Climate Policy and the Nordics

Nordic Economic Policy Review

Nordic Council of Ministers

24 October 2018

NEPR

- Since 2009
- One review per year
- Nordic Council of Ministers – Finance
- Nordregio
- Steering group with representatives from Finance Ministries in all Nordic countries

Nordic Council of Ministers

INCREASING INCOME INEQUALITY in the Nordics

Nordic Economic Policy Review 2018

Are Climate Policies in the Nordic Countries Cost-effective?

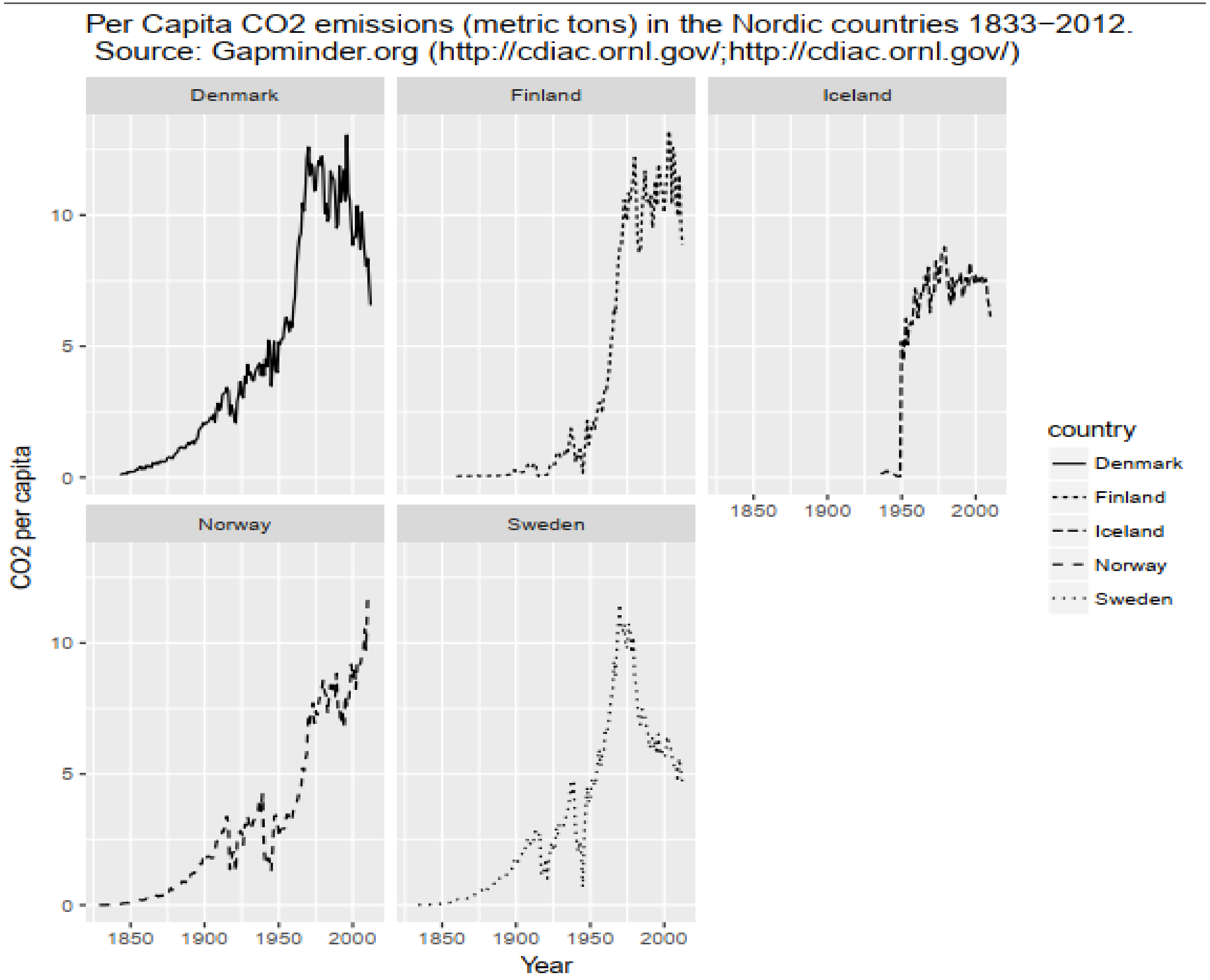
Björn Carlén, National Institute of Economic Research

Bengt Kriström, SLU and CERE, Umeå university

Structure

- Background
- The climate policy landscape
- Gains from international emissions trading
- Policy implications

Background



Per Capita CO2 emissions (metric tons) in the Nordic countries 1833−2012.
Source: Gapminder.org (http://cdiac.ornl.gov/;http://cdiac.ornl.gov/)
Denmark
Finland
Iceland
Norway
Sweden
CO2 per capita
0
5
10
1850
1900
1950
2000
Year
country
Denmark
Finland
Iceland
Norway
Sweden

The climate-policy landscape 1

- The Paris Agreement aims at keeping climate change well below 2ºC
  - Broad coverage
  - Effective?
  - Pledge and review is a poor basis for international emissions trading.

- EU's objective: reduce *domestic emissions* by at least 80% to 2050 (rel. 1990)

- EU's pledge: reduce *domestic emissions* by at least 40% to 2030 (rel. 1990)

  - No international emissions trading under Paris (ITMOs or para 6.4)

- EU' climate policy defines three sectors
  - EU ETS: -43% to 2030 (rel. 2005)
  - Effort Sharing Regulation (ESR) sector: -30% to 2030 (rel. 2005)
  - LULUCF

- The problem is how attaining these emission targets cost effectively.

The climate-policy landscape 2

- EU ETS has full flexibility ➔ one price.
- ESR ➔ a set of national carbon prices/taxes. Some flexibility mechanisms:
  - A member state may borrow ESR emission-quota units from the next allocation period (up to five percent of succeeding five years allotment) and may save unused emission-quota units to future allocation periods.
  - Some member states (including all Nordic member states) may use EU ETS emission permits to comply with the ESR. (Up to 2 percent of 2005 years level)
  - A member state may transfer up to five percent of its yearly ESR-allocation to other member states. A member state that over-comply may transfer part of or all unused emission-quota units to other member states.
  - A member state may up to a limit use so-called LULUCF-credits to comply with the ESR.
- Thus, no binding restriction for a small buyer country.

The Nordic countries' ESR-targets and policies

- Only Denmark, Finland and Sweden are covered by ESR. However, Iceland and Norway have articulated ambitions to join.

Table Emission-reduction targets for the Nordic ESR-sector

		2030 % relative 2005	
Denmark		39	
Finland		39	
Iceland		39[1]	
Norway		Climate neutral (40)[1]	
Sweden		59 (40)	
EU average ESR		30	

Notes: [1] Assumed ESR-targets for Norway and Iceland.

- All Nordic countries aim at reducing their domestic emissions (ESR+EU ETS) to 2045-50 with at least 80 percent (rel. 1990).

- Policy palettes:
  - Carbon and energy taxes
  - Tax deductions for bio fuels
  - Carbon differentiated car excises and vehicle taxation
  - Support schemes for emission reducing investment
  - Support for production of bio fuels

Taxation of fossil fuels

Table. Nordic tax rates on gasoline and diesel in 2018, euro per m^3

	CO2 tax	Energy tax	Total
Denmark			
Gasoline	55.8	574.9	630.7
Diesel	61.7	409.4	471.1
Finland			
Gasoline	173.8	521.9	702.5
Diesel	199.0	327.7	530.2
Iceland			
Gasoline	100		
Diesel	100		
Norway			
Gasoline	121.6	541.9	663.5
Diesel	139.4	393.1	532.5
Sweden			
Gasoline	255.3	391.6	646.8
Diesel	254.1	315.9	570.1

Sources: National Tax Administrations.

- The Nordic carbon taxes and energy taxes on fossil fuels vary substantially, but in opposite directions.
- Total taxation varies less.
- Total taxation at the higher end in Europe.

Gains from emissions trading

An analytical general equilibrium model – 2 countries (1 and 2), 2 sectors (EU ETS and ESR).

$$\frac{dW}{\lambda} = pdz_{ETS} + t^1 dz_{ESR}^1 + t^2 dz_{ESR}^2 + \sum \frac{V_z^i}{\lambda} dZ$$

Imagine a 2030 where ETS-firms comply and ESR-targets are reached unilaterally. Can we do better by reallocating emission reductions within the EU?
$(dz_{ETS} + dz_{ESR}^1 + dz_{ESR}^2 = dZ = 0)$

- Case 1 – transfer from EU ETS to ESR ($-dz_{ETS} = dz_{ESR}^1 + dz_{ESR}^2$, $t^1 = t^2$)

$$\frac{dW}{\lambda} = (t - p) dz_{ESR}$$

- Case 2 – transfer from ESR^1 to ESR^2 ($dz_{ESR}^1 = -dz_{ESR}^2$)

$$\frac{dW}{\lambda} = (t^1 - t^2) dz_{ESR}^1$$

Relative emission reductions in 2030

	2005 Mton CO2e	Ref. scen. 2030 Mton CO2e	Emissions target 2030 Mton CO2e	Gap rel. Ref
Denmark	40	30,5	24.3	20 %
Finland	33.7	26,6	20.6	23 %
Iceland				
Norway	27.6	23.1	16.6[1]	28 %
Sweden	41.8	26	17.1	34 %
Nordic countries	143.1	106.2	78.6	26 %
EU	2 808	2 238	1 966	12 %
Bulgaria				0 %

Notes: [1] Assuming that Norway has -40 percent in ESR obligation.

- We ignore the Swedish target for domestic transport and any other targets for sub-sectors of the countries ESR-sectors.

- What are the tax rates that close these gaps?

Tax rates on gasoline under unilateral fulfillments of ESR-obligations

Tax rate on gasoline (carbon tax plus energy tax), € per kg CO2				
	2018	2030 with ε=-.5	2030 with ε=-.8	Trade gains vs Denmark
Denmark	.267	.517	.424	0
Sweden	.274	.674	.524	.1
Finland	.290	.560	.459	.035
Iceland				
Norway	.274	.603	.480	.056
"EU"	.250	.384	.334	-.09
Bulgaria	.156	.156	.156	-.27
EU ETS 2030	.02	.033	.033	-.39

- Tax rates on gasoline required to reduce gasoline consumption in the same proportion as the ESR-sector.
- Some gains from trade between the Nordic ESR-sectors. Larger gains from trade between the Nordic countries and other EU members.
- Aspects not covered by the illustrations above

Cons
- Higher emissions of other pollutants?
- Less pressure on domestic emitters…
- Less demo effect?
- …

Pros

Climate policy becomes less costly (not only a cost for poorer countries)

The EU/Europe as a whole may move faster

Demo of inter-governmental emissions trading

…

Policy recommendation

- Unless it can be shown that the potential cons mentioned above are large, trade!

- The Nordic policies are broader than taxes.
  - Complementary policies: Eg. Industriklivet, parts of Klimatklivet (Sweden), parts of Enova (Norway)…
  - Overlapping policies: Eg. programs to promote green electricity (Denmark, Finland, Norway and Sweden) on top of EU ETS. Parts of Klimatklivet and Enova's program. Carbon differentiated vehicle taxation and tax deductions for biofuel use.
  - The policy induced incentives for choosing an electric car or bio-fueled car is substantially higher than the incentives for driving less.

- In some instances, more coordination is needed
  - Electric cars Sweden vs Norway
  - Bio gas Sweden vs Denmark

Thank you!

Comments on the paper:
Are Climate Policies in the Nordic Countries Cost-Effective?

Peter K. Kruse-Andersen

Danish Economic Councils

The NEPR Conference on Climate Policy and the Nordics

October 24, 2018

De Økonomiske Råd

Main comments

1. Other existing externalities and climate policy
2. Cost effectiveness depends on policy objectives
3. Use of the suggested flexibility mechanism
4. The time perspective could be important

1. Other externalities and climate policy

- Assume only a national emission target in the non-ETS sector

- Then, the cost-effective climate policy is a uniform carbon price in that sector

- But, this is only true if other externalities are internalized

- To evaluate the cost-effectiveness of existing climate policies, we need to know if other externalities (like NOx emissions) are internalized

- E.g., large non-climate externalities in Danish agriculture

2. Cost effectiveness and policy objectives

- Only national emission target in the non-ETS sector:
  - Uniform carbon price in that sector
  - Exploit flexibility mechanisms

- But, if we also care about global emissions, we need to think about carbon leakage

- And if we have other targets (e.g., share of renewable energy or energy efficiency improvements), we need other instruments as well

3. Using the flexibility mechanism

- EU member states can transfer up to 5 pct. of its non-ETS reduction obligation to other member states
- Advantage: exploit low marginal abatement costs in other EU countries
- Disadvantage: these countries might not have binding targets, implying substantial carbon leakage
- Alternative flexibility mechanism: cancel ETS allowances
  - Reduces global emissions after the latest EU ETS reform, cf. Beck and Kruse-Andersen (2018)

4. The time perspective matters

- The Nordic countries all have ambitious long-run targets
  - Nearly complete decarbonization by 2050 or sooner
- Overshooting the 2030 obligation can reduce the long-run cost
- Argument requires market failures
  - E.g., learning-by-doing effects, technological spillover effects, political economy issues
- Using the flexibility mechanisms in the non-ETS sector can
  - Reduce transition cost until 2030
  - Increase transition cost after 2030

Global impact of national climate policy in the Nordic countries

M. Greaker, R. Golombek & M. Hoel

Tampere 18/10 - 2018

Nordic climate policies

1. Some sectors face very high carbon prices
2. The promised total GHG emission reductions exceed those of other comparable industrialized countries
3. The shadow cost of GHG emission reductions for a range of specific climate policy measures far exceeds international permit prices

Research questions:

- Are there "rational" reasons for taking on a climate policy leadership?
- Are current policies aligned with the "rational" reasons?

