Climate Change and Development Series

DECARBONIZING DEVELOPMENT

Three Steps to a Zero-Carbon Future

Motivation

- A lot of talk about 2^{o}C but limited awareness of implications
- Planning targeted to the medium term
- Debate focusing on what should be done without enough discussion on the obstacles to do so – especially in political economy terms…

Self evident?

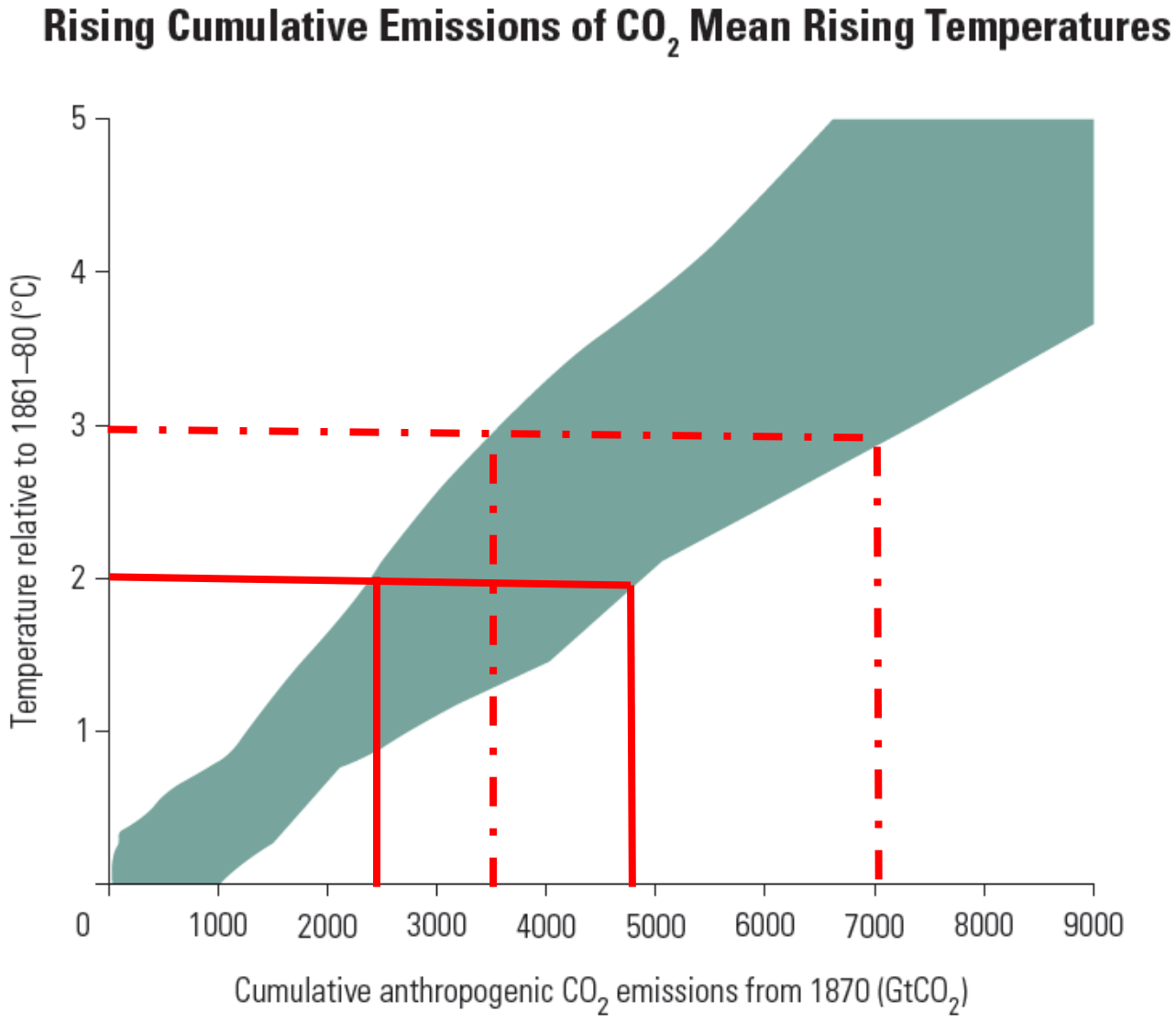
Stabilizing the Climate

=

Full Decarbonization

The future is carbon free

- For any temperature limit, there is a maximum CO_2 budget
- So CO_2 emissions have to go to zero at some point
- The only question is *when?*



Three steps to a zero-carbon future

- **Step 1 – Plan ahead for a future with *zero* emissions**
- **Step 2 - Getting carbon prices *and* *complementary policies* right**
- **Step 3 - Mind the *political* economy and *smooth the transition* for those who stand to be most affected**

Step 1 – Plan ahead for a future with zero emissions

Good news: we know how to get to zero emissions

Decarbonization of electricity generation, i.e. renewable and/or Carbon Capture and Sequestration

Fuel shifting (especially to electricity) in transport, heating, and industries

Efficiency in all sectors, including building, transport, and agriculture

Preservation and increase of natural carbon sinks

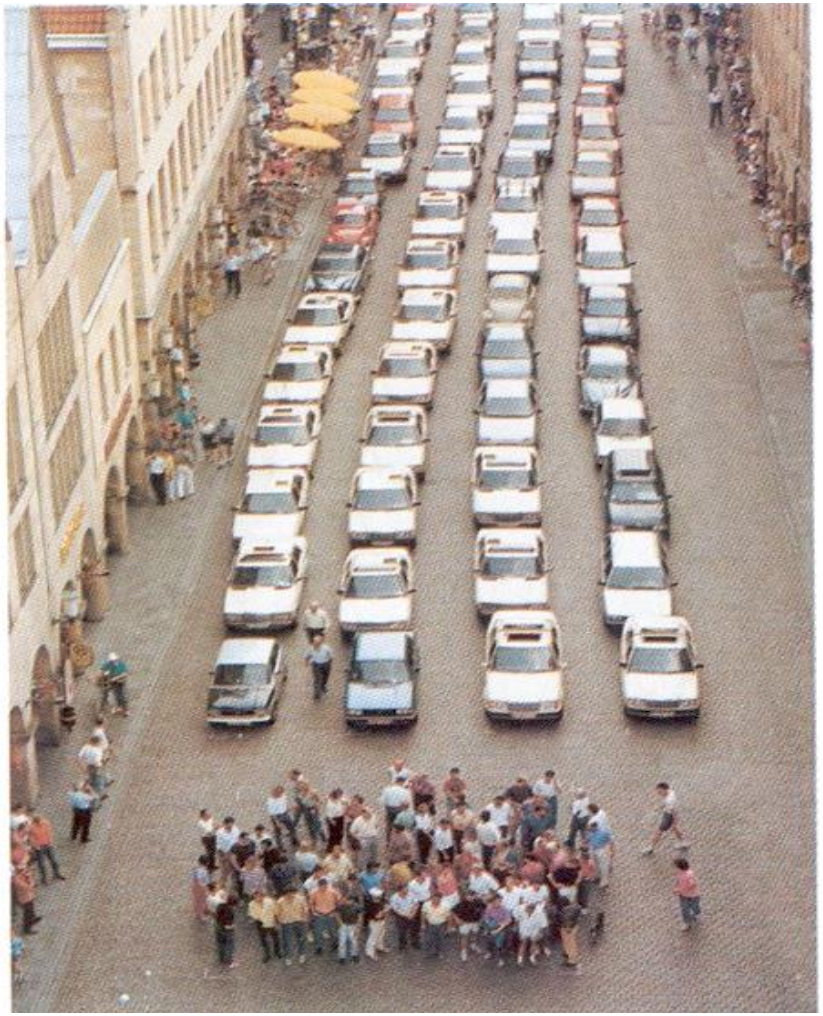
- *Beware of marginal changes that do not lead to the long-term goal.*
- *Progress is required on high-potential measures, and in each of the four pillars*

Sectoral indicators help track progress along the four pillars of decarbonization

TABLE 3.2 Examples of Possible Sectoral Targets for Tracking Progress toward the Decarbonization End Goal

Pillar	Sector	Example of target	Rationale
Decarbonization of electricity production	Power generation	Produce at least 30% of electricity from renewable sources by 2025	This type of target prevents the power sector from locking into intermediate solutions, such as gas power or enhanced coal power, which do not have the potential to fully decarbonize the power sector. It also supports the development of the required technologies (e.g., solar photovoltaic and smart grid able to manage intermittency).
Efficiency	Transport	Get 50% of the population to commute by public transport (bus) in 2025 in a city	At city scale, this target helps reduce energy expenditures, congestion, and local pollution, in addition to lowering CO_2 emissions and building zero-carbon cities. Accessible public transit can also influence household localization choices, which have long-term consequences on energy and carbon efficiency.
	Building	Build 50% of zero-energy buildings in 2030	Zero-energy buildings are needed for full decarbonization, and reduce energy bills and increase comfort. Early action is needed given the long lifetime of buildings.
	Cities	Plan for dense cities	Urban sprawl is mostly irreversible and locks inhabitants into carbon-intensive pathways as it makes it much more difficult to develop viable public transit systems.
Fuel shifting/ substitution	Transport	Reach 1% of electric vehicles in 2015	Favoring electric vehicles prevents locking into marginal improvements of combustion engines, and contributes to total decarbonization as long as the electricity sector is being decarbonized at the same time.
	Buildings/ forestry	Use 20% of sustainable wood in new building structure by 2025	Wood construction contributes to reaching zero carbon, if wood is produced sustainably. It is one of the options to reduce emissions from construction materials.
Natural carbon sinks	Forestry	Stop deforestation by 2017	Deforestation (and associated loss of ecosystem services) is largely irreversible, so action in this domain cannot wait.

