax payments**: exemptions, reduced tax rates, rebates, offsets. • **Support measures**: support programs, output-based rebates • **Border adjustments and consumptions-based taxation** • **Tax-coordinating measures**

Thank you!

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CARBON TAX DESIGN

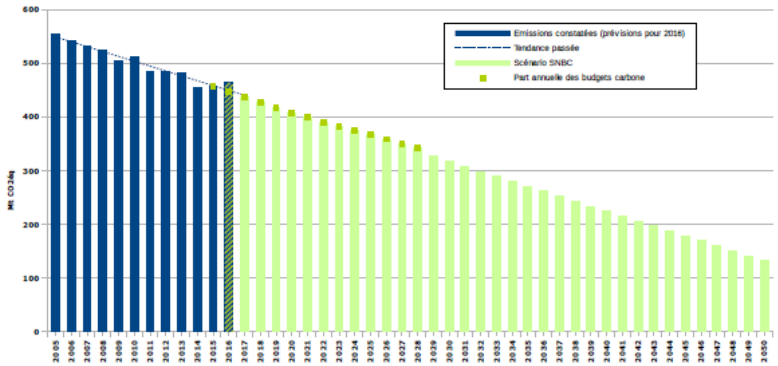
FRANCE FAILS TO REDUCE GHG EMISSIONS IN 2016 & 2017

Stratégie Nationale Bas-Carbone – Indicateurs de résultats

Indicateur n°2 : Émissions globales de gaz à effet de serre en France

Référence : Indicateur de résultats IR2

Nature de l'indicateur : Indicateur permettant de suivre l'évolution des émissions de gaz à effet de serre en France (émissions territoriales). Cet indicateur n'est pas corrigé des variations climatiques, et n'intègre pas les émissions nettes liées à l'utilisation des terres, aux changements d'affectation des terres et foresterie (UTCATF)

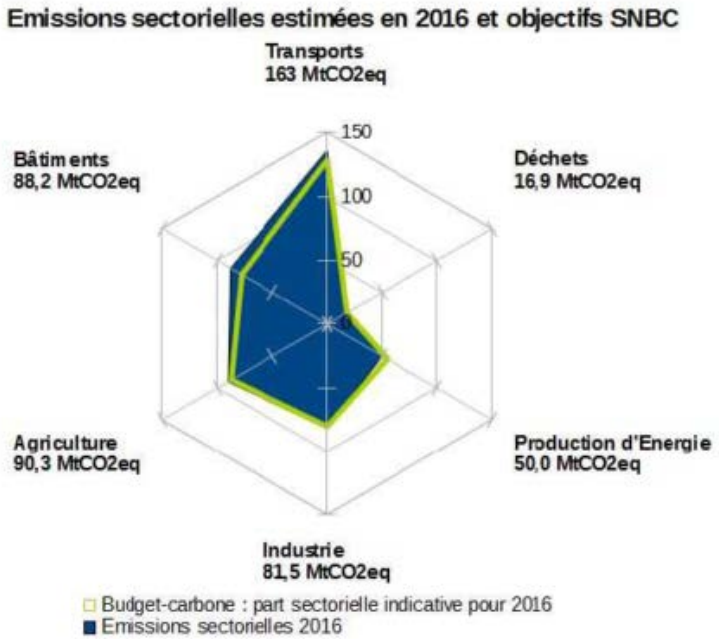


Evolution /objectif : Les émissions de 2015 correspondaient très exactement au budget annuel indicatif prévu dans le scénario de référence de la stratégie nationale bas carbone. Selon les premières estimations, les émissions de 2016 excèderaient le budget annuel indicatif de 3,6 %.

Observations : -

Source : CITEPA (Centre interprofessionnel technique d'études de la pollution atmosphérique)

Fréquence de suivi : annuelle



UNWANTED EFFECTS

ADDRESS UNWANTED EFFECTS

Measures to address leakage and distributional risks

Measure	Pros	Cons	Examples
Exemptions	• Straightforward to implement • Targeted at affected groups • Contingent upon emission reduction agreements • Unlikely to present inter. legal challenges	• **Negative price signal** • Difficult to determine appropriate level • Risk of domestic legal challenge (non-exempted industry) • Loss of tax revenue • Contrary to PP Principe	Japan, South Africa, Switzerland
Reduced rates			Sweden, France
Rebates on carbon tax payments			Denmark, Ireland, Finland
Offsets	• Incentive for emission reductions in uncovered sectors • Incentivize private investment in emission reductions	• Administratively complex • Reduced tax revenues	Mexico, South Africa

CARBON TAX DESIGN

MRV & ADMINISTRATION

MRV & Administration influence each of the decisions

DECISION	MRV & ADMINISTRATION FACTORS
Sectors and activities	Preexisting systems for monitoring inputs outputs or transactions Preexisting systems for tax collection and administrations Number of participants in different sectors Emissions factors in different sectors
Point of regulation	Number of emitters at different points of taxation Preexisting MRV or tax administration at different points of taxation Capacity of emitters to undertake M&R of emissions
Level of reporting	Access of different entities to data for M&R
Thresholds	Share of small emitters in covered sectors Capacity of emitters to undertake M&R of emissions M&R their emissions for tax reporting purposes or only fuel use/sales ?

UNWANTED EFFECTS

ADDRESS UNWANTED EFFECTS

Measures to address leakage and distributional risks

Measure	Pros	Cons	Examples
Output-based rebates	• **Strong leakage protection** • Retain price signal	• Uncertain cost to public budget • Significant MRV • Reduce incentive to shift to other products	Sweden
Support programs	• **Popular w/h industry groups** • Retain signal price • Offer additional emission reduction incentive • Flexible in design	• Costly to public budget	South Africa, Ireland, Japan, Switzerland
Other tax reductions	• Retain price signal • Potential for net positive effect on business and economy	• Cost to public budget • Difficult to target directly at affected entities	France
Flat payments	• Retain price signal • Simple to claim • Popular with general public • Potential for net positive social and eco. Benefits	• Cost to public budget	

UNWANTED EFFECTS

ADDRESS UNWANTED EFFECTS

Measures to address leakage only

Measure	Pros	Cons	Examples
Border carbon tax adjustments	• Maintain price signal for domestic industry • Prevent free-riding (companies from non taxing jurisdictions) • No pressure on public budgets	• Politically unpopular (risk damaging international relations / WTO) • Administratively challenging • Potential negative impacts on importers	California ETS
Tax-coordinating measures	• Retain domestic price signal • Leverages domestic carbon price to encourage carbon pricing in partner jurisdictions • No domestic administration needs	• Difficult to negotiate across many countries	