Tougher targets:

Country	Paris treaty; emission reduction target 2030 all GHG reported as NDC to the UNFCCC
Canada	30% below 2005 levels
US (has later withdrawn)	26-28% below 2005 levels (by 2025)
Japan	25,4% below 2005 levels
Australia	26-28% below 2005 levels
New Zealand	30% below 2005 levels
Russia	25% below 1990 levels
EU including EFTA	40% below 1990 levels
EU ETS	43% below 2005 levels
EU Non-ETS	30% below 2005 levels
Denmark	39% below 2005 levels
Sweden	40% below 2005 levels
Finland	39% below 2005 levels
Norway	40% below 2005 levels
Iceland	?% below 2005 levels
Rest of EU	<30% below 2005 levels

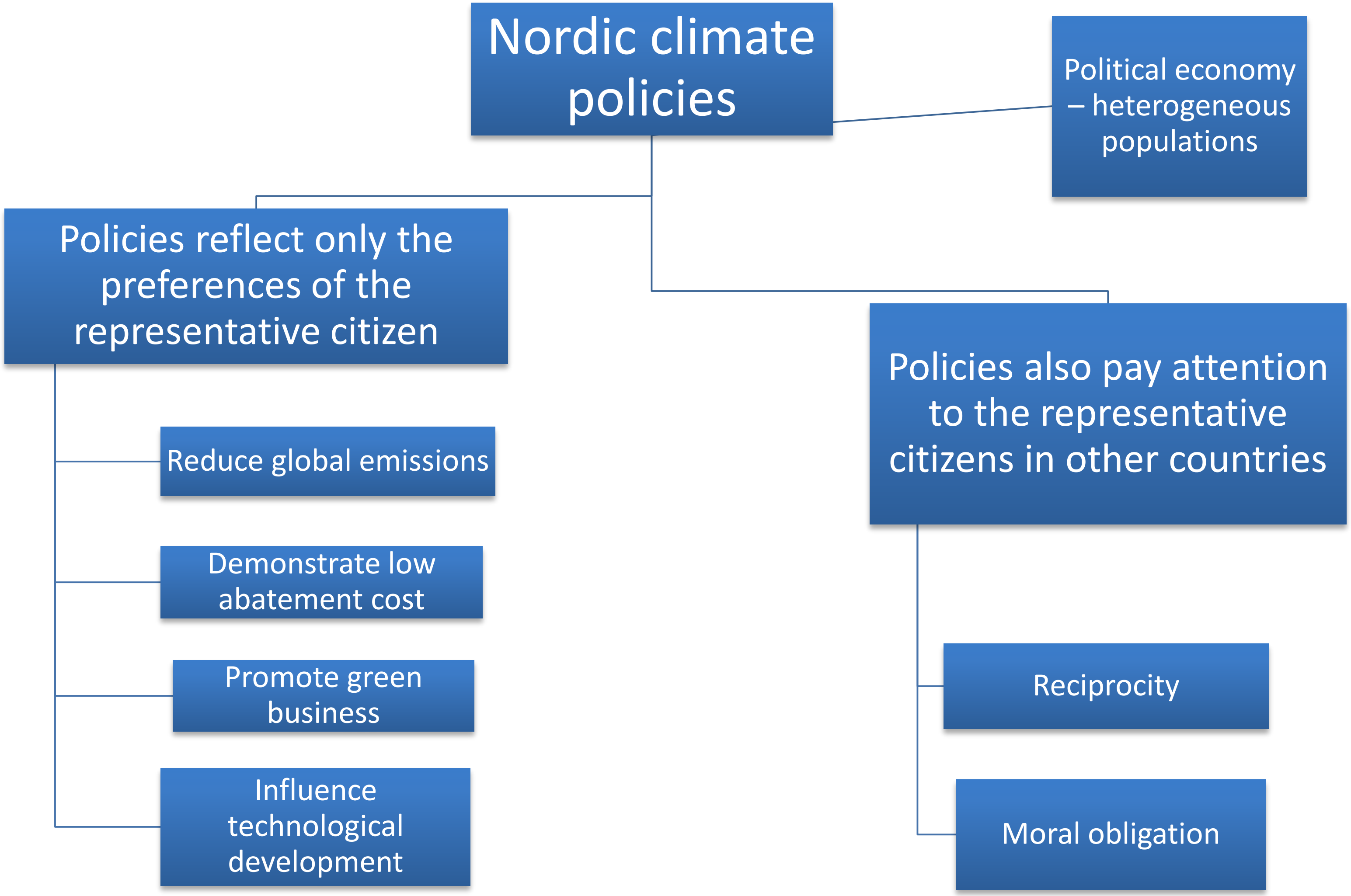
Particular policy measures ETS

- Green certificates (Sweden & Norway) and Feed-in-tariffs (Denmark & Finland) for renewable electricity
- Norway’s carbon capture and storage (CCS) program
- Extra taxation on domestic air travel and public programs for using biofuels in aviation
- Public subsidy programs for use of bioenergy in industries and energy efficiency (Norway: Enova)

Particular policy measures Non-ETS

- Biofuels policies in Sweden; Reduce emission from domestic transport by 70% before 2030
- Biofuels policies in Finland; 30 percent blending of biofuels by 2030.
- Finland bans coal for energy and subsidizes phase out of coal in district heating
- Norway's electric vehicles (EVs) policy; EVs are exempted from value added tax, vehicle registration tax, and enjoy other benefits such as reduced congestion charge etc.
- Norway sponsors electric ferry connections; the goal is to have 50 ferries in operation by 2020.

Can we explain the ambitious policies?

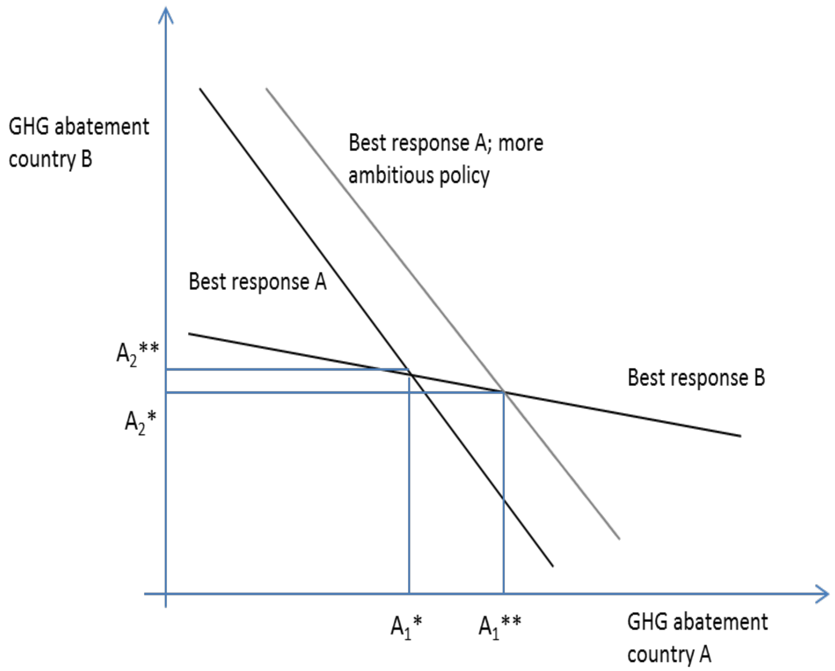


Directly reduce global emissions

- A more ambitious policy may reduce global emissions (although by very little in percentage terms)

- Problem; Carbon leakage
  1. Through markets
  2. Through policy adjustments by other countries

- Opposite of what the Nordic countries want



Demonstrate low abatement cost

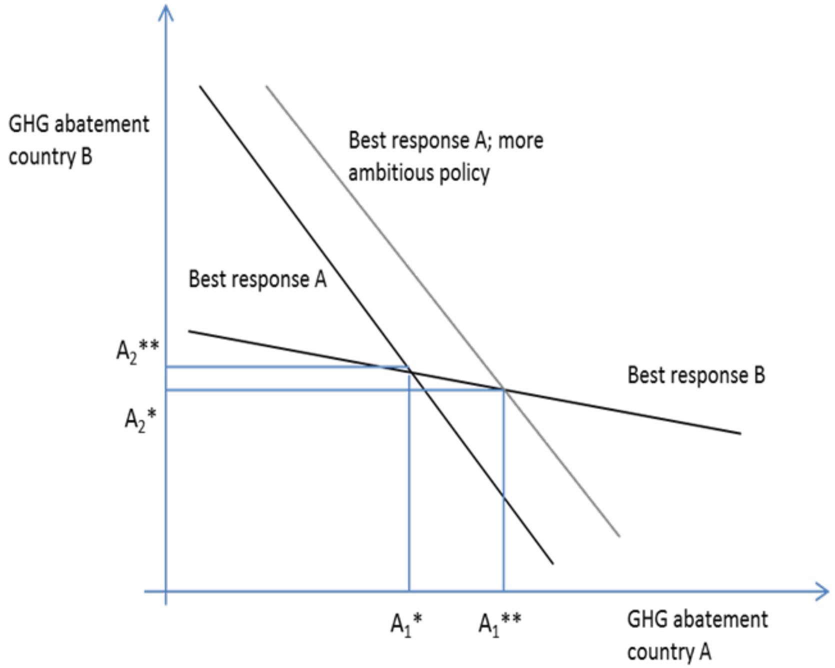
- All Nordic countries aim to be *low emission societies* by 2050
- Impossible to know what this cost
- By moving ahead Nordic countries may show other countries that it is less costly than expected
- Other countries may then follow…
- But will other countries update their beliefs about GHG abatement costs even if they turn out to be low in the Nordic countries?

Promote green business

- Type of double dividend; Reduce GHG emissions, and create new, successful businesses
- Greaker and Rosendahl, Jeem (2008), *"R&D subsidies work better towards promoting green business than ambitious climate policies"*
- Fischer, Greaker and Rosendahl, Jeem (2017), *"R&D subsidies should be directed towards abatement technology suppliers and not towards polluting industries"*

Strategic technology policy

- The essential idea is that a country can affect the state of GHG abatement technology in other countries
- If countries have different technological needs, technological development should be directed at *foreign* needs
- Technology policy can then also affect the size of the coalition in coalition games



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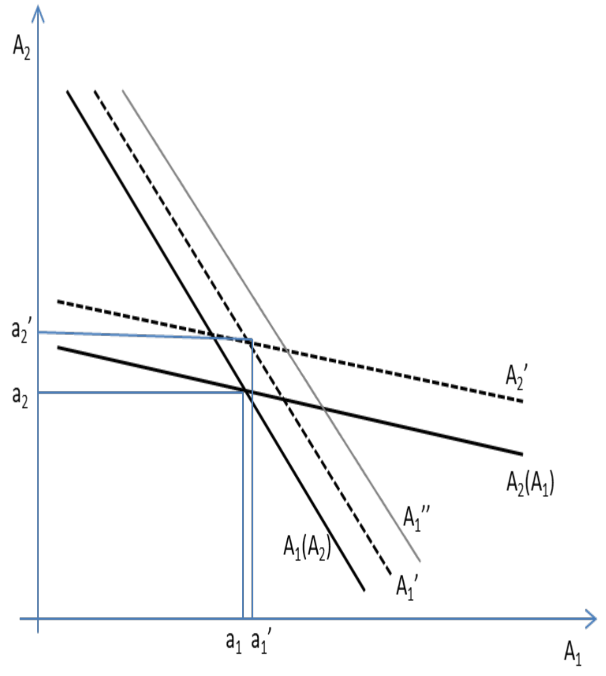


Reciprocity

- If I give something to you, you will give something to me later…
- Proven to be the case in lab experiments playing e.g. the trust game or the ultimatum game
- Hard to go from lab experiment with individuals to countries in climate change negotiations
- The mechanism behind «reciprocity» is not settled; inequality aversion, tit-for-tat inherited trait
- Will other countries view Nordic climate policies *as a gift to them* that they will later reward?
- (Or punish less ambitious Nordic climate policies?)

Moral obligation

- Kant (1785); you should act "*as if the maxim of your action were to become through your will a general natural law*"
- Alger and Weibull (2016) studies agents with pay-off function:

$$U(x, y) = (1 - \gamma)\pi(x, y) + \gamma\pi(x, x)$$

- They show that $\gamma > 0$ is evolutionary stable, while $\gamma = 0$ is not
- A theoretical prediction is thus that people are partly Kantian

Implications for climate policy

- Act (partly) as if an *ideal climate treaty* were in place
- An ideal climate treaty;
  - Ensures maximum 2^0C global temperature increase
  - Is cost efficient
  - Implies a fair allocation of the available CO_2 budget between countries
- This provides a guideline for an ambitious climate policy

Policy recommendations technology

- Clean technological development should focus on technologies that can be applied in other countries - in particular developing countries
- Renewable power generating technologies, electricity storage and mobility solutions are emerging as key technologies
- Will technologies for biofuels based on forest material have a significant potential in other countries? In large parts of the world, deforestation is a major problem…
- Biofuels policies should have a clearly specified technology object, and not be used as «prioritized» way to reduce GHG emissions
- The Nordic countries should instead fully take advantage of the flexible mechanisms being provided from the EU in this sector
- The Norwegian CCS projects risk being isolated events - their positive external value depends on more new CCS projects in other Nordic and/or EU countries to follow suit