There are many co-benefits

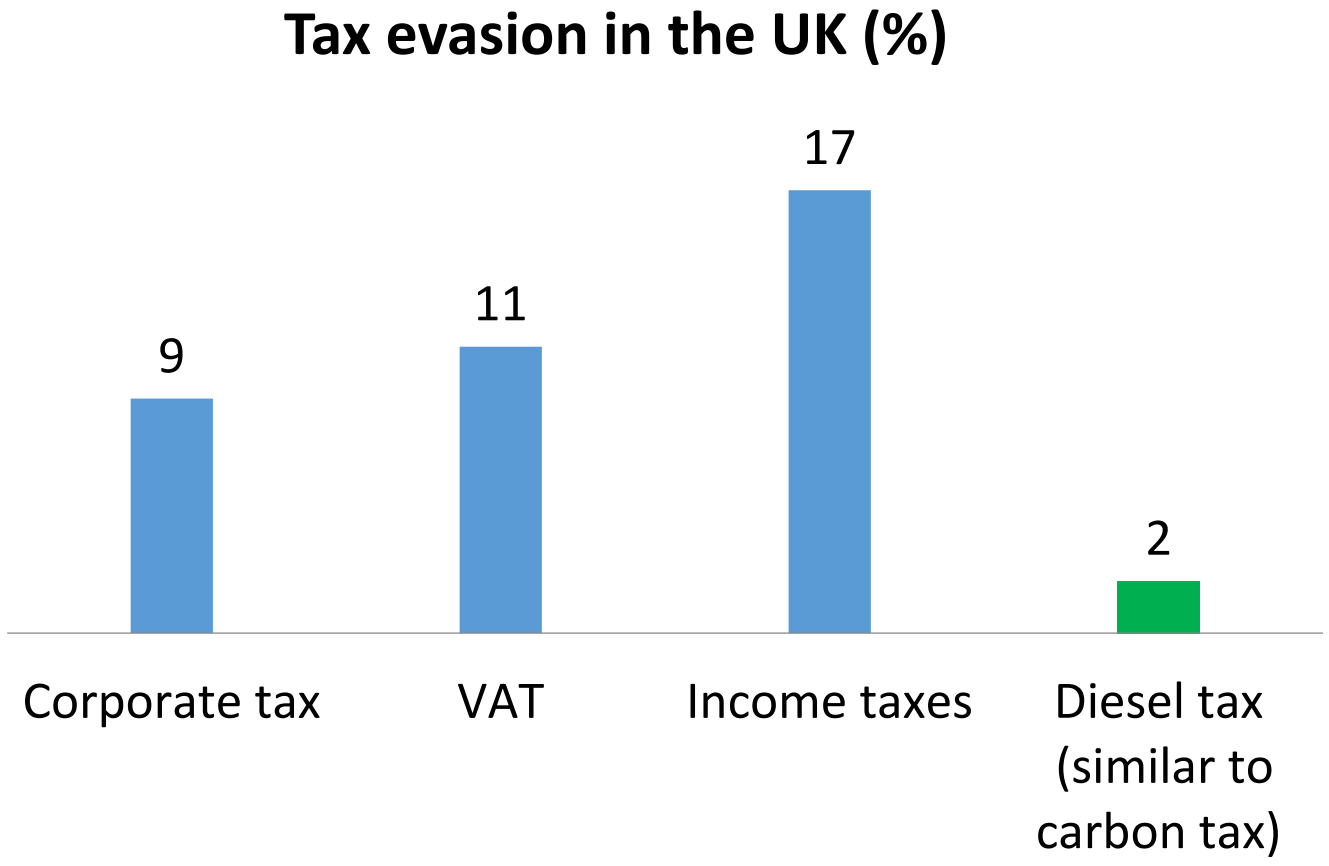


There are many co-benefits

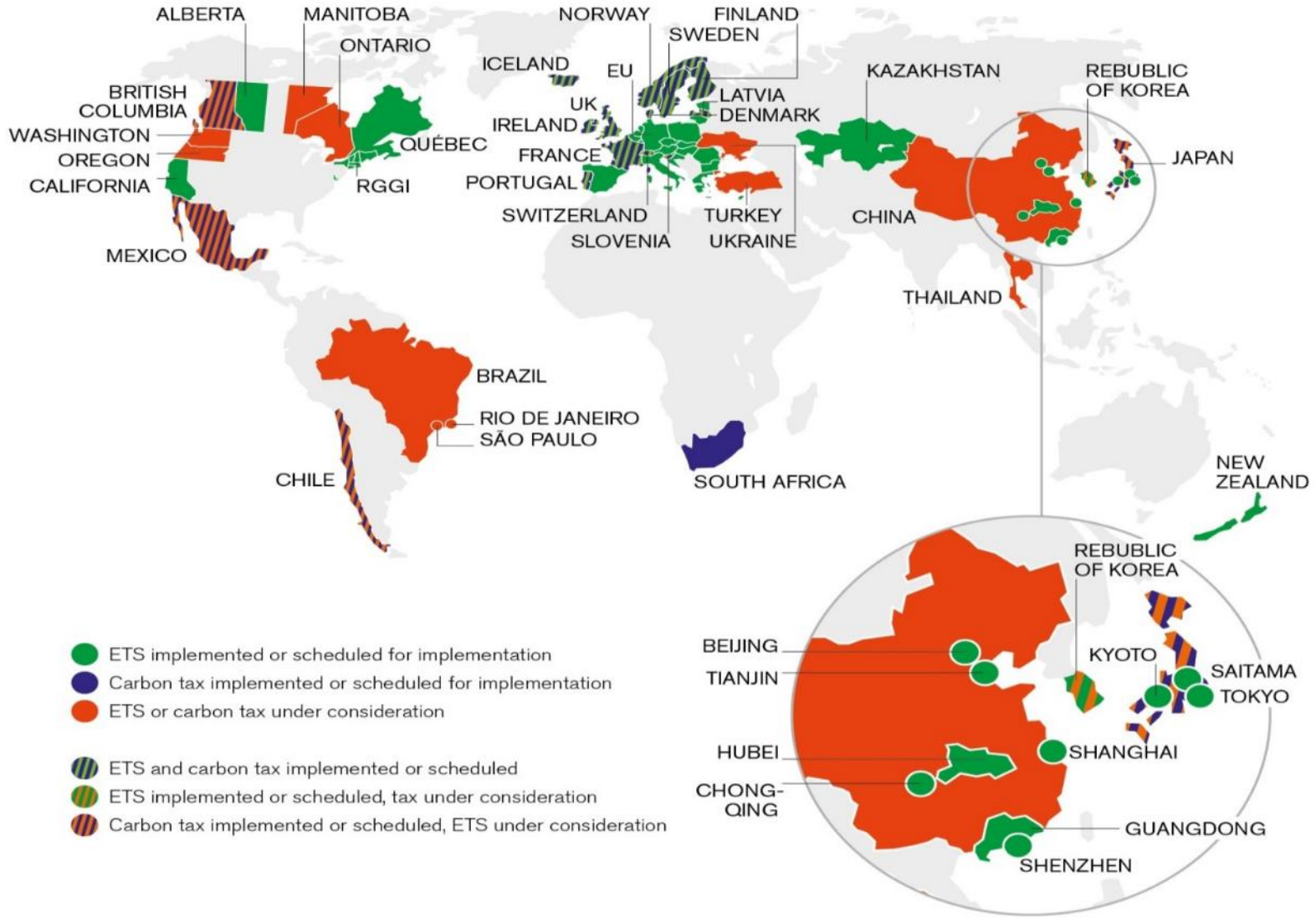
Step 2 - Getting carbon prices *and complementary policies* right

Tax the bads, not the goods!

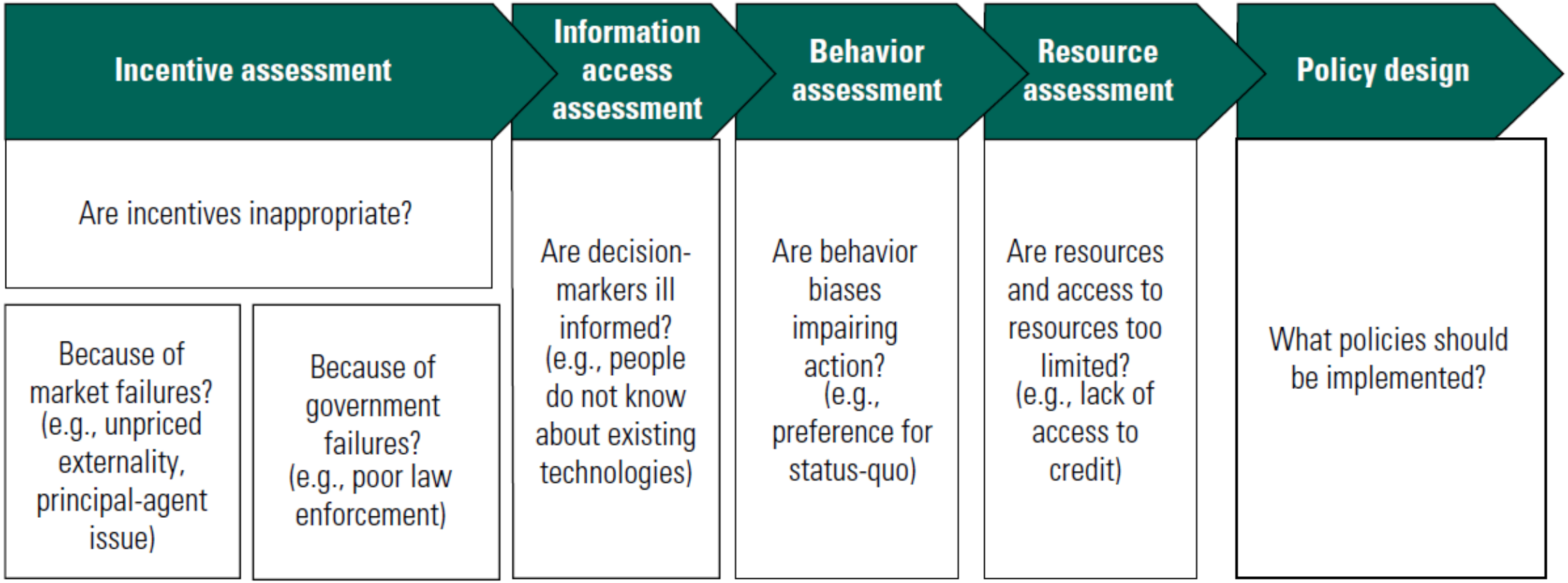
- Getting prices right is good fiscal policy: a carbon tax can generate revenues efficiently
- Better to tax energy consumption or emissions rather than jobs or investments
- And evasion is more difficult
- This is even more important in low-income countries with weaker institutions