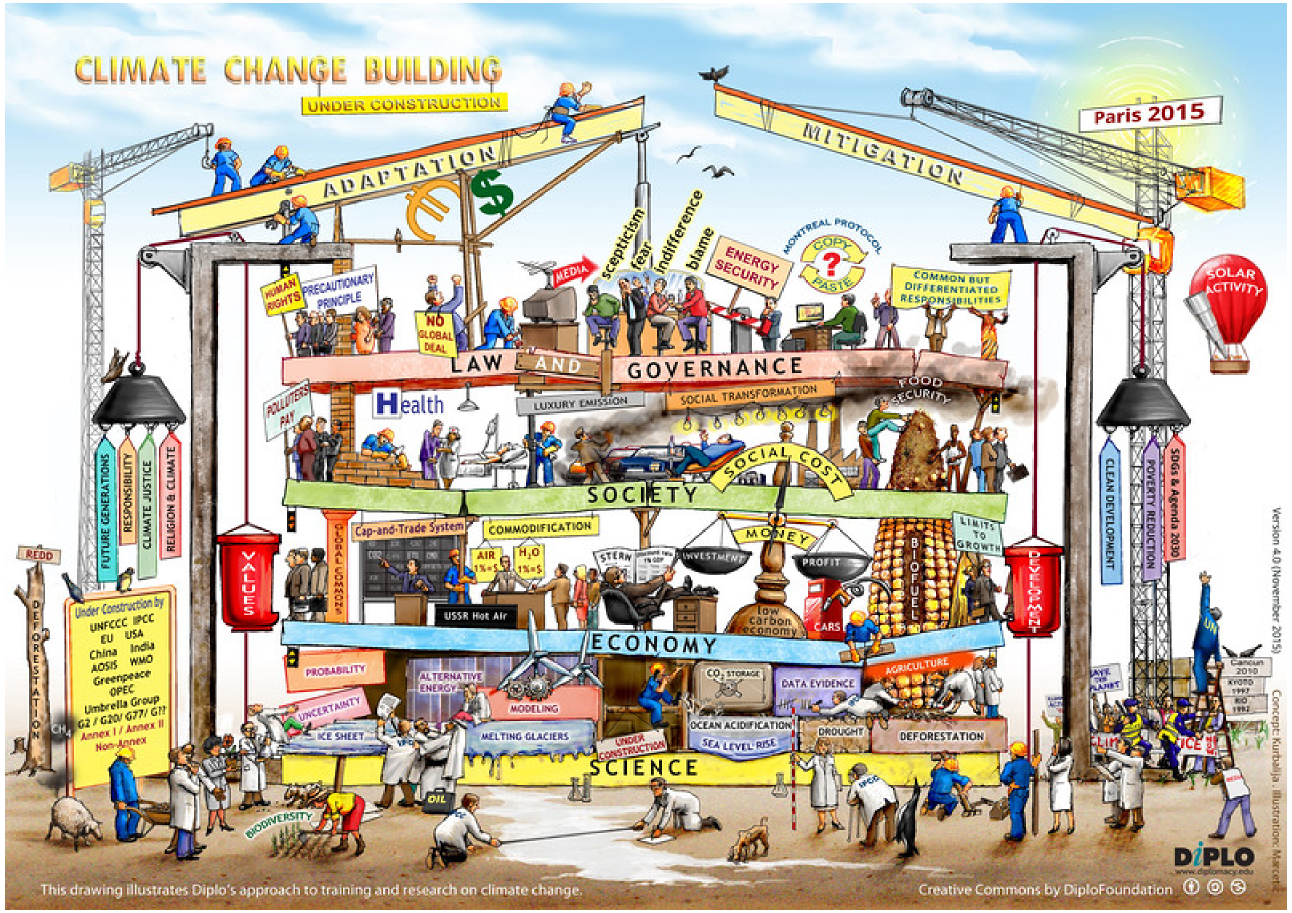
Policy recommendations “Kantian” approach

- It should be acknowledge that the EU already has a very ambitious climate policy
- *If the EU fulfills their Paris commitment (NDC),* the Nordic countries may in fact be doing their part of an *ideal climate treaty* together with the EU
- If not, the Nordic countries should consider additional emissions reductions in developing countries such as REDD+
- The Nordics should avoid/limit muddling with the ETS (read: Aviation)
- The major uncertainty is whether the EU will succeed to reduce emissions in the Non-ETS sector by 30 percent from 2005 levels before 2030.
- This could require a very ambitious climate policy in the Nordic countries for the Non-ETS sectors even if they make full use of the flexible mechanisms being provided from the EU in this sector.
- The response of the Nordic countries should be to set a sufficiently high, common (across sectors), GHG tax for the Non-ETS sectors.
- (Network effects in transportation may require additional policies)

International Climate Politics in the post-Paris era

Naghmeh Nasiritousi & Karin Bäckstrand

Department of Political Science, Stockholm University


CLIMATE CHANGE BUILDING
UNDER CONSTRUCTION
ADAPTATION
MITIGATION
Paris 2015
SOLAR ACTIVITY
HUMAN RIGHTS
PRECAUTIONARY PRINCIPLE
NO GLOBAL DEAL
MEDIA
scepticism
fear
indifference
blame
ENERGY SECURITY
MONTREAL PROTOCOL
COPY ? PASTE
COMMON BUT DIFFERENTIATED RESPONSIBILITIES
LAW AND GOVERNANCE
POLLUTERS PAY
Health
LUXURY EMISSION
SOCIAL TRANSFORMATION
FOOD SECURITY
SOCIAL COST
SOCIETY
FUTURE GENERATIONS
RESPONSIBILITY
CLIMATE JUSTICE
RELIGION & CLIMATE
CLEAN DEVELOPMENT
POVERTY REDUCTION
SDGs & Agenda 2030
VALUES
DEVELOPMENT
GLOBAL COMMONS
Cap-and-Trade System
COMMODIFICATION
AIR 1%=$
H_2O 1%=$
STERN
INVESTMENT
MONEY
PROFIT
BIOFUEL
LIMITS TO GROWTH
low carbon economy
CARS
USSR Hot Air
ECONOMY
REDD
DEFORESTATION
Under Construction by
UNFCCC IPCC
EU USA
China India
AOSIS WMO
Greenpeace
OPEC
Umbrella Group
G2 / G20/ G77/ G??
Annex I / Annex II
Non-Annex
PROBABILITY
ALTERNATIVE ENERGY
CO_2 STORAGE
DATA EVIDENCE
AGRICULTURE
UNCERTAINTY
MODELING
OCEAN ACIDIFICATION
ICE SHEET
MELTING GLACIERS
SEA LEVEL RISE
DROUGHT
DEFORESTATION
UNDER CONSTRUCTION
SCIENCE
BIODIVERSITY
OIL
IPCC
Cancun 2010
KYOTO 1997
RIO 1992
Version 4.0 (November 2015)
DiPLO
www.diplomacy.edu
This drawing illustrates Diplo's approach to training and research on climate change.
Creative Commons by DiploFoundation

The global response

UNFCCC 1992

Objective and principles

Kyoto Protocol 1997

Targets for developed countries

Copenhagen Accord 2009

Political agreement on post-2012 action

Durban 2011

Launch of negotiations on agreement for post-2020 action

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

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Take me to your legally binding treaty
AVAAZ
COP15

Paris Agreement December 2015

Marrakech COP22 November 2016 and ”Trump hangover”

Marrakech – Implementation COP?

Aim and research questions

- .. provide an assessment of the efficacy of the Paris Agreement to generate policies and incentivize actions that can contribute to halt climate change significantly.
- Can the Paris Agreement seen as a successful multilateral agreement in curbing global climate change and decarbonizing the global economy?
- What is the nature, strengths and limitations of the Paris Agreement the prospects for effective action on climate change?

Four features of the Paris agreement

- Eroding the firewall between developed and developing countries
- Replacing top down ‘targets and timetables’ with a bottom-up ‘pledge and review’ process
- Though nationally determined contributions –NDCs) Making domestic climate action central
- New model of hybrid multilateralism strengthening links between sub-state, no—state and intergovernmental processes

Global Climate Action Summit , 13-14 September 2018 in San Francisco

4000 delegates from cities, regions, government, business, investors, civil society, and 20 000 participants in affiliated events

American Pledge

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“COP21 was a success, but that was the easy part”

Christina Figueres, Executive Secretary United Nations Framework Convention on Climate Change (2010-2016)

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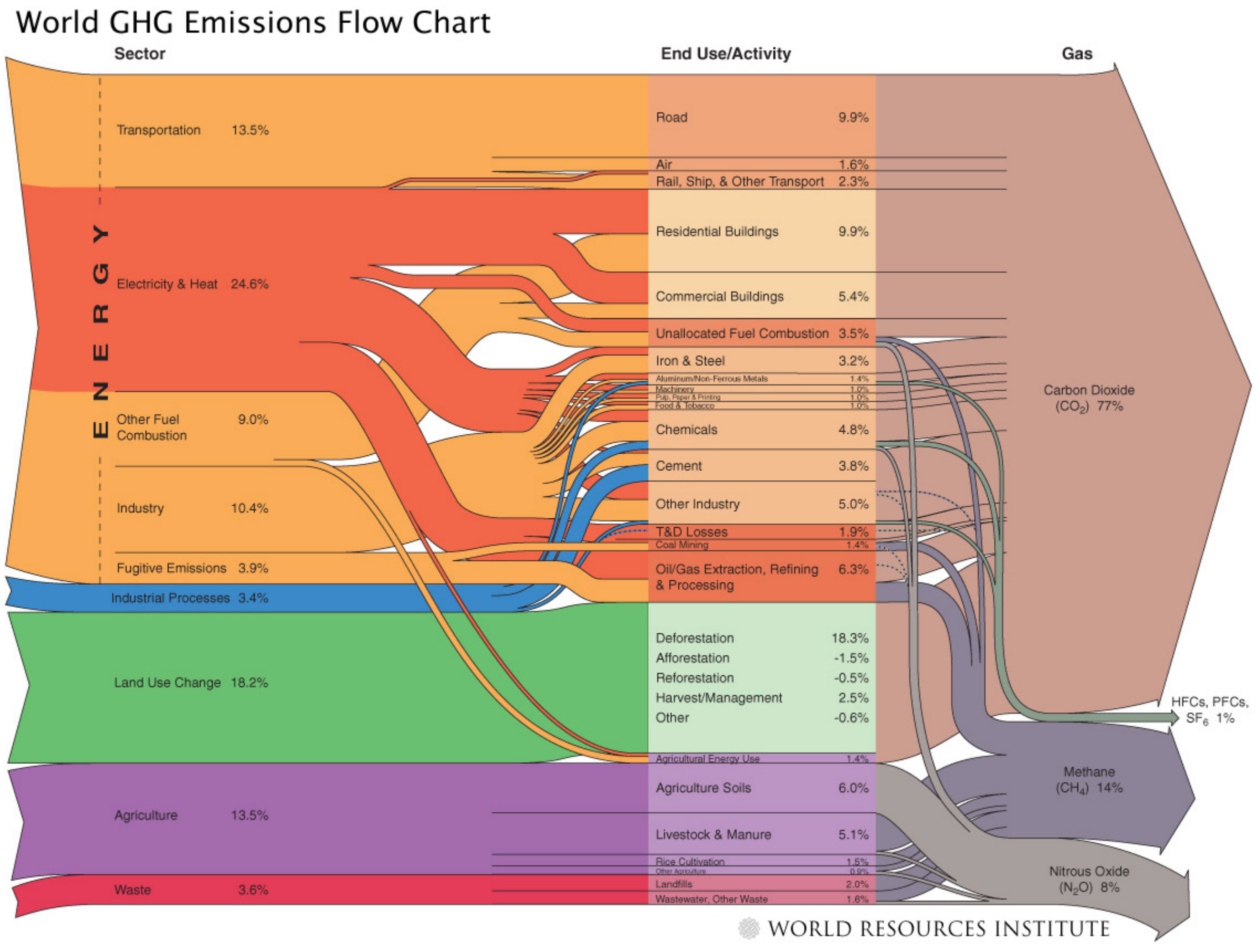
Outline

- Climate change as a public good, multilateral gridlock, and lack of effective action
- Milestones in international climate diplomacy
- The Paris Agreement, Nationally Determined Contributions and Global Climate Action
- International climate change cooperation after Paris
- Outlook and policy recommendations

Collective action problem, burden sharing and problem of enforcement.



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History

- 1979 – First World Climate Conference
- 1985 – Villach Conference: concluded that states should consider developing an international climate convention
- 1988 – Establishment of the IPCC
- 1992 – Climate Convention opened up for signature at Rio Summit
- 1994 – UNFCCC entered into force

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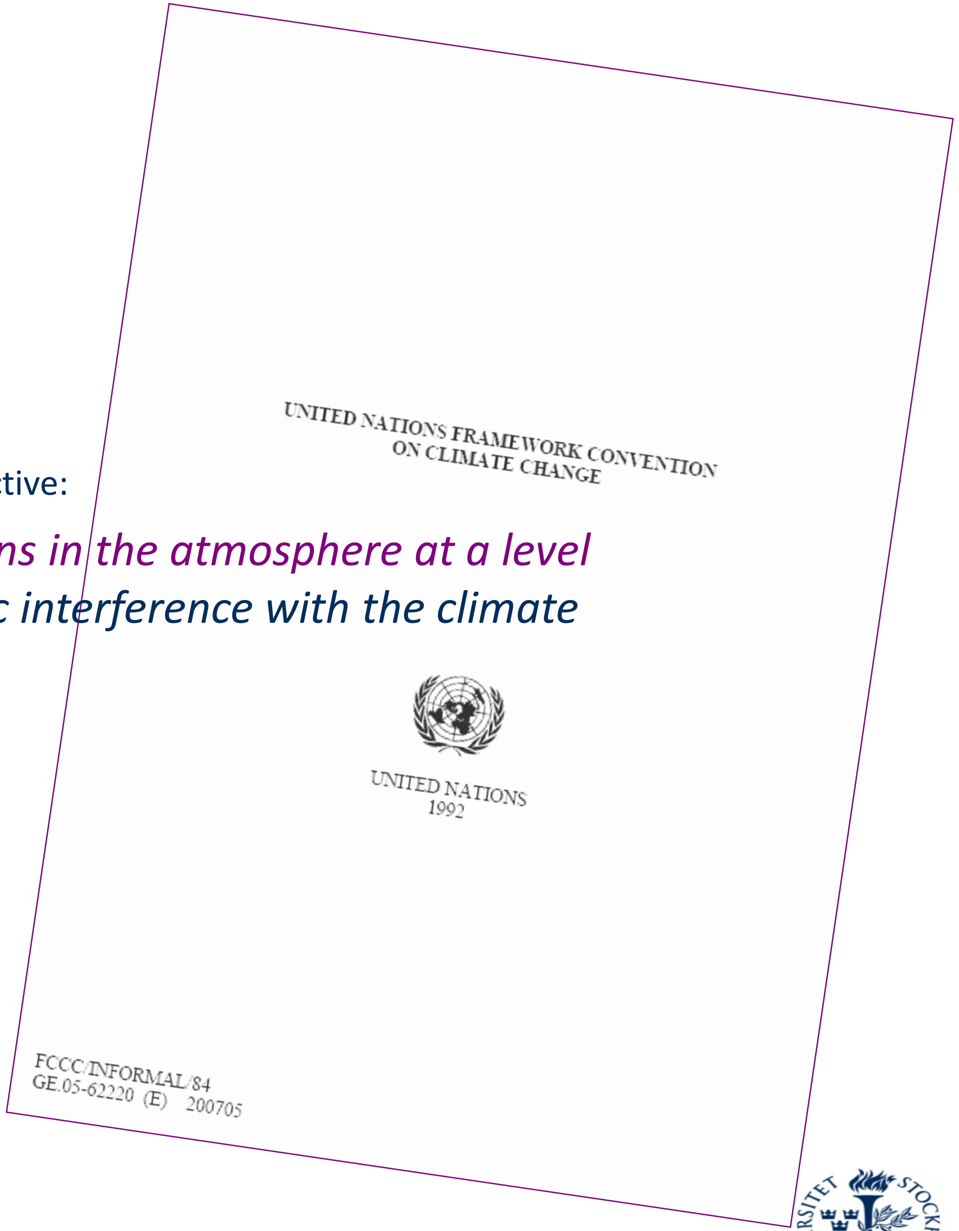
UNFCCC Article 2, Objective:

“stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.”


UNITED NATIONS FRAMEWORK CONVENTION
ON CLIMATE CHANGE

UNITED NATIONS
1992

FCCC/INFORMAL/84
GE.05-62220 (E) 200705

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The great conflicts in the climate change negotiations

- Nature of commitment and type of governance instruments

- North-South divide

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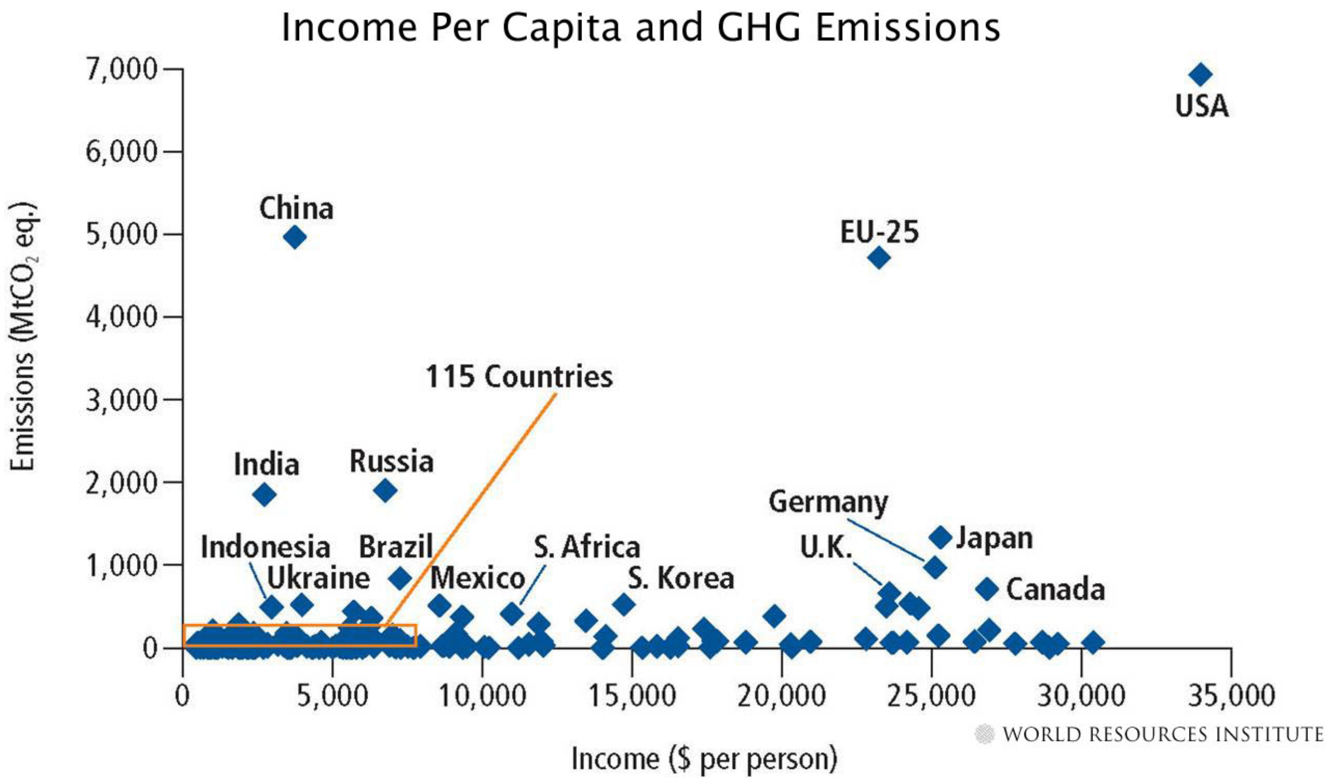
Inequality



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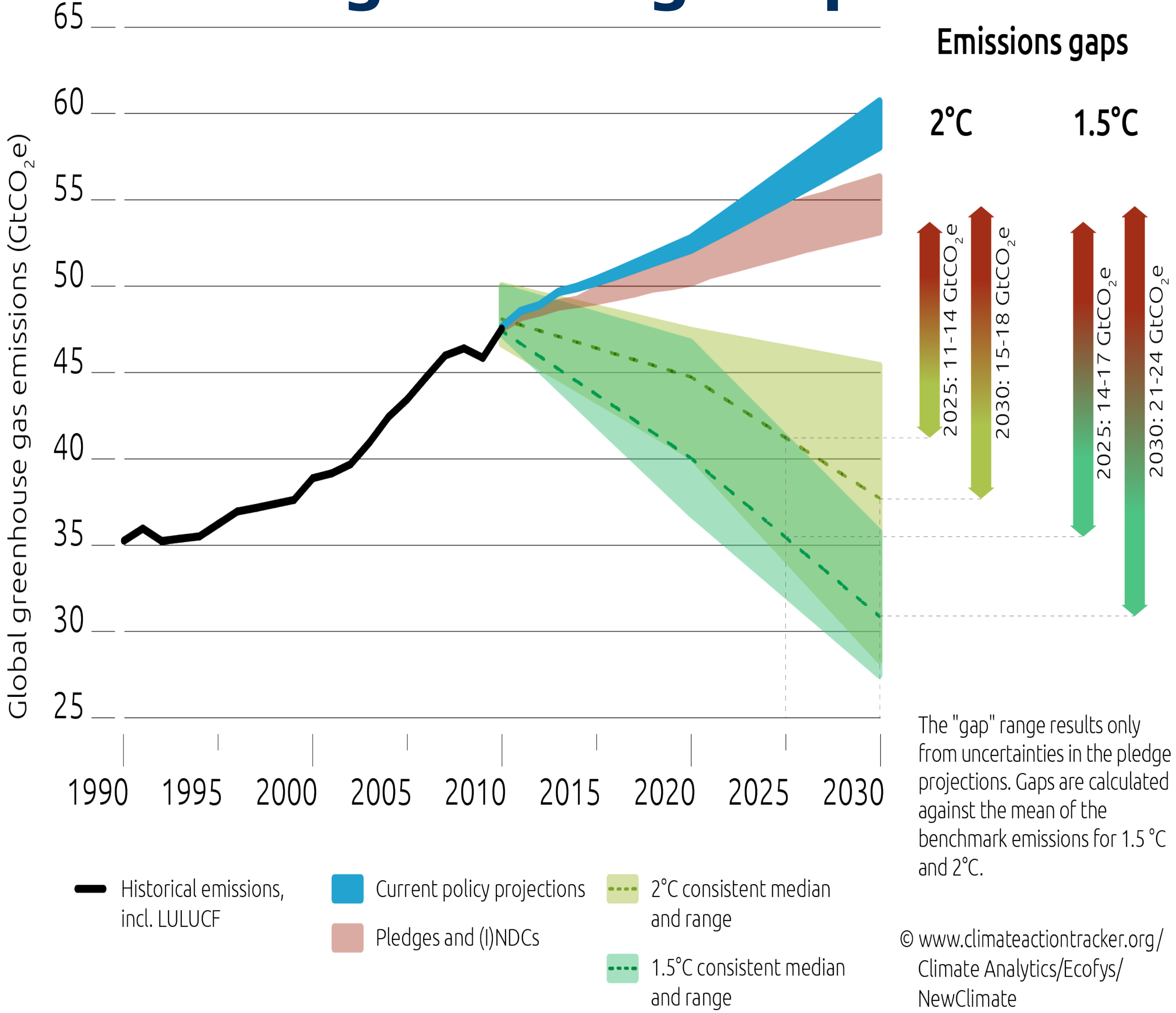
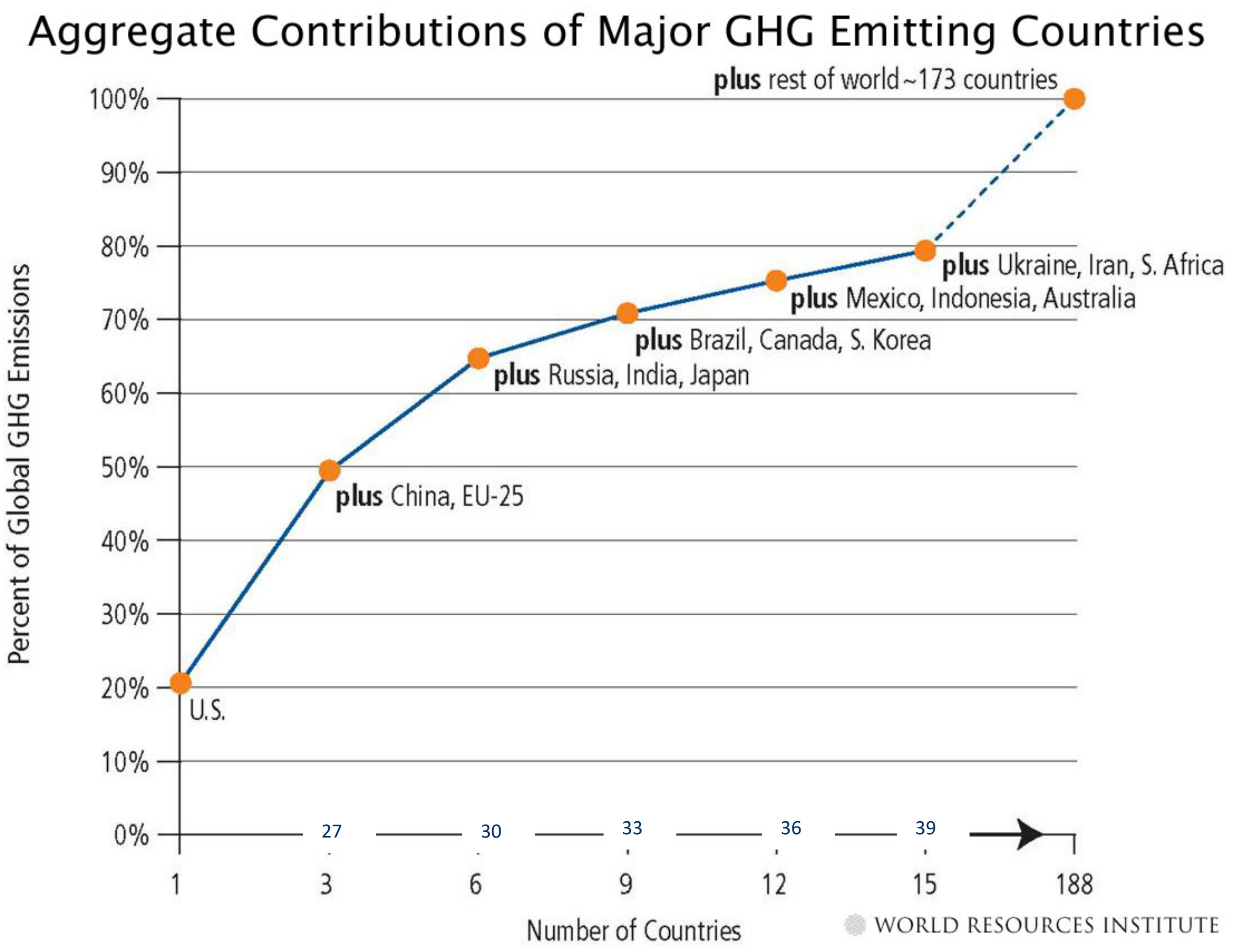
Climate change: an urgent problem