Good news: progress on carbon pricing



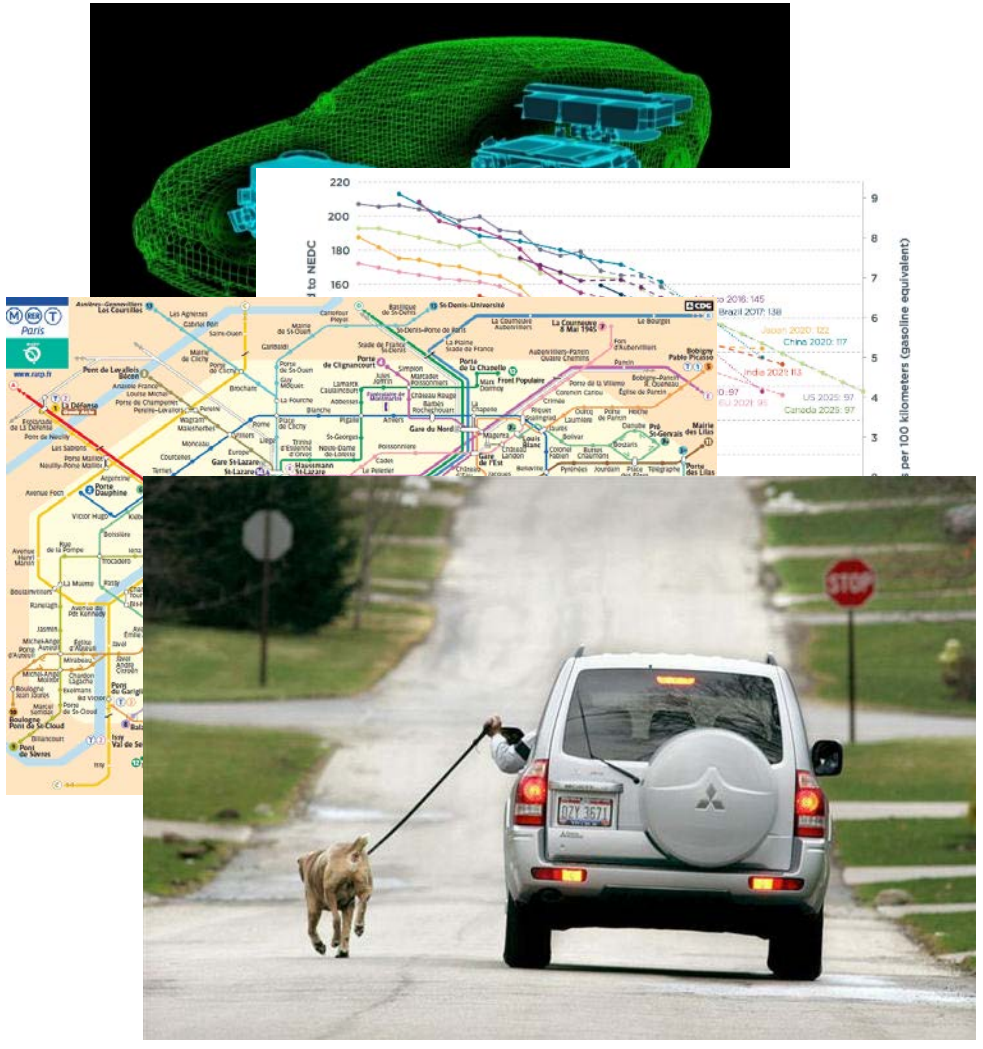
Pricing is not enough: decarbonization faces many obstacles



Source: Adapted from World Bank (2013).

Prices are not enough: what's needed is a policy package

- **Develop the technologies** we'll need to get to zero-emissions
  - Subsidies and demand-support
  - it makes sense to pay a **higher price per abated ton** than average when using higher potential technologies or solutions
- **Act on new investments**, to make sure they are energy-efficient
  - Norms and performance standards on cars, building, appliance, etc.
- **Develop the right infrastructure**
  - Paris without metro system would emit twice as much, and be half less reactive to carbon pricing
  - This creates large financial challenges
- **Inform and promote the right behaviors**



Step 3 - Mind the political economy and smooth the transition for those who stand to be most affected

The political economy is key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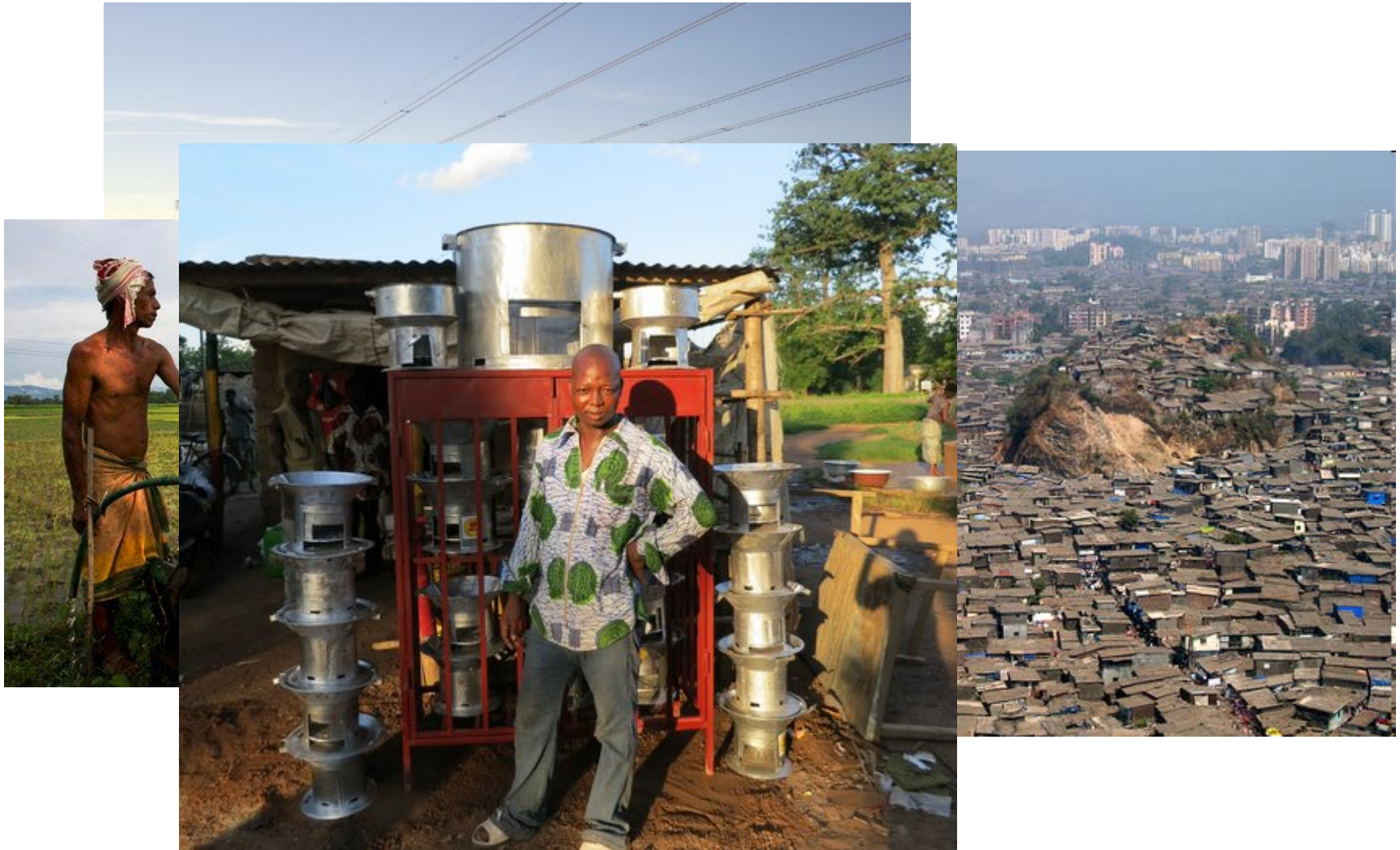
Climate policies will be successful only if they contribute to development and poverty reduction

- Climate policies can be designed such that poor people benefit
- Revenue-raising policies makes it possible to invest in development and poverty reduction

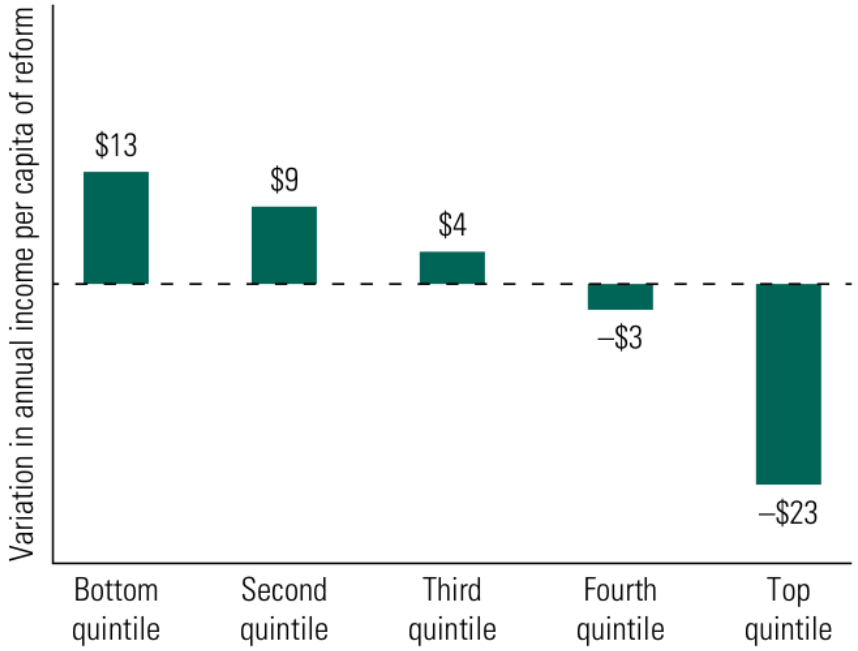


Climate policies will be successful only if they contribute to development and poverty reduction