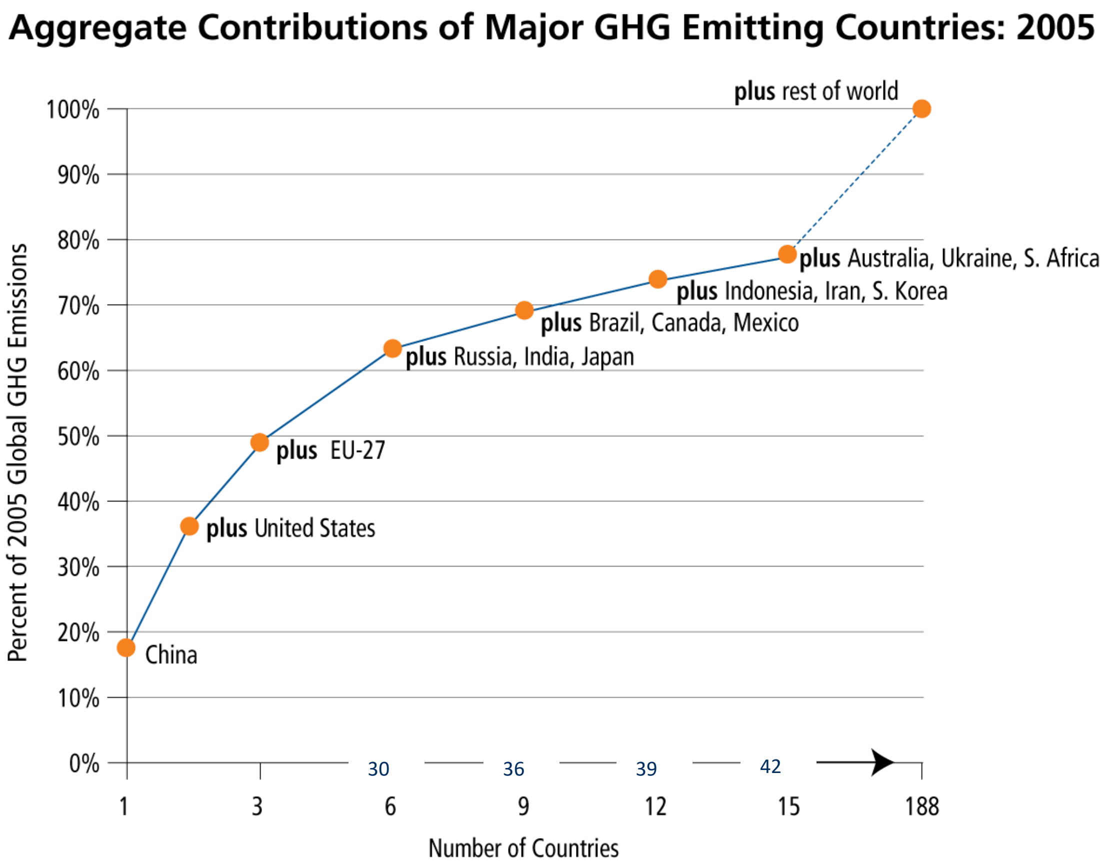


The "gap" range results only from uncertainties in the pledge projections. Gaps are calculated against the mean of the benchmark emissions for 1.5 °C and 2°C.

Year 2000


Aggregate Contributions of Major GHG Emitting Countries
plus rest of world ~173 countries
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent of Global GHG Emissions
plus Ukraine, Iran, S. Africa
plus Mexico, Indonesia, Australia
plus Brazil, Canada, S. Korea
plus Russia, India, Japan
plus China, EU-25
U.S.
27
30
33
36
39
1
3
6
9
12
15
188
Number of Countries
WORLD RESOURCES INSTITUTE

Year 2005



Sources & Notes: WRI, CAIT (http://cait.wri.org). Percent contributions are for year 2005 GHG emissions only. Moving from left to right, countries are added in order of their absolute emissions, with the largest being added first. Figures exclude emissions from land-use change and forestry, and bunker fuels. Adapted from Figure 2.3 in Baumert et al. (2005).

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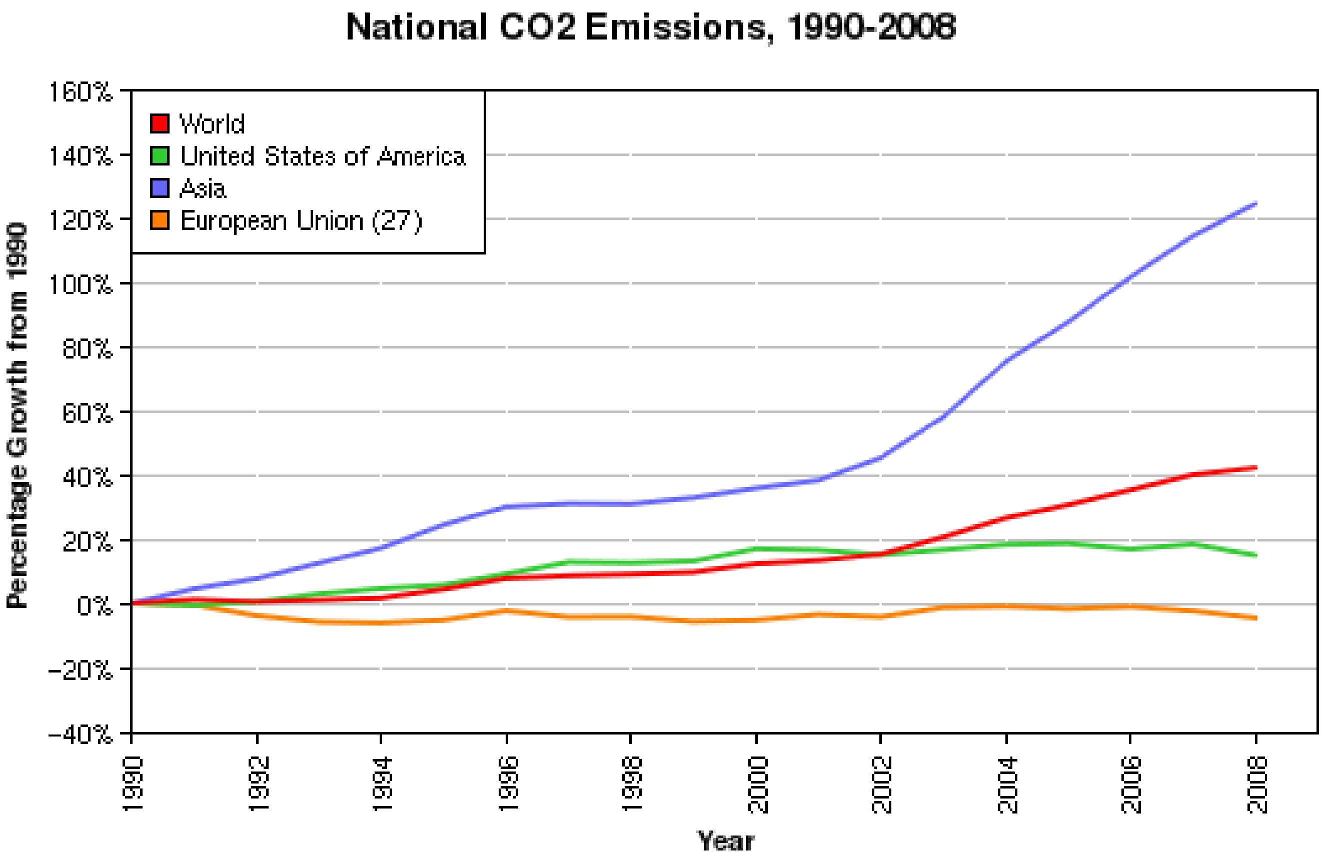

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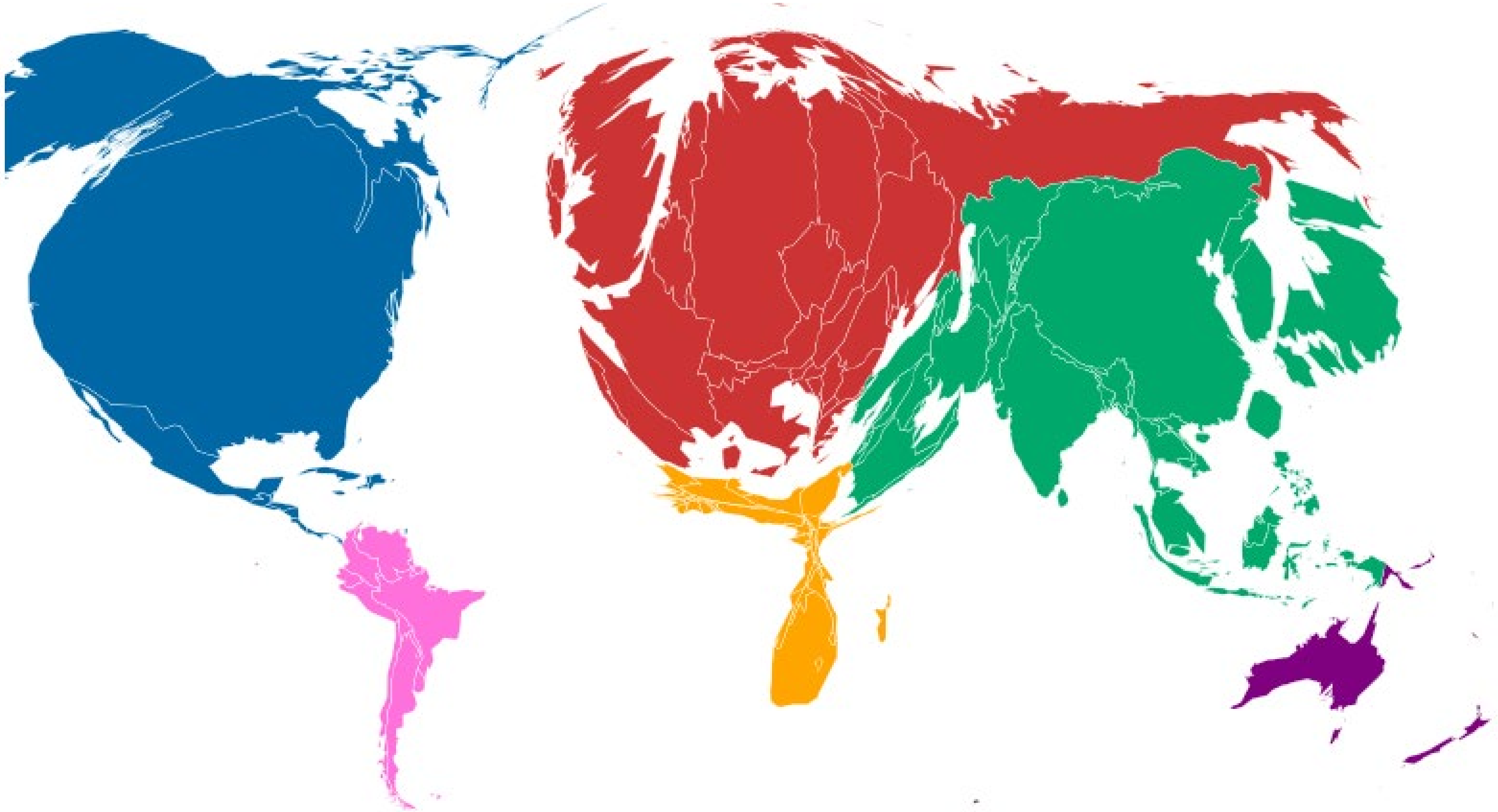
Historical responsibility



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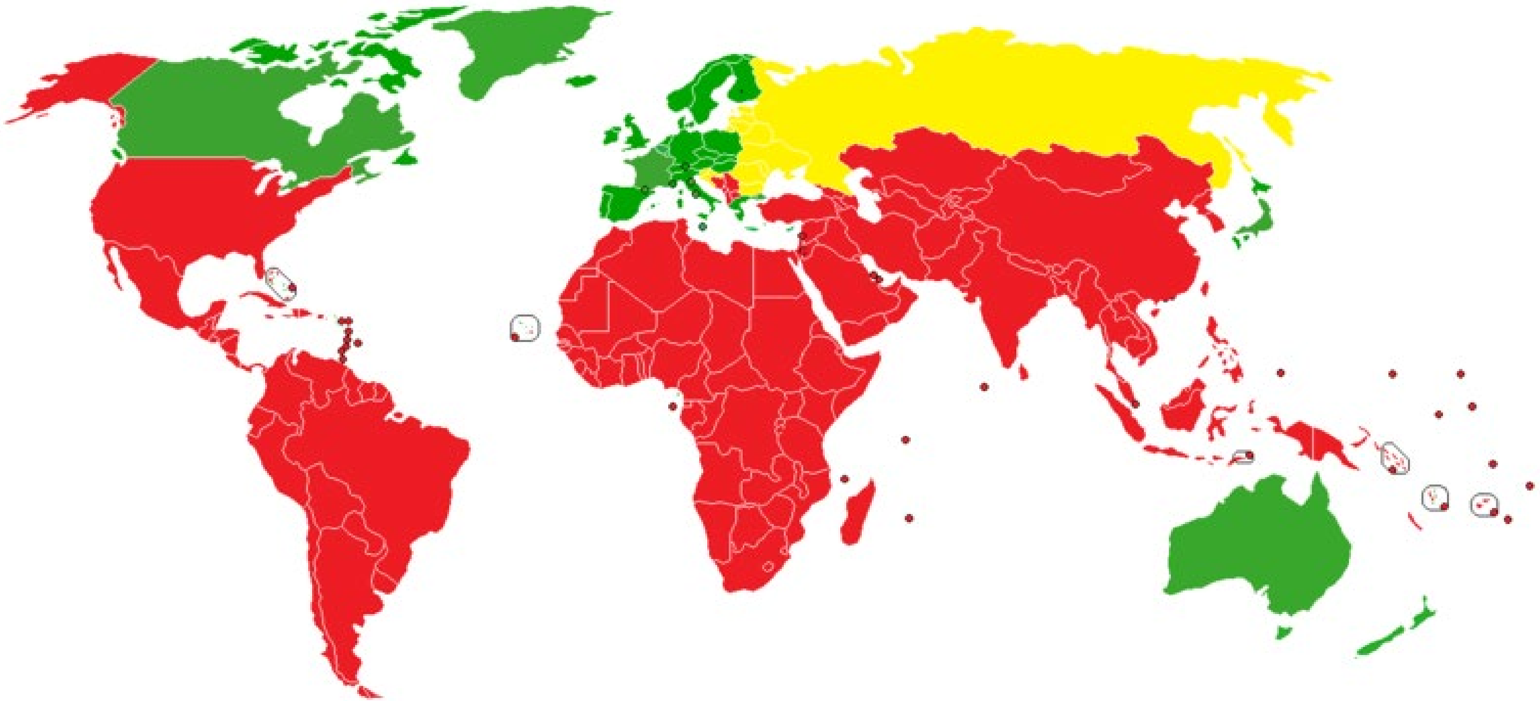
Negotiators’ positions

- Degree of vulnerability
- Economic dependence on the sale of fossil fuels
- Emissions per capita
- The importance attached to environmental protection
- Attitudes to multilateral cooperation in general, including levels of trust and geopolitical relations with other nations
- Ideological preferences for private or public initiatives in fighting climate change

The Kyoto Protocol

- Adopted in December 1997 and entered into force in February 2005
- Enshrines commitments for 38 industrialized countries between 2008-2012
- Greenhouse gas emission reductions amount to an average of 5% against 1990 level
- Allows for several ”flexible mechanisms”

Overview map of states obligated by Kyoto I (2008-2012)



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Copenhagen and the Global Warming Gridlock

Two weeks of intense negotiations that after much drama resulted in a political compromise deal – the Copenhagen Accord

Introduced 'Pledge and Review' with a bottom-up logic

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Durban Outcome

- Kyoto II

- Durban Platform for Enhanced Action

Para 2:

"*decides* to launch a process to develop a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties, through a subsidiary body under the Convention hereby established and to be known as the Ad Hoc Working Group on the Durban Platform for Enhanced Action"

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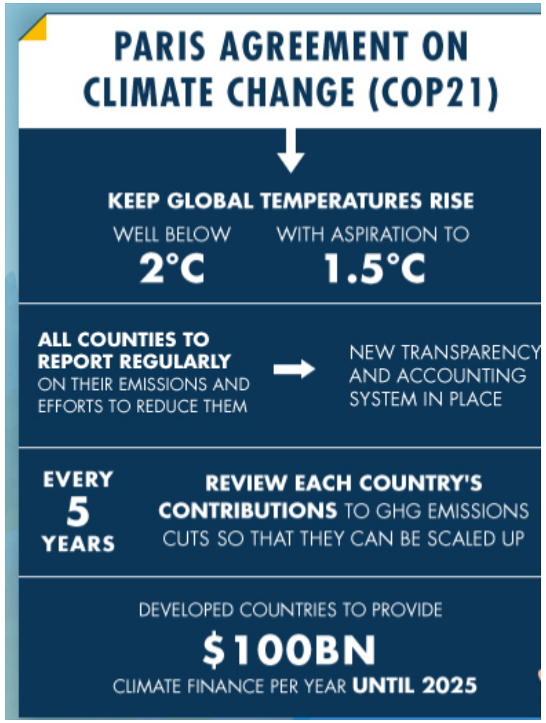
Paris Agreement

- On 12 December 2015, 195 countries reached agreement on a new climate treaty
- The beginning of a new phase in international climate politics the departs form the regulatory logic of the Kyoto Protocol



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Paris Agreement

- 2 degree/1,5 degree
- De-carbonization; global net GHG should be phased out by 2050
- NDCs to escape multilateral gridlock
- Ambition mechanism for international review and ratchening up ambition domestic mitigation plans.
- Transparency framework and 5 year global stock starting 2023.
- Facilitative dialogue in 2018 to ramp up climate action
- Informal review: Naming and shaming by civil society

The role of bottom-up initiatives in the Paris Agreement

The Paris Agreement welcomes the ”efforts of all non-Party stakeholders to address and respond to climate change, including those of civil society, the private sector, financial institutions, cities and other subnational authorities”.

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Transnational non-state climate action

- Lima Paris Action Agenda LPAA 2014-2016, back-up option to avoid repeat of Copenhagen failure
- The "quartet" of the UNFCCC secretariat, Executive Office of the UN Secretary- General and the French and Peruvian COP Presidency
- 2014 New York UN Climate Summit (UNCS) coordinated by the UN Secretary General
- 2014 Non-State Actor Zone for Climate Action (NAZCA) containing more than 12 000 commitments by corporate actors, civil society, cities
- Global Climate Action (GCA) launched during the 2016 Marrakech Climate Summit to spur pre-2020 climate action, coordinated by the 2 high level champions nominated by the Conferences of Parties (COP)

Transnational climate governance initiatives

RGGI

GREENHOUSE GAS PROTOCOL

SUSTAINABLE ENERGY FOR ALL

Covenant of Mayors
Committed to local sustainable energy

The Gold Standard
Premium quality carbon credits

reeep
renewable energy & energy efficiency partnership

CDP
DRIVING SUSTAINABLE ECONOMIES

CCAC
CLIMATE AND CLEAN AIR COALITION
TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS

VCS VERIFIED CARBON STANDARD
A Global Benchmark for Carbon

Global Methane Initiative

C40 CITIES
CLIMATE LEADERSHIP GROUP

CCBA
The Climate, Community & Biodiversity Alliance

FFFsR

REN21 Renewable Energy Policy Network for the 21st Century

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Paris Agreement

- Paris Agreement ”the importance of the engagements of all levels of government and various actors, in accordance with respective national legislations of Parties, in addressing climate change’.
- Non-state action should be complement not substitute to state action
- United Nations Environment Programme (UNEP) indicates that together cities, businesses and other non-state actors have the potential to mitigate 2,5-4 billions tons of CO2 by 2020

Non-state actors in the Paris outcome

Decision 1/CP.21:

- Establishes technical examination processes (2016-2020) for mitigation and adaptation
- Encourages registration on NAZCA platform
- Establishes high-level champions to galvanize non-state actors and calls for annual high-level events

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The growing role of non-state action

UN Climate Summit 2014
- UNSG mobilizes, CEOs, mayors, civil society

COP20 Lima 2014
- Launch NAZCA platform
- Lima-Paris Action Agenda

COP21 Paris 2015
- Action Agenda fourth pillar
- Thematic & high-level days
- Formal encouragement in Decision 1/CP.21

COP22 Marrakech 2016
- High-level event
- Marrakech Partnership for Global Climate Action

Source: Hale 2016

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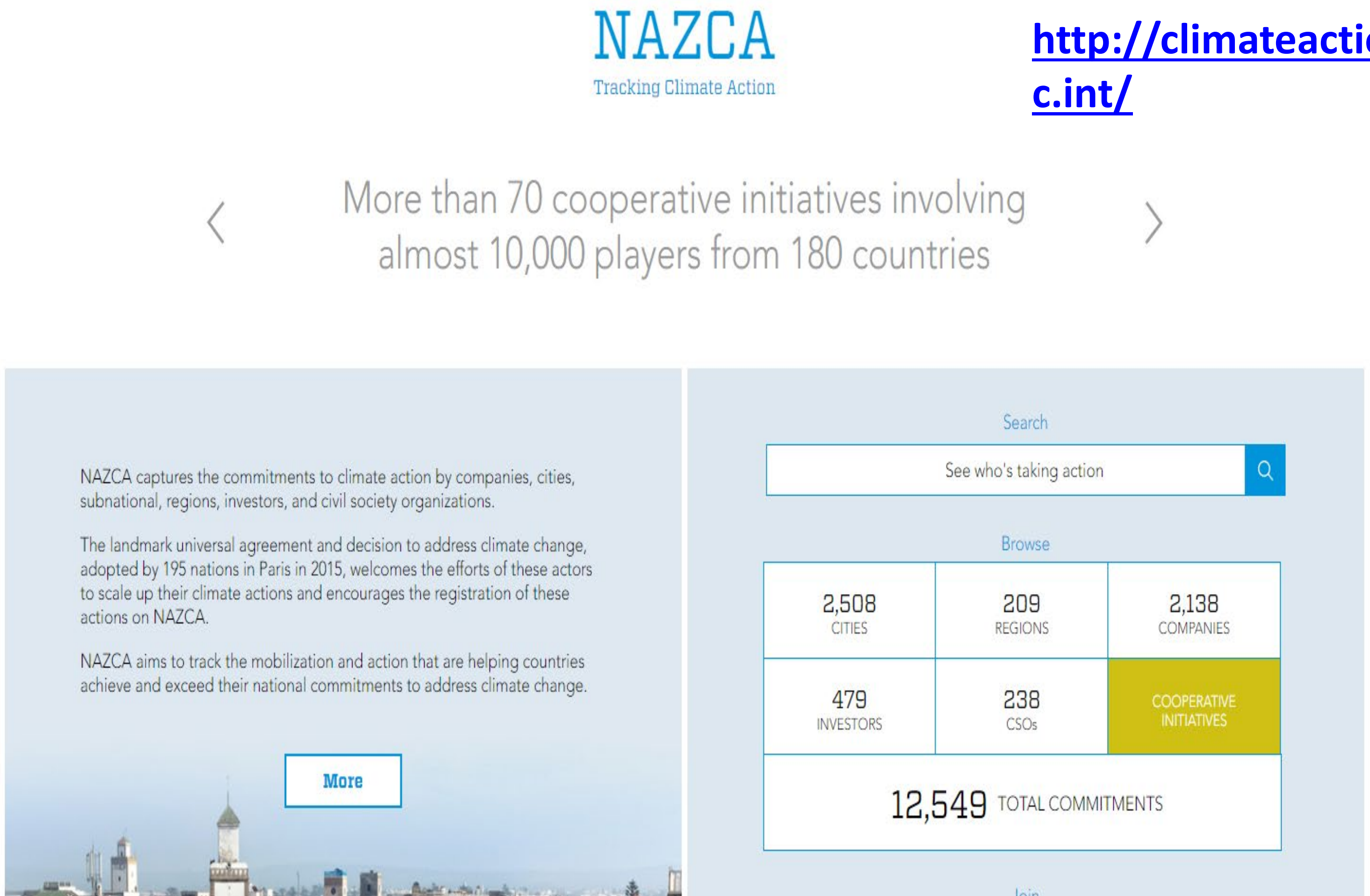
Non-state climate action



http://climateaction.unfccc.int/

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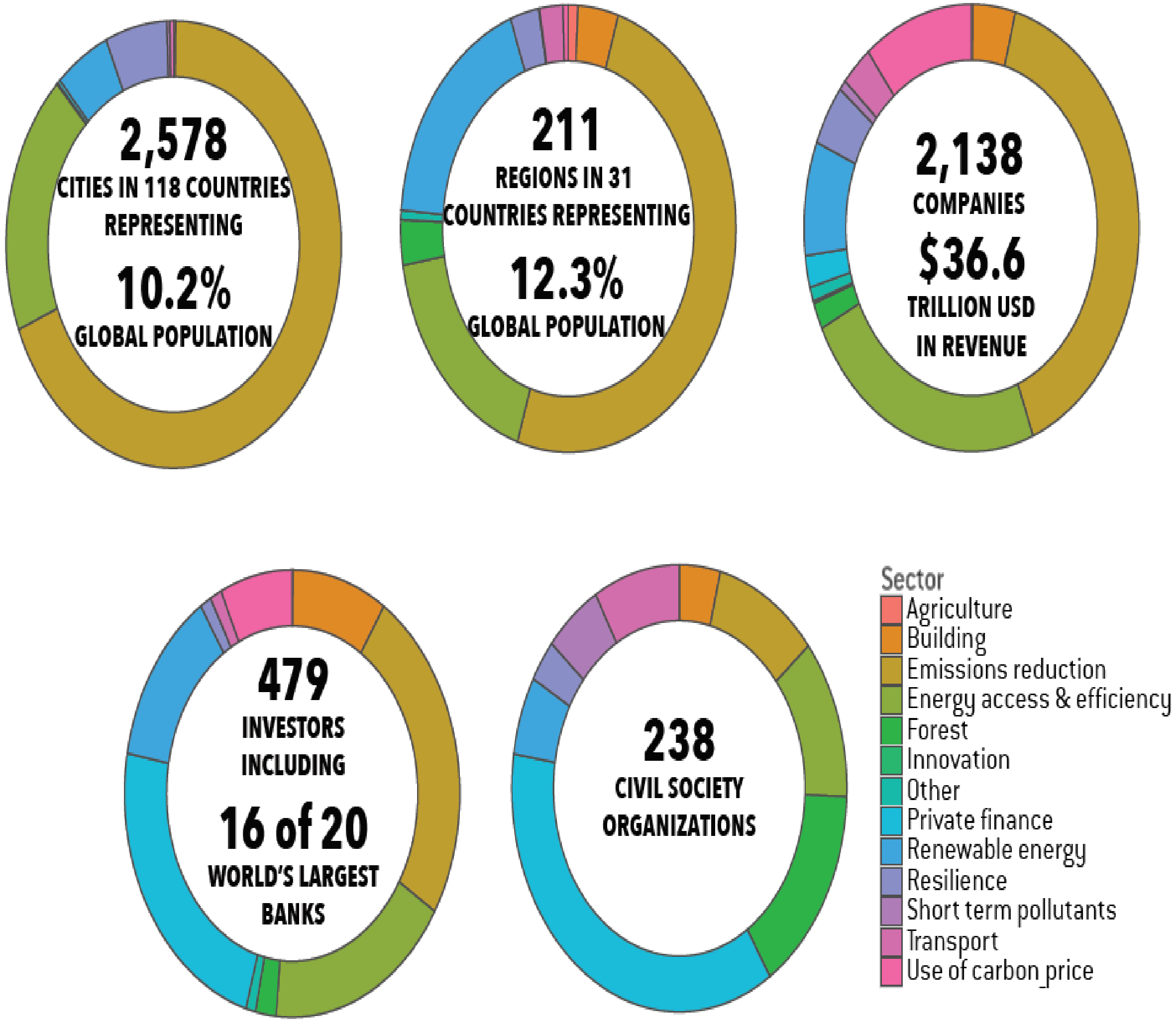
Non-state climate action in numbers



Source: Hsu et al. 2016

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-Aims to accelerate the scale and pace of climate action among Parties and non-Party stakeholders in all parts of the world
-NAZCA Climate Action Portal

Ongoing challenges

- Agreeing on a rule-book for the Paris Agreement
- Implementing NDCs and driving up ambition
- The role of USA

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AMERICA'S PLEDGE
AMERICA'S PLEDGE
AMERICA'S PLEDGE

Institutional Complexity

- Involves both synergies and conflicts

From GCAS to COP24 i Katowice i Polen 2018

- Negotiations of the Paris rulebook as a guide to reach the temperature goal; how will countries Nationally Determined Contributions (NDC) be reported and how should states be held accountable
- The Facilitative Dialogue 2018 through *Talanoa* dialogue (in Fijian) - inclusive, transparent and participatory to highlight good practice to enhance ambition for new rounds of NDCs to be submitted 2020
- Enhance ambition level for 2020 for the Kyoto Protocol's second commitment period (2013-2020)
- Action Plan for gender equality and gender mainstreaming in the UNFCCC
- The global stock-take of countries' NDC will will happen in 2023.