- Fossil fuel subsidies and low energy prices are not efficient tools to help poor people

FIGURE 0.5 Using Fossil Fuel Subsidy Resources for Universal Cash Transfers Benefits Poor People

(Impact of recycling $100 from a fossil fuel subsidy to a universal cash transfer)

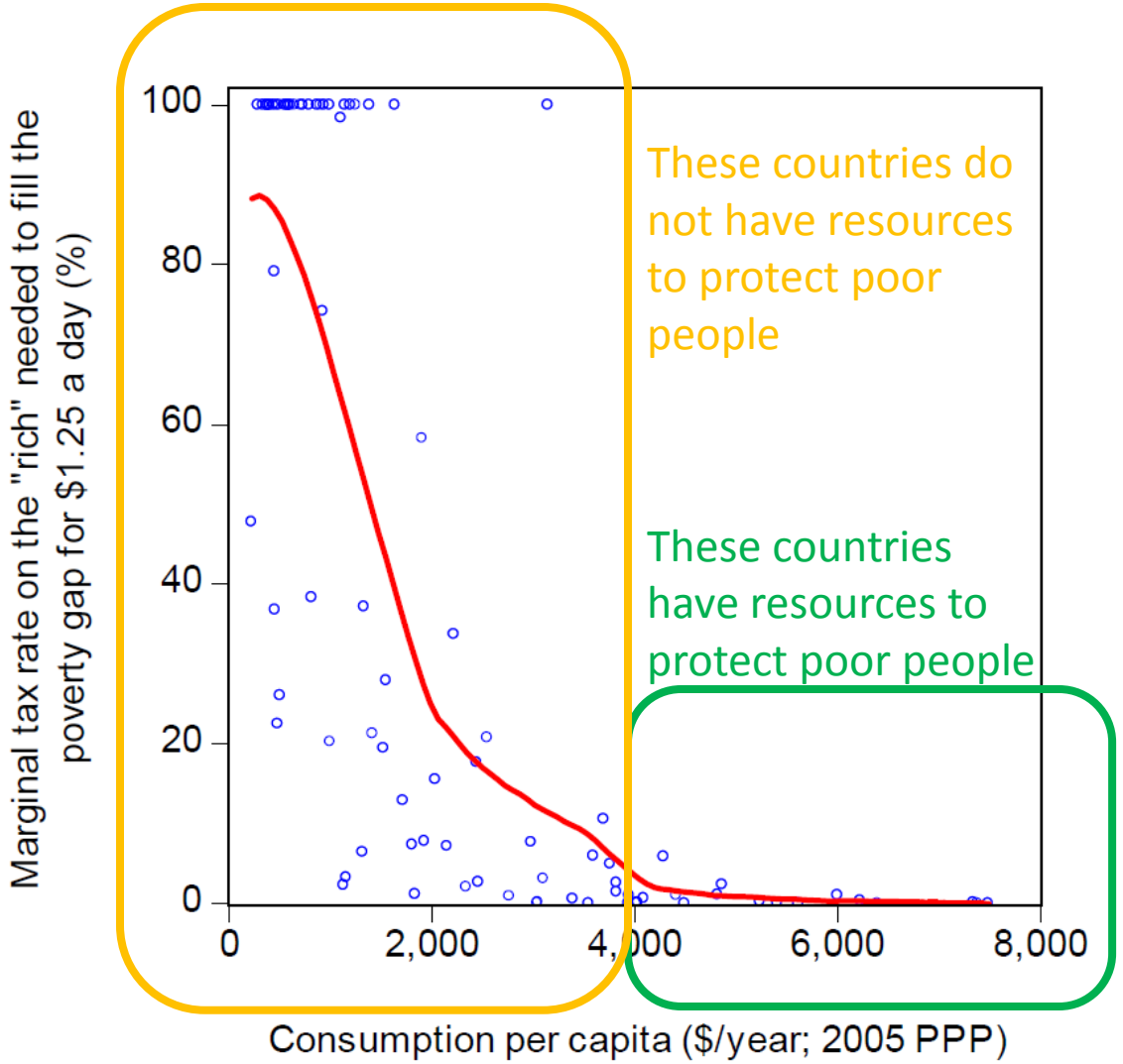


Source: Based on Arze del Granado, Coady, and Gillingham (2012).

Note: The figure shows the impact of reducing the fossil-fuel subsidy budget by $100 and distributing the savings as a universal cash transfer.

But very poor countries cannot protect poor people

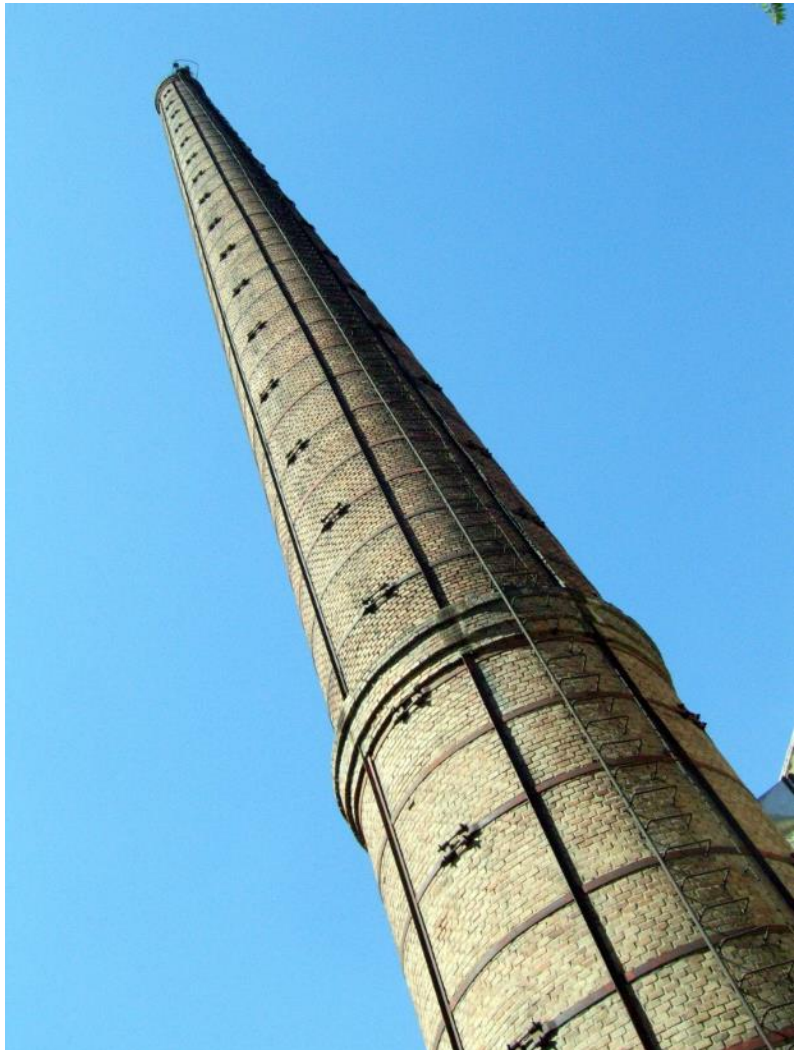
For low-income countries, only international support can prevent a trade-off between emissions reduction and poverty alleviation



Source: Ravallion, 2010

Climate policies will be successful only if they recognize and support those who are affected

- Make industries and regions benefit from the change
  - Automakers and electric cars
  - Oil and gas industry and carbon capture and sequestration
  - Green pilot projects in negatively affected areas
- Avoid concentrated losses and smooth the shock
  - Social protection and social safety nets
  - Dedicated adjustment mechanisms – examples of the Japan industrial policies
  - Worker retraining – examples from trade agreements and from the US



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Three Steps to a Zero-Carbon Future

OVERVIEW

See the full report at
www.worldbank.org/decarbonizingdevelopment

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Julie Rozenberg
Ulf Narloch
Tom Kerr

DECARBONIZING DEVELOPMENT

Decarbonizing Development: Planning Ahead for a Future with Zero Emissions

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DECARBONIZING DEVELOPMENT

Decarbonizing Development: Getting Carbon Prices and Policies Right

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DECARBONIZING DEVELOPMENT

Decarbonizing Development: Smoothing the Transition and Protecting the Poor

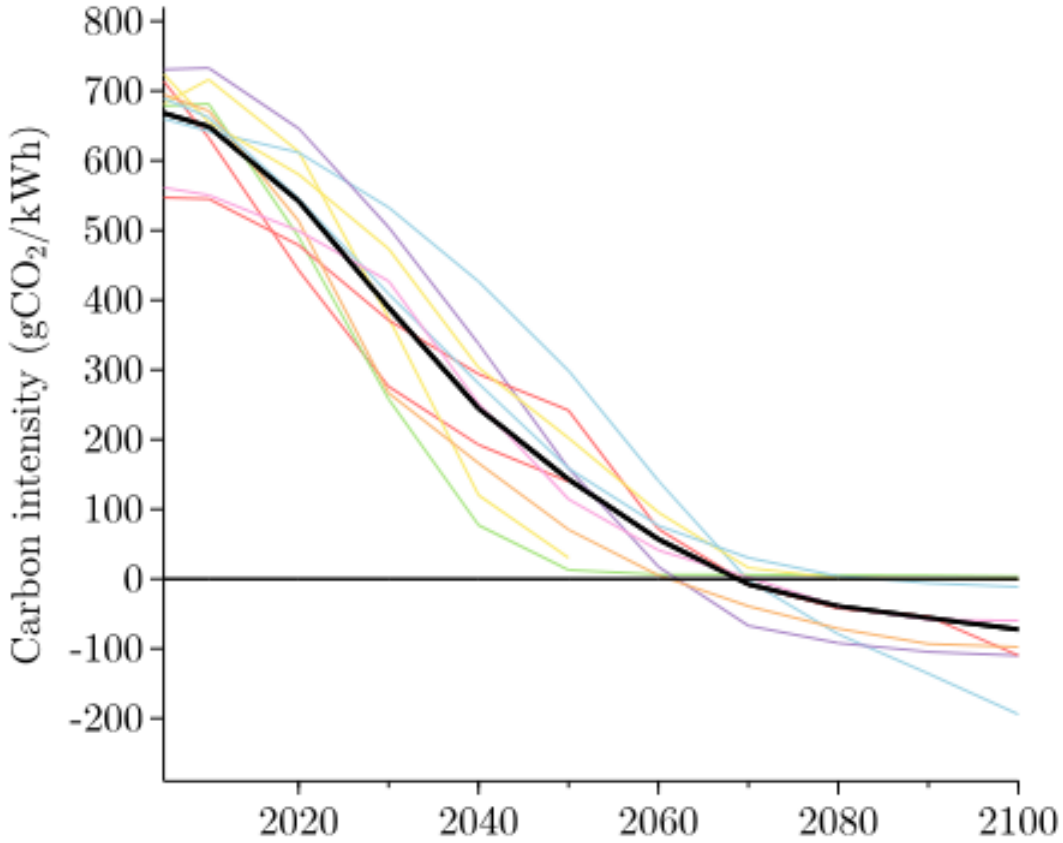
All of that is on www.worldbank.org/climate/decarbonization

What's next? A report on "Poverty and Climate Change," expected released on next week! Thursday November 5th.

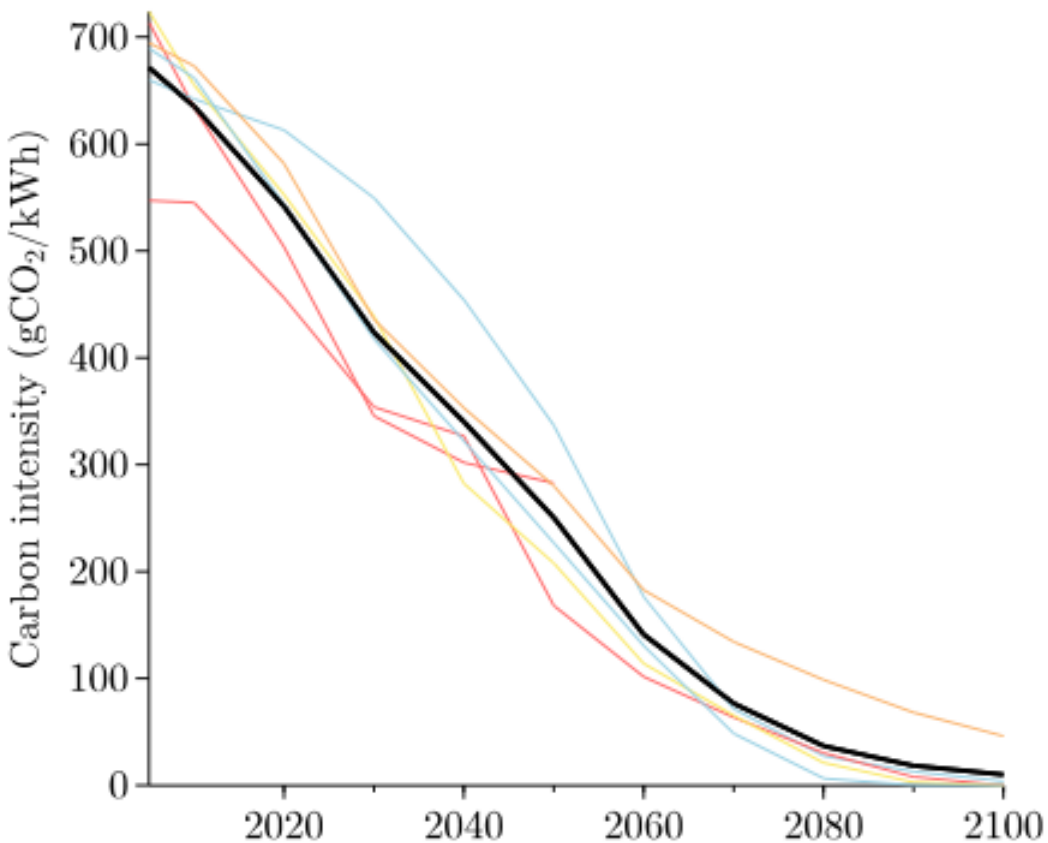
Stephane Hallegatte, shallegatte@worldbank.org