Suggestions for policy-makers

- Greater nexus thinking
- Establishing catalytic linkages between different actors at the international, regional, national and local levels
- Economic framework for decarbonization

- ➢ Setting a clear vision through dialogue with citizens and coordinating actions by a multitude of stakeholders
- ➢ Mobilizing the key ingredients: climate finance and political will

Thank you for your attention!

Naghmeh Nasiritousi, Post-doc
Karin Bäckstrand, Professor

Department of Political Science
Stockholm University

naghmeh.nasiritousi@statsvet.su.se, karin.backstrand@statsvet.su.se

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What makes Paris agreement a success?

LL.M. Åsa Romson

Senior researcher in environmental law and policy,

At Paris conference 2015 Swedish minister for climate and the environment

ivl
Swedish Environmental Research Institute

This is the end of fossil fuels

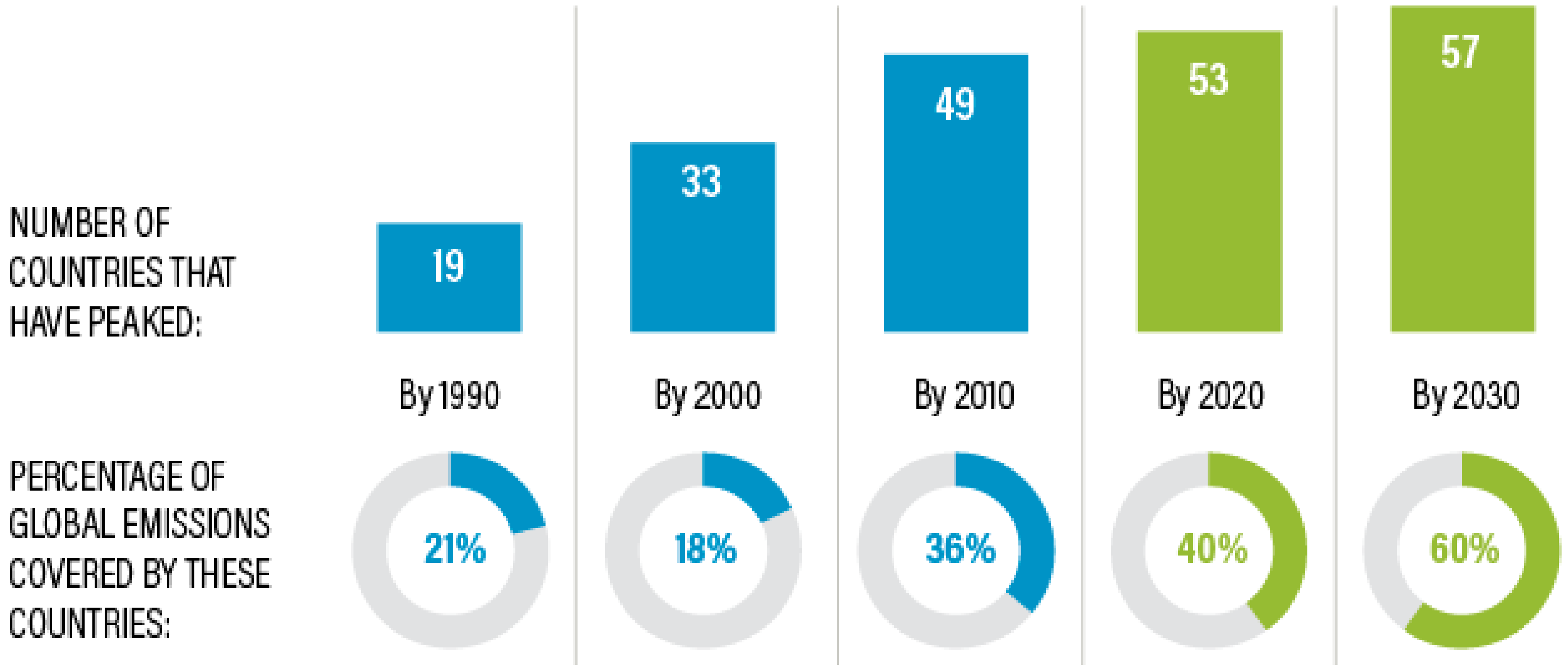
By John D. Sutter, CNN
Updated 0559 GMT (1359 HKT) December 14, 2015 | Video Source: CNN

Top stories

Actor declared dead afte
botched hanging scene

Denver Broncos win Sup
Bowl 50

Growth in Peaking of Countries' GHG Emissions Over Time



Source: wri.org/turning-points

WORLD RESOURCES INSTITUTE

ivl Swedish Environmental Research Institute

Swedish Environmental Research Institute

Nasiritousi and Bäckstrand suggest:

Yes,

- it is more successful than the predecessor Kyoto protocoll in gather wide support from states,
- it is innovative in active support by non-state actors, and
- it has overcome initial challenges around U.S. stepping out

But,

- It is less successful to final settle the issues around the so called firewall, and
- in many respects the effects of the agreement are too early to evaluate

Other elements that might lead to success:

- Science is in its core processes
- Timing with technology development and breakthrough for renewable energy
- It is a procedural framework – the work is done nationally (decentralised multilateralism?)
- It creates a process for strategic national climate plans – tool for civil society and political opposition
- The real test is the new NDCs, do they arrive in time for 2025 and will they be more ambitious?

Swedish Environmental Research Institute

Thank you!

Åsa Romson

International Climate Politics in the post-Paris era: Discussion

Torben K. Mideksa

Department of Economics
Uppsala University

24 October 2018

Outline

The Politics of Climate Change is Hard.

- The piece provides an excellent assessment of evolution of the international politics of climate change.

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  The culprits:

  - the free-rider problem,
  - burden-sharing disagreement, and
  - limits to enforceability of agreements.

The Politics of Climate Change is Hard.

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- It explains why it is hard for countries to form an effective international climate agreement.

  The culprits:

  - the free-rider problem,
  - burden-sharing disagreement, and
  - limits to enforceability of agreements.
- The international mechanism has gradually evolved from the Kyoto Protocol to the Paris Accord.

Paris's Novel Institutional Features.

Combinations of:

- mandatory and voluntary provisions,
- top-down and bottom-up features, and
- reliance on state and non-state actors.

Some Challenges for the Paris Accord

- The US's withdrawal from the agreement.

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- The US's withdrawal from the agreement.
- The lingering conflict about transparency and reporting between developing and developed countries.
- The dwindling contributions to climate finance.

Emerging issues

- Nexus thinking,
- catalytic linkages between different actors, and
- leadership through a climate club.

Remark: Policy Makers' Behavior

The strong tension between the agreement's goal and the ways of achieving the goal poses a set of questions.

- what is the effect of Paris's institutional innovations on the bottom-line of global abatement?

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Remark: Policy Makers' Behavior

The strong tension between the agreement's goal and the ways of achieving the goal poses a set of questions.

- what is the effect of Paris's institutional innovations on the bottom-line of global abatement?

- why do countries sign up for environmentally ineffective global agreements that kick the solution to the future?

Understanding why ineffective global agreements emerge and how to make such agreements effective are important to address the problem of climate change.

Remark: Supporting Policies

It is necessary to think about supporting policies that can raise abatement within the Paris framework.

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1. The US will not be a reliable participant in international environmental agreements.
    - How can the agreement's participants incentivize a country that can only deliver temporary and short term emissions reduction?

Supporting Policies: Border Tax Adjustment

2. Raising abatement from free-riding countries using a border tax adjustment.

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   - How to enact carbon tariffs while controlling domestic mercantalistic forces and minimizing trade wars?

Supporting Policies: Conservation Contracts

3. Providing incentives for other countries to abate more from activities with low economic and high environmental values using forest and fossil fuel conservation contracts.

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   - How to design conservation contracts in a way that restrains the perverse conservation incentives of domestic political institutions?

Supporting Policies: Leadership in Climate Policy

4. Leadership in climate policy raises abatement.

Supporting Policies: Leadership in Climate Policy

4. Leadership in climate policy raises abatement.

    - How to make leadership in climate policy effective given the EU and the US cannot coordinate and send similar signals?

Supply-side climate policy in Norway

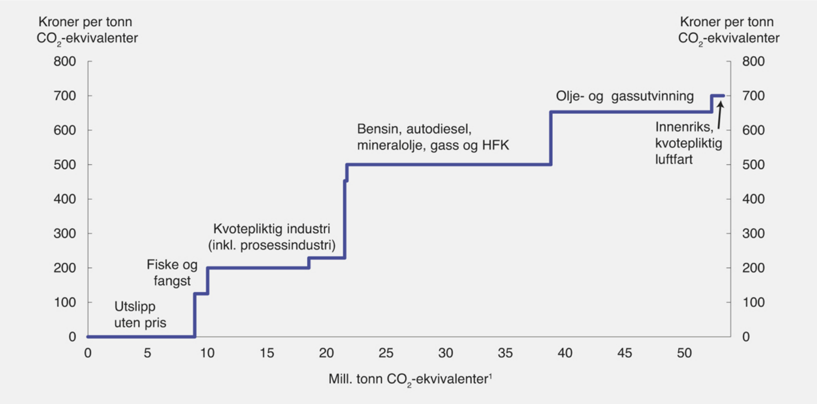
Katinka Holtsmark, University of Oslo

October 2018

Supply- versus demand-side climate policy

- Paradox: Norwegian climate policy only on the demand side.

Carbon pricing in Norway[1]



[1]Source: Norwegian national budget 2019.

Supply- versus demand-side climate policy

- Paradox: Norwegian climate policy only on the demand side.

Supply- versus demand-side climate policy

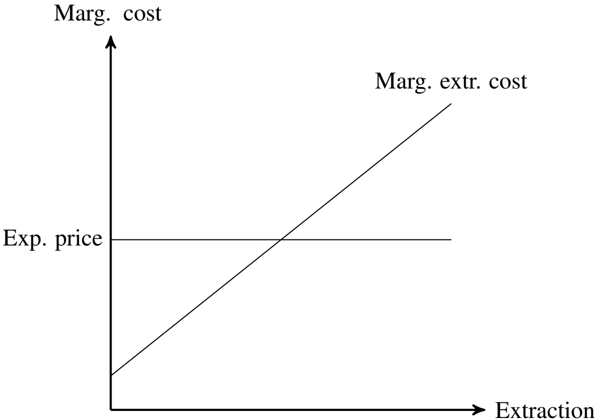
- Paradox: Norwegian climate policy only on the demand side.
- Global climate agreement: Supply- and demand side reductions are equivalent in terms of emission reduction.
- Unilateral climate policy: Supply- and demand side reductions can give very different global effects.

Does cost-effective Norwegian climate policy include reduced oil extraction?

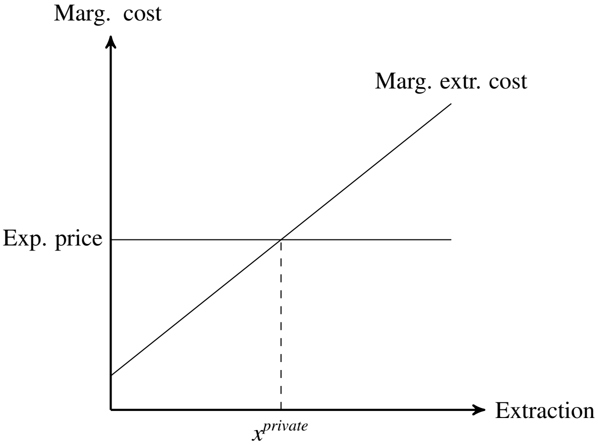
Does cost-effective Norwegian climate policy include reduced oil extraction?

Both theory and empirics tell us it does.

Optimal oil extraction with negative externalities



Optimal oil extraction with negative externalities



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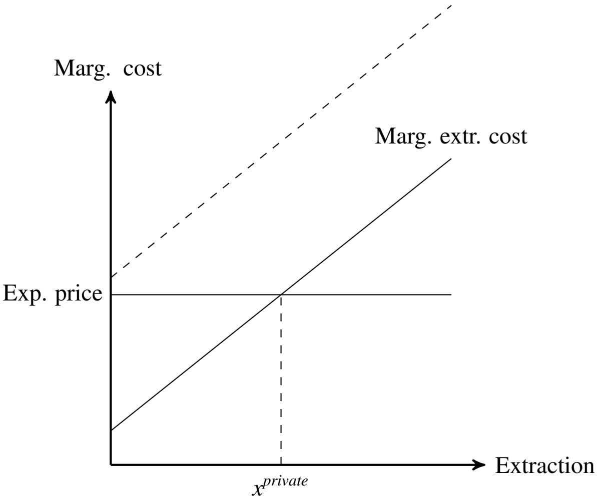

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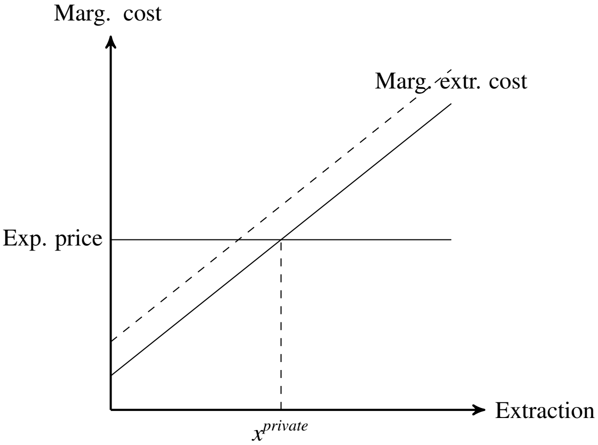

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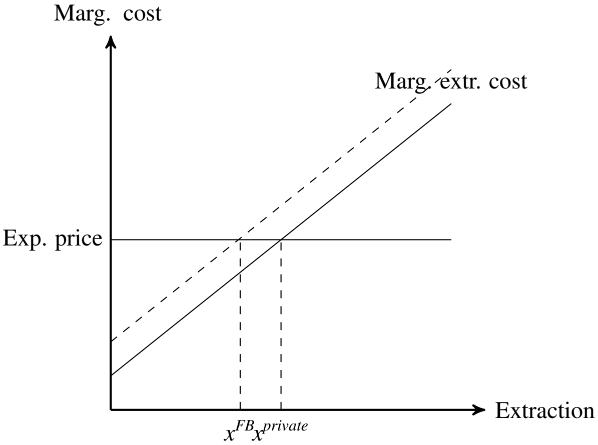

(How much) Should Norwegian oil extraction be reduced?