Additional slides

Pathways toward zero-carbon electricity, even without nuclear and carbon capture

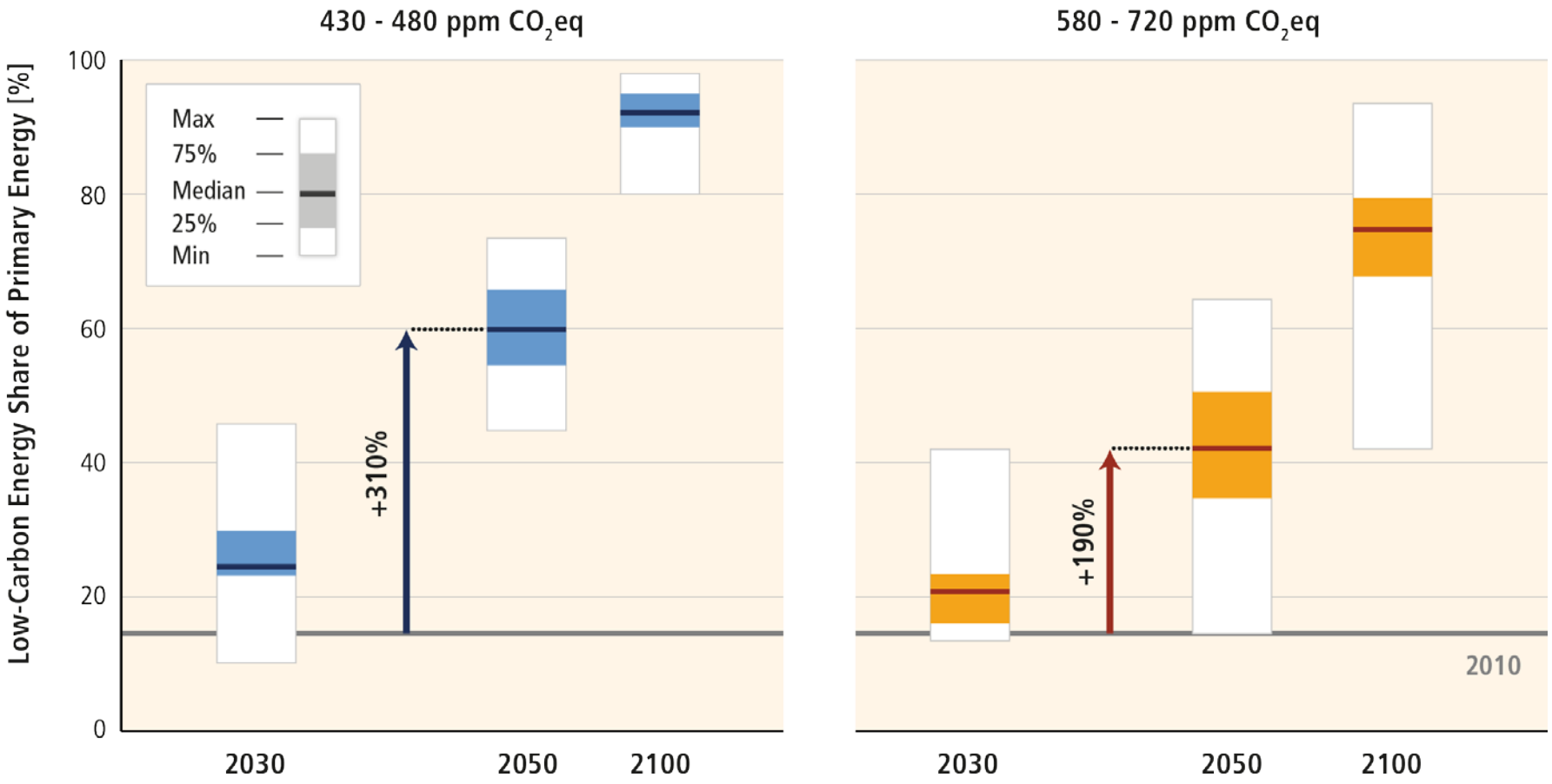


All carbon-free technologies

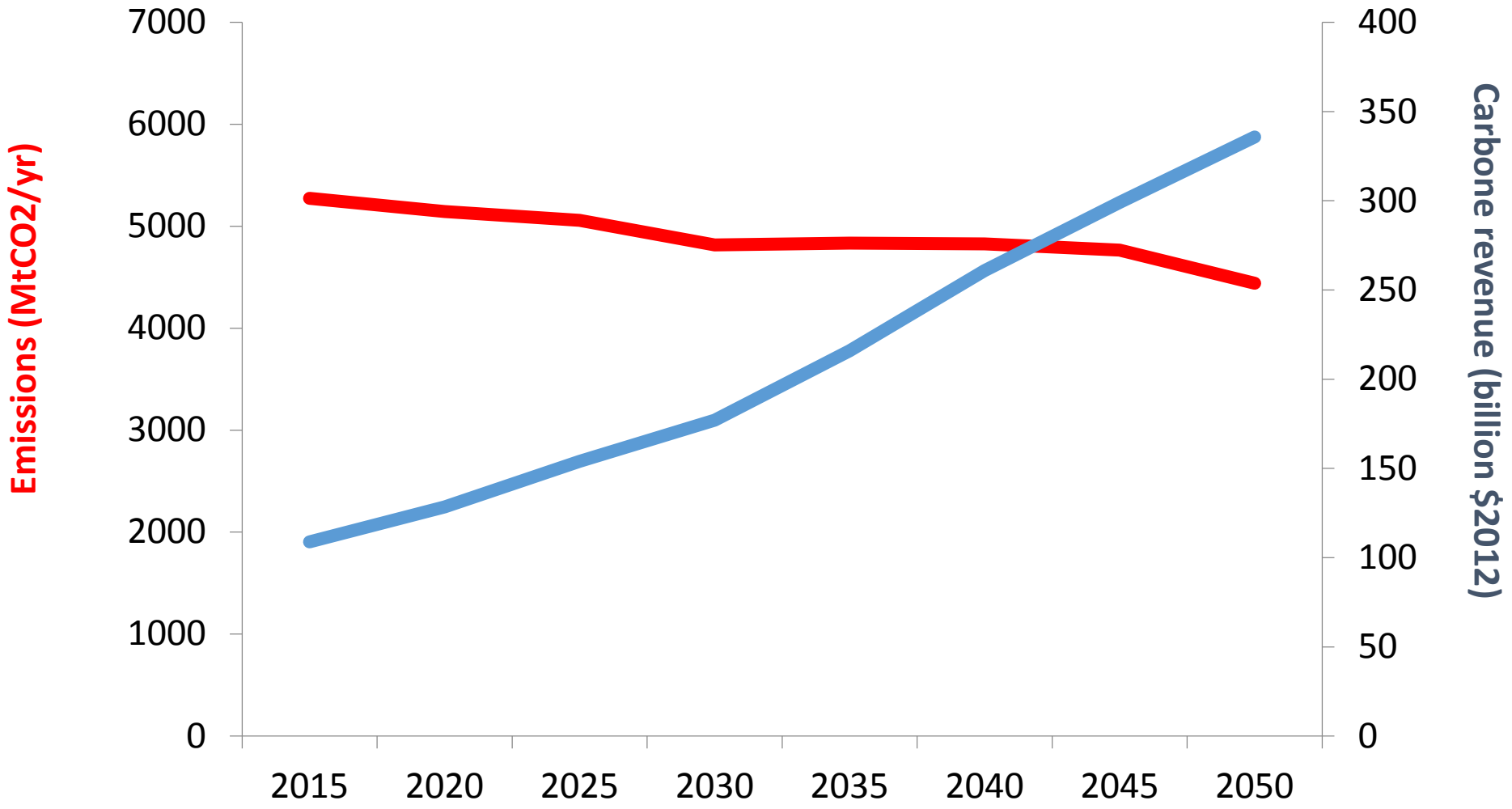


No new nuclear and no CCS

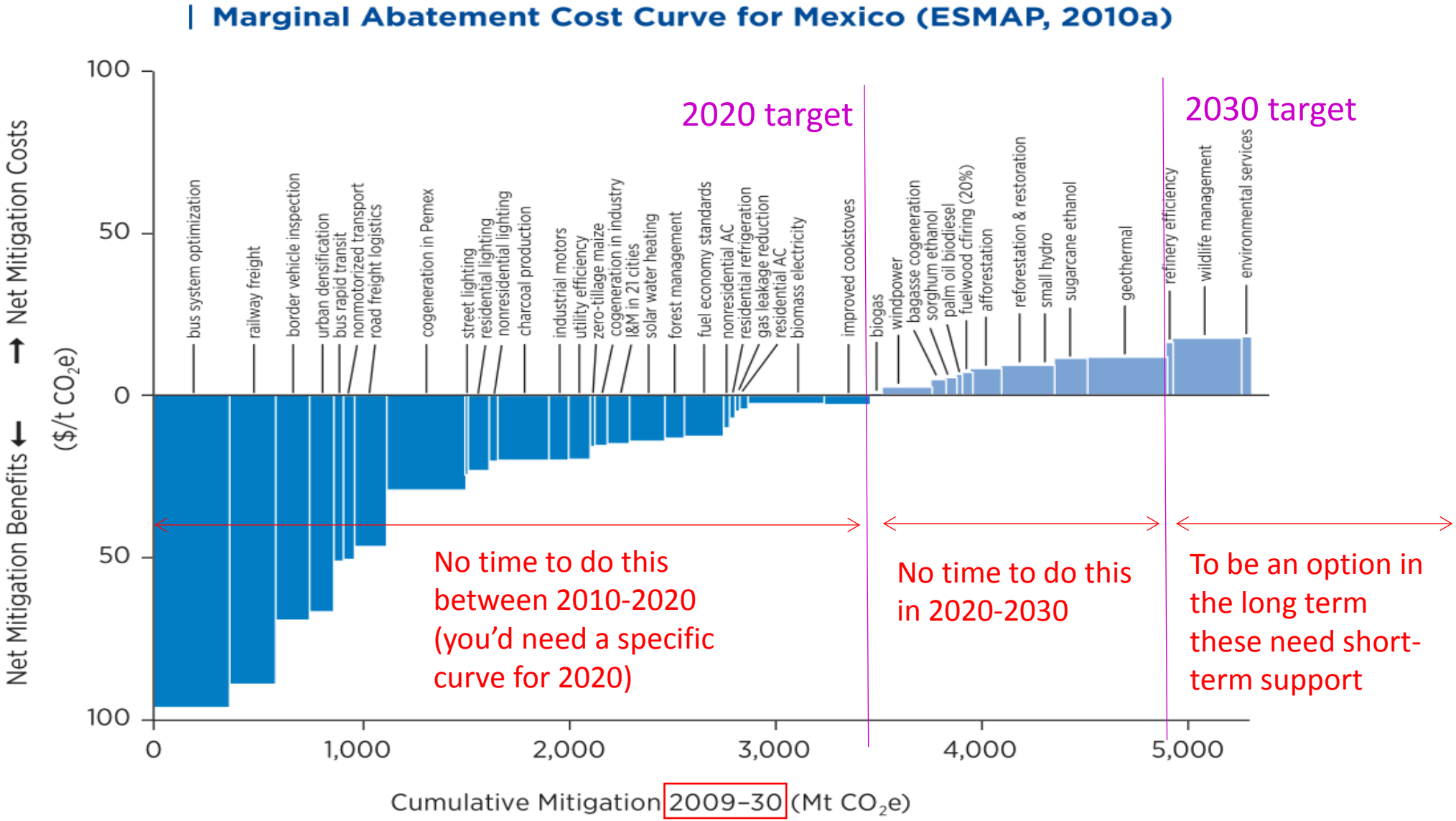
Carbon-free electricity



Carbon is a solid tax base – because the carbon price increases over time



Reaching a shorter-term target through cheap options (supply curve approach) would cause carbon-intensive lock-in

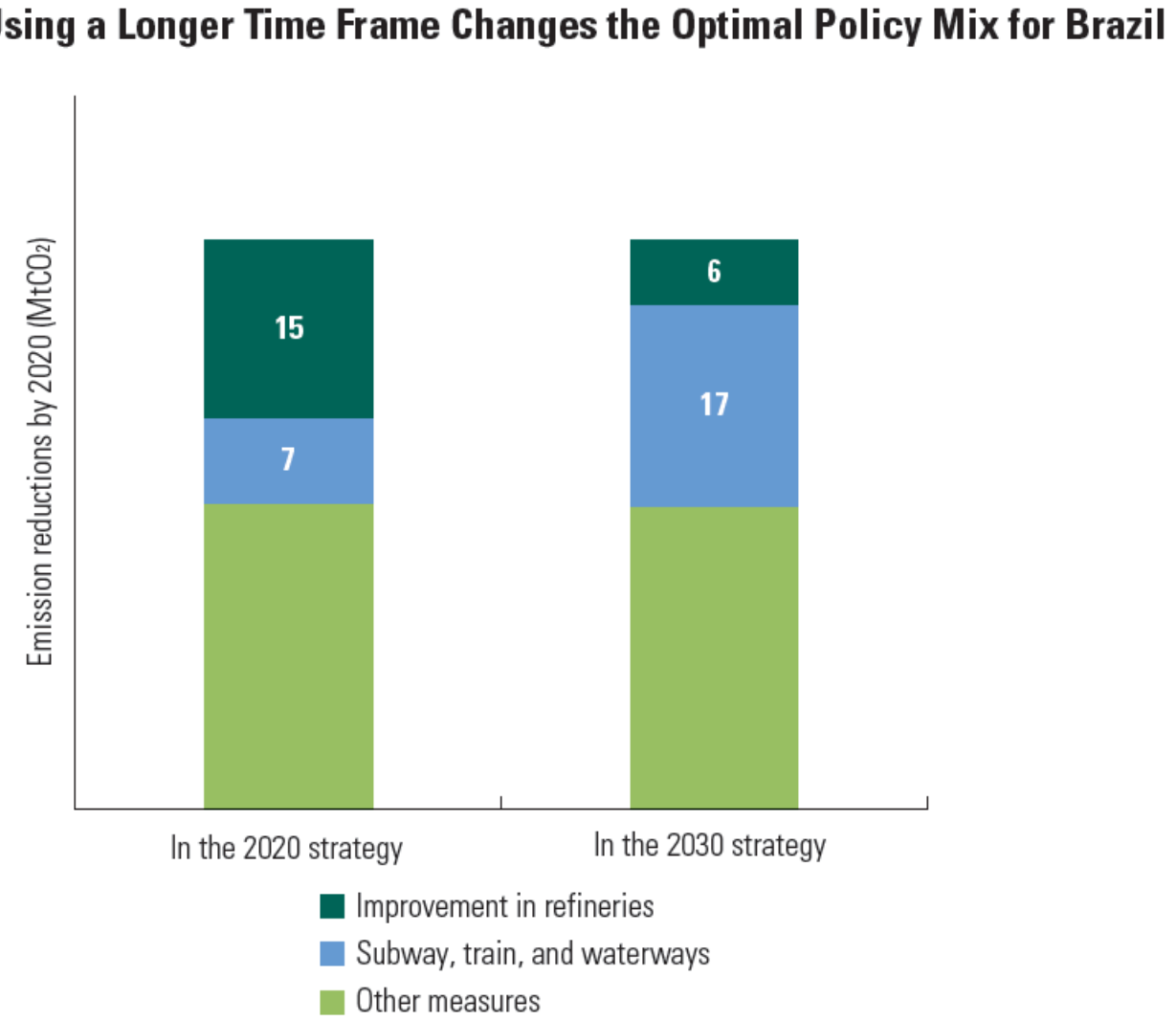


Source | ESMAP, 2010b.

The zero-emission goal determine immediate needs for action

- In a case study on Brazil, we highlight the difference in strategy between a marginal and a structural change

- To get to zero emissions, we need to start now to:
  - Develop and test needed technologies
  - Redirect investments in long-lived equipment
  - Improve land use and urban development



Short term action depends on the long term goal

FIGURE 0.3 Devising a Strategy Requires Information on Time, Cost, and Emission-Reduction Potential

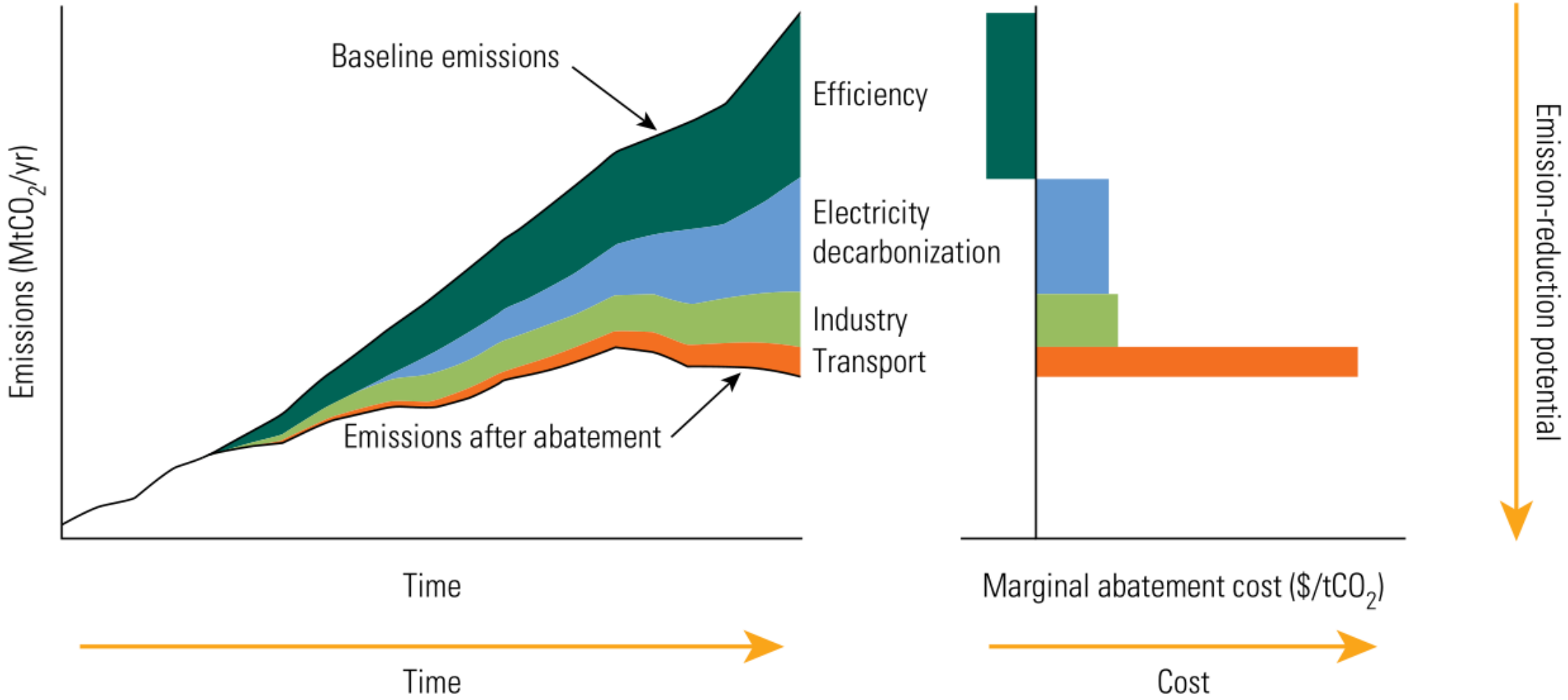
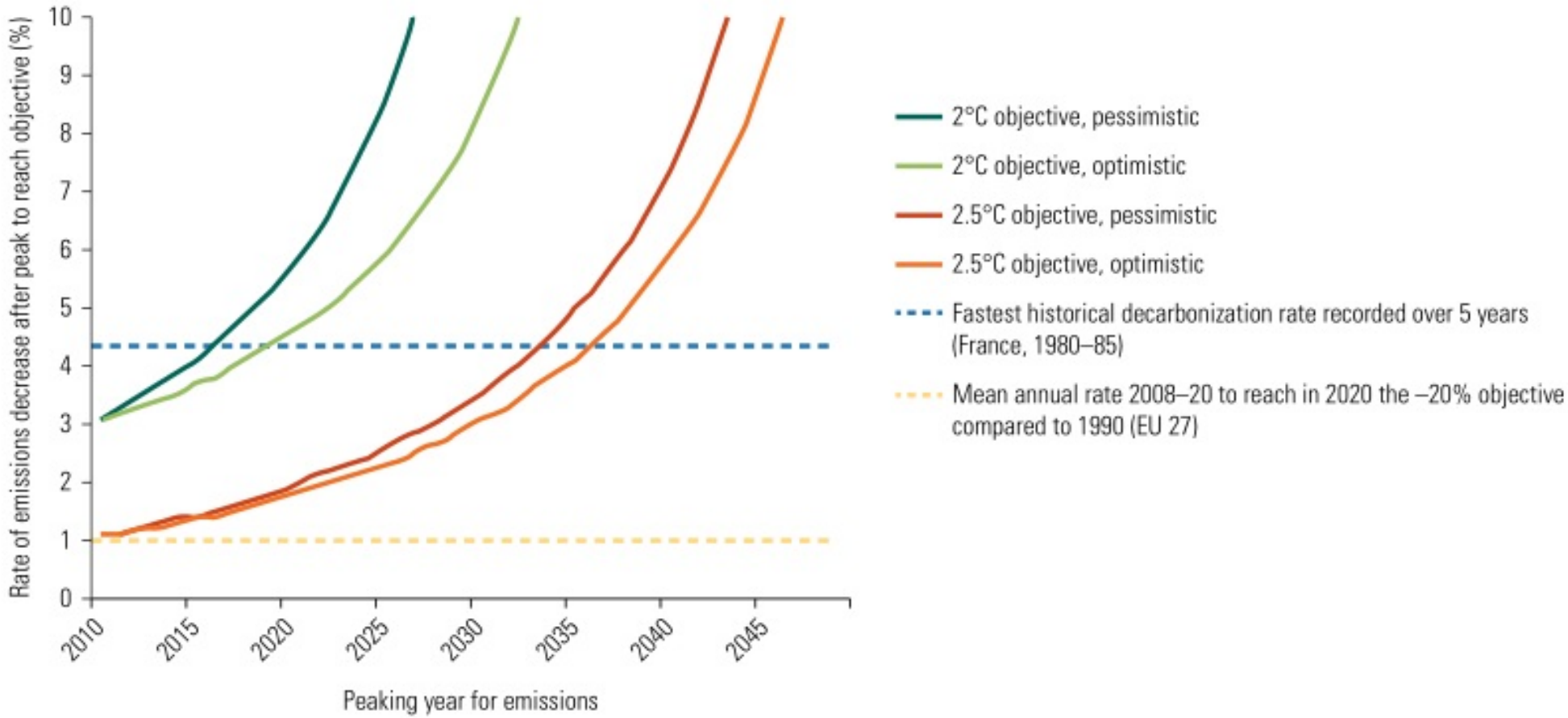
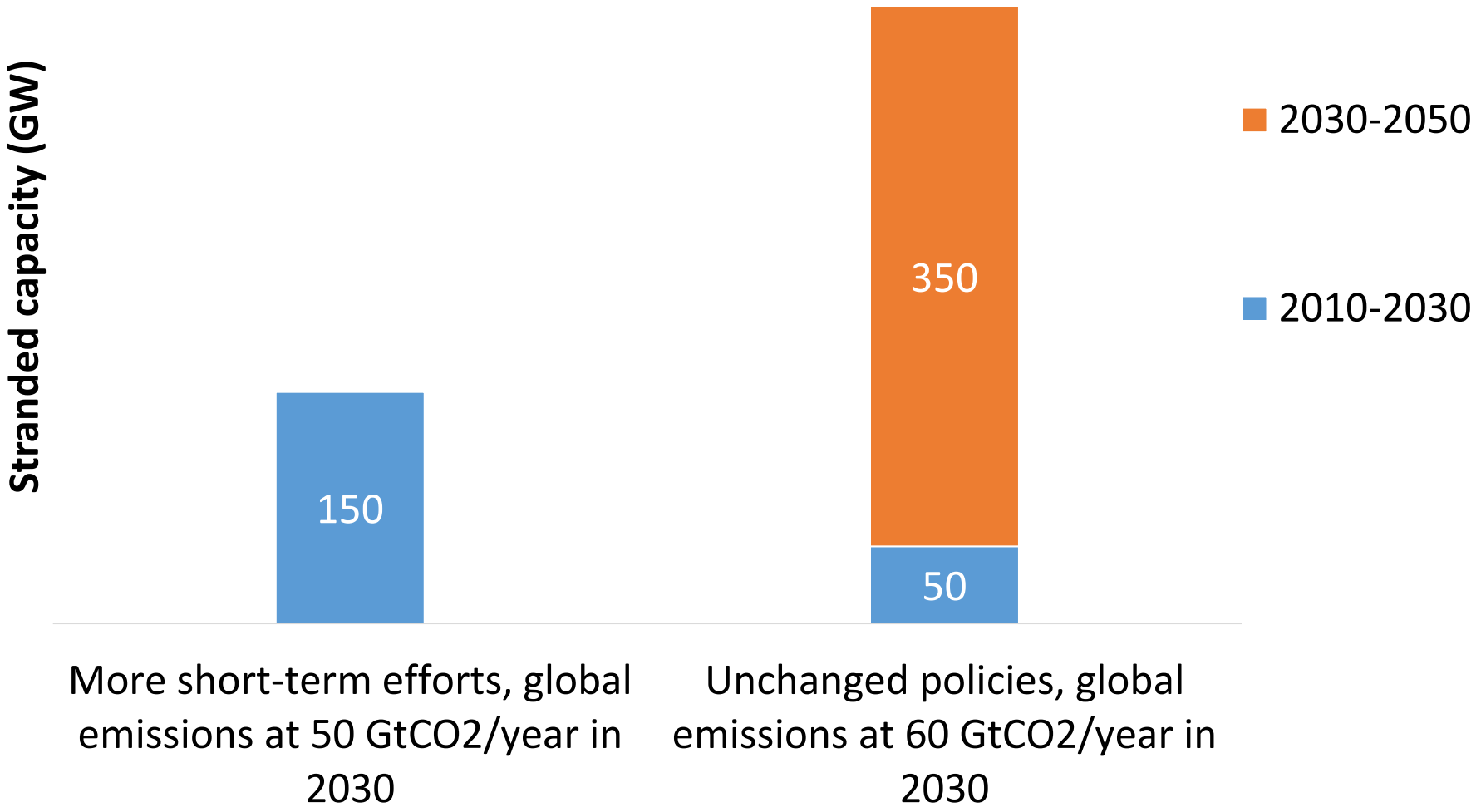