- What is the value of a reduction in global emissions?

- What is the cost of reducing demand and supply of fossil energy?
- How large is the global emission reduction following a reduction in supply and a reduction in demand?

(How much) Should Norwegian oil extraction be reduced?

- What is the value of a reduction in global emissions?
  - Not relevant for the optimal combination of supply- and demand-side policy.
- What is the cost of reducing demand and supply of fossil energy?
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Carbon leakage on the supply side

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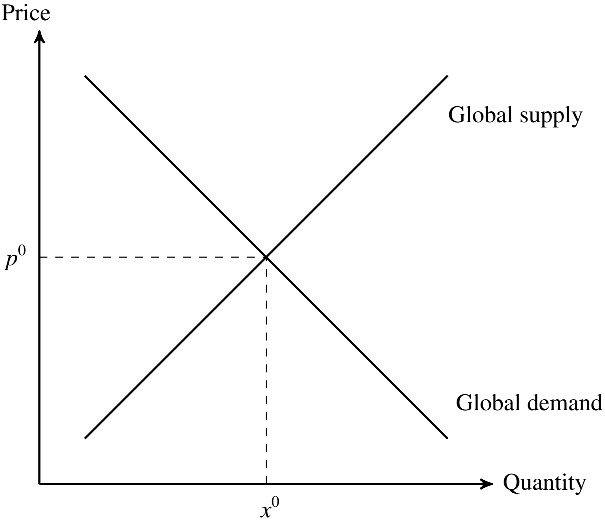

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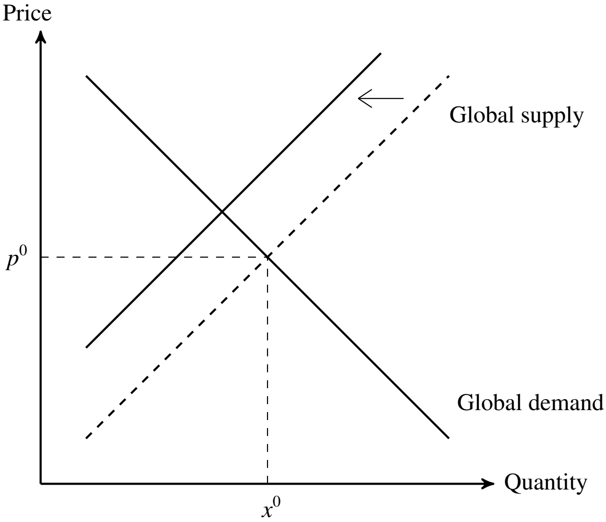

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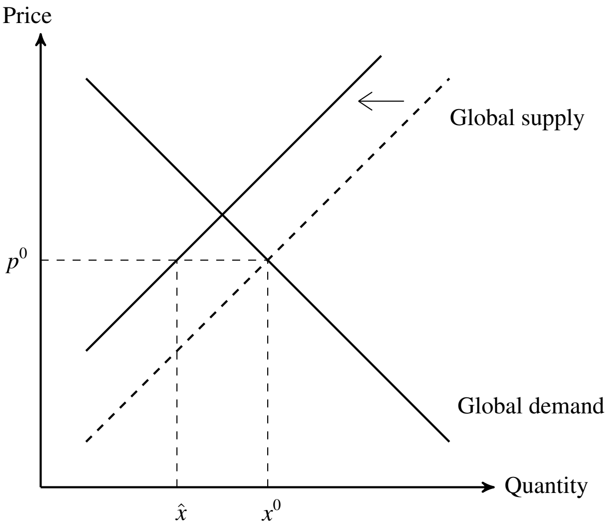

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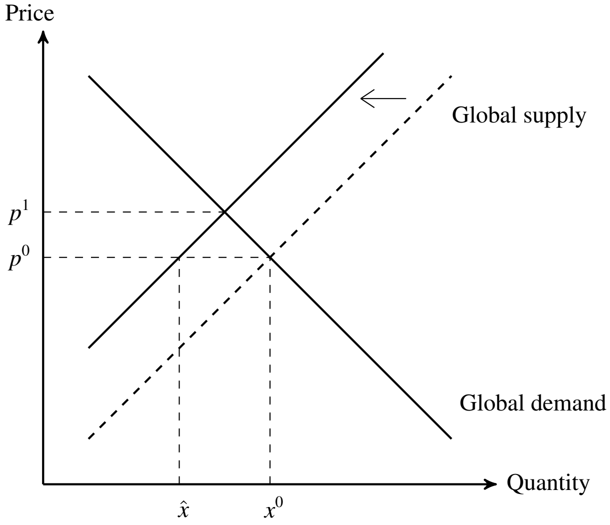

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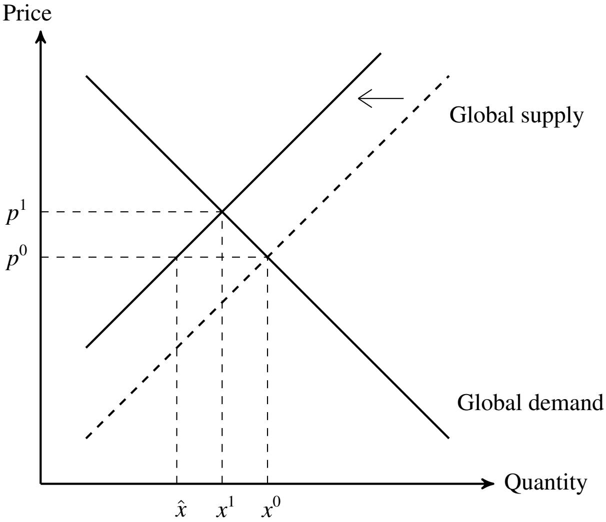

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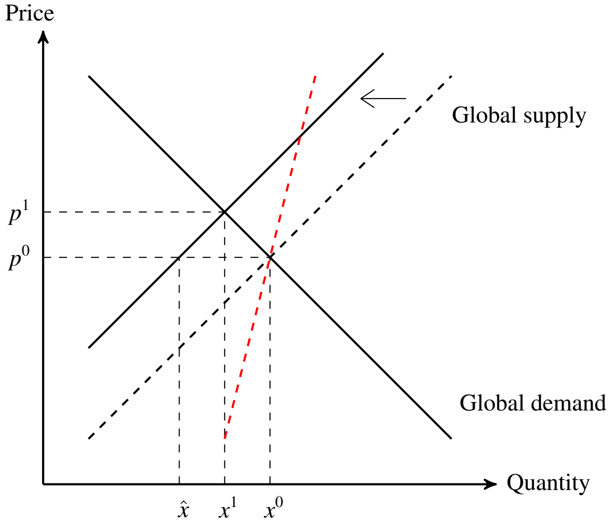

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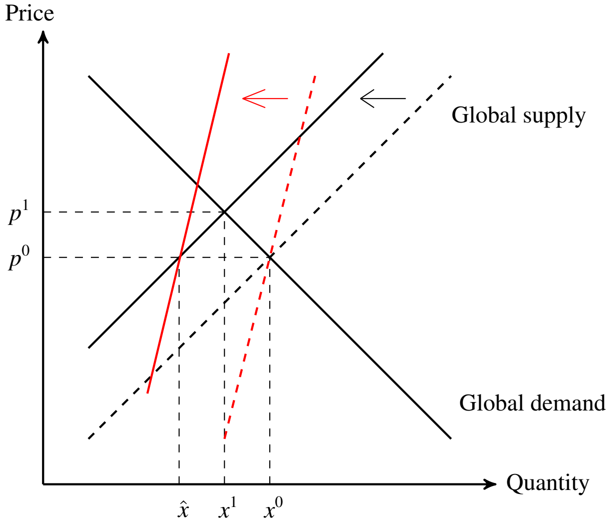

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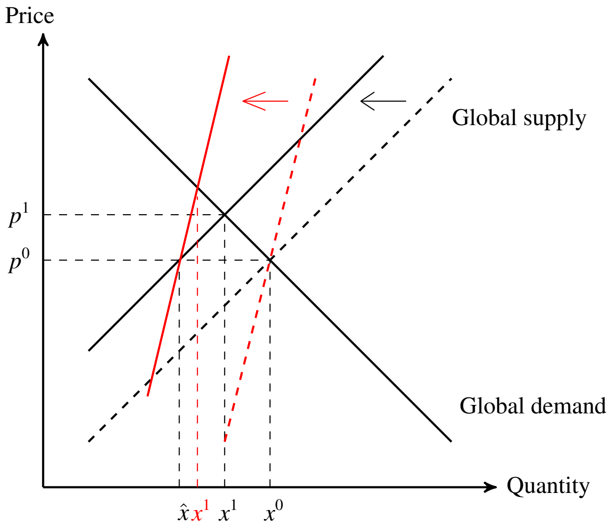
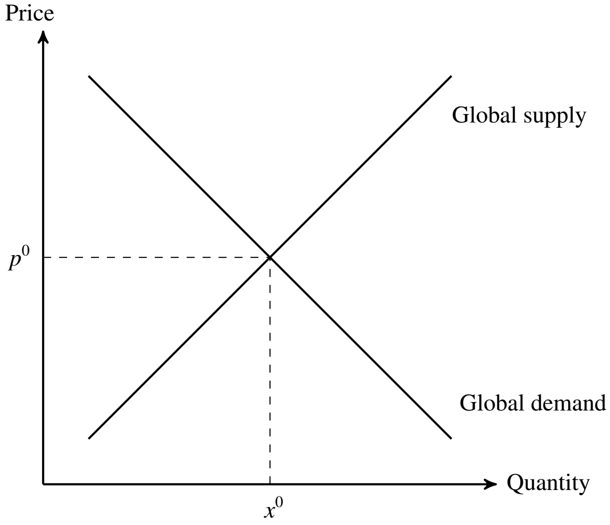


Carbon leakage on the demand side



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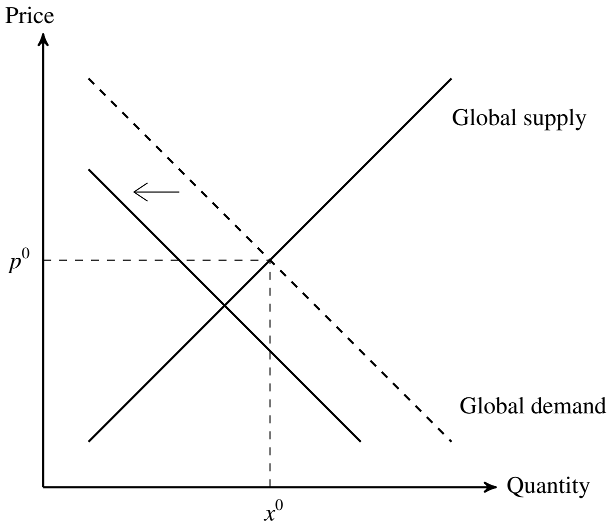

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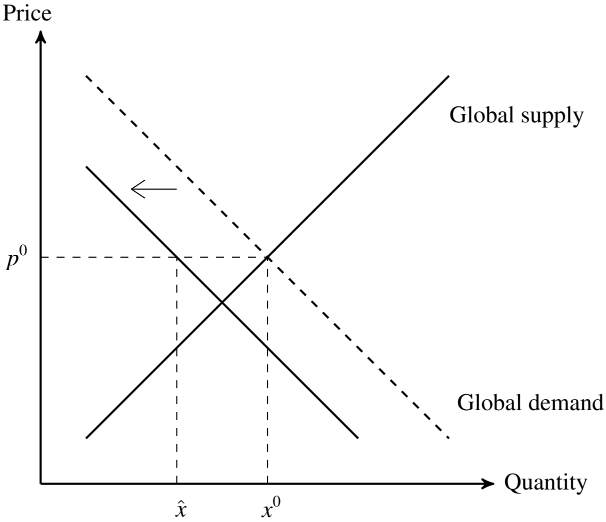

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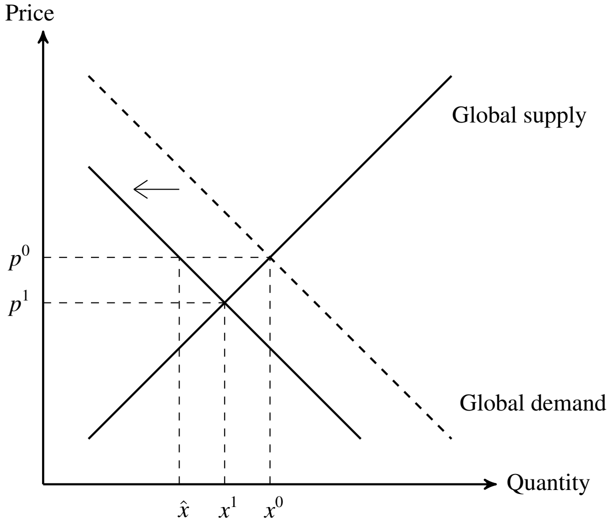

The optimal combination of supply- and demand cuts in Norway

Fæhn et al (2017), *The Energy Journal*:

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