FIGURE 0.1 The Tortoise and the Hare: Not Starting Early Will Entail More Drastic Emission Cuts Later

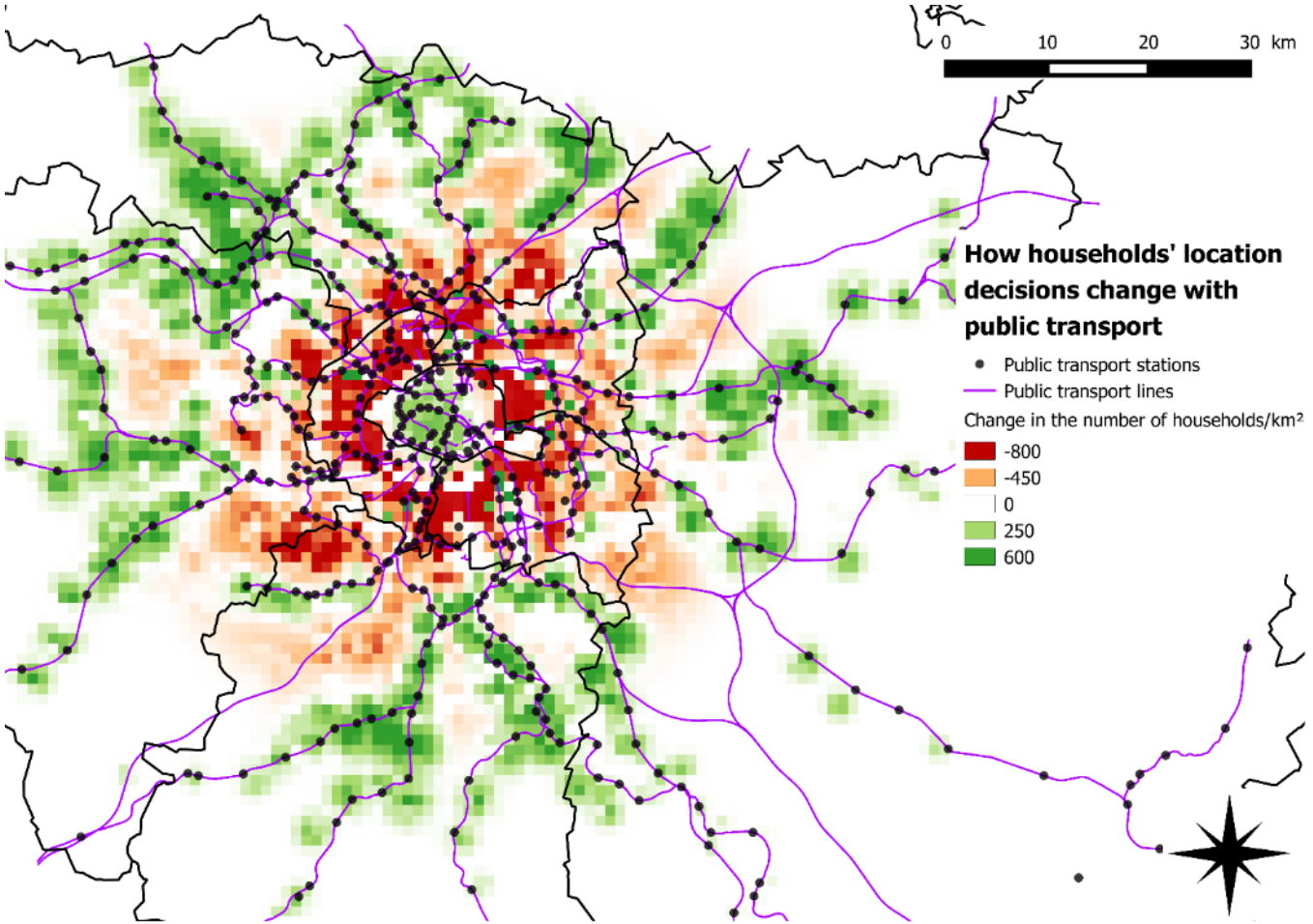


Source: Adapted from Guivarch and Hallegatte (2013).

Note: Peak year refers to the year in which emissions have reached their highest level and start to decline. Delaying the peak year by just a few years, say from 2010 to 2020, entails increasing the rate of annual emissions reduction from 3 percent to 4.5–5.5 percent. The figure also reports the fastest historical decarbonization rate achieved over a five-year period (outside of periods of economic collapse) and the decarbonisation rate implied by the European Union's commitment between 2008 and 2020. EU = European Union.

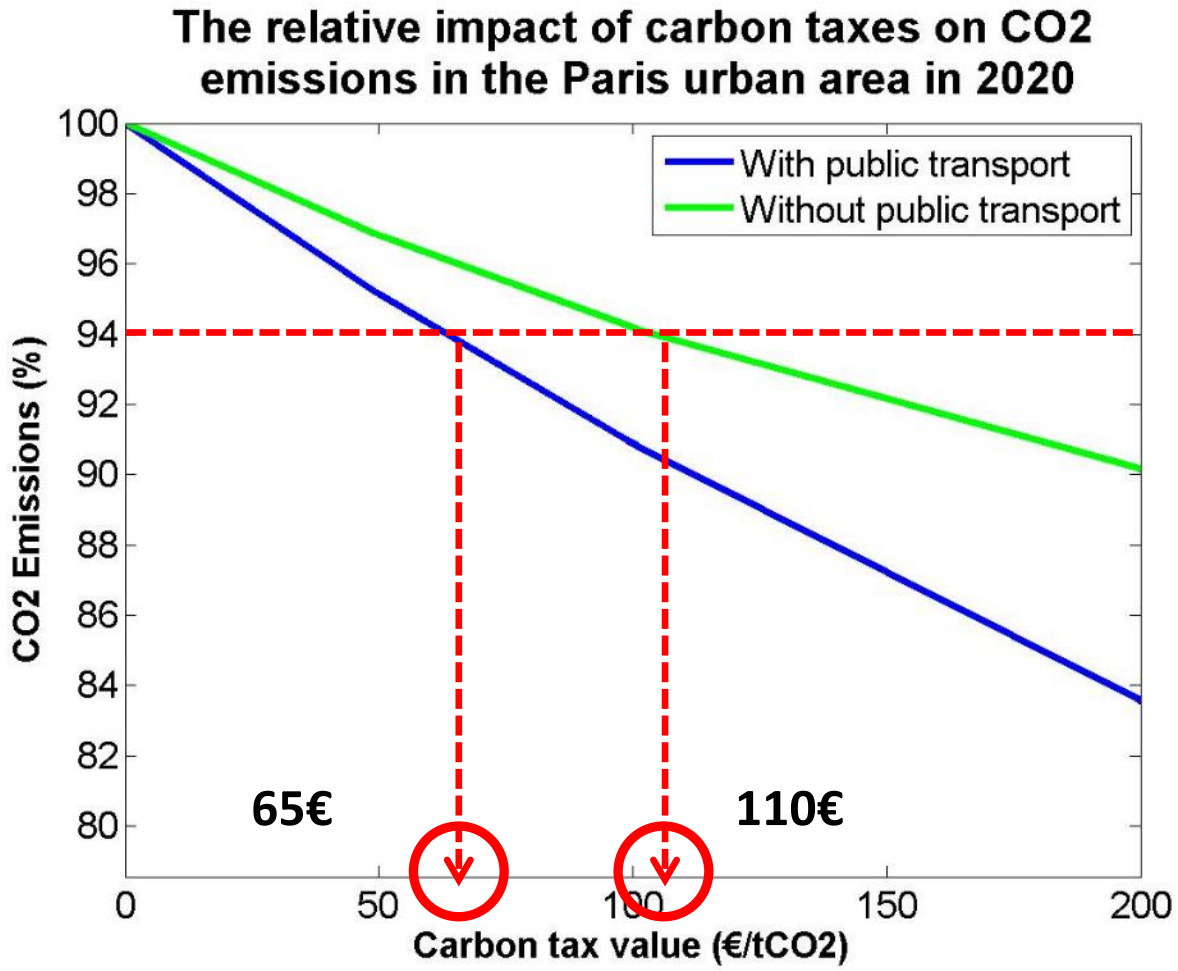

Stranded capacity (GW)
150
350
50
2030-2050
2010-2030
More short-term efforts, global emissions at 50 GtCO2/year in 2030
Unchanged policies, global emissions at 60 GtCO2/year in 2030

Prices are not enough: develop the right infrastructure



- On a case study on Paris, we find that without the metro system, the Paris agglomeration would look very different.
- Transport would emit twice as much CO_2 and a carbon tax would be half as efficient as with the metro system
- Infrastructure financing remains challenging

A carbon price is twice as effective in the city with public transport…



… it is also probably much more acceptable politically

Avoid stranded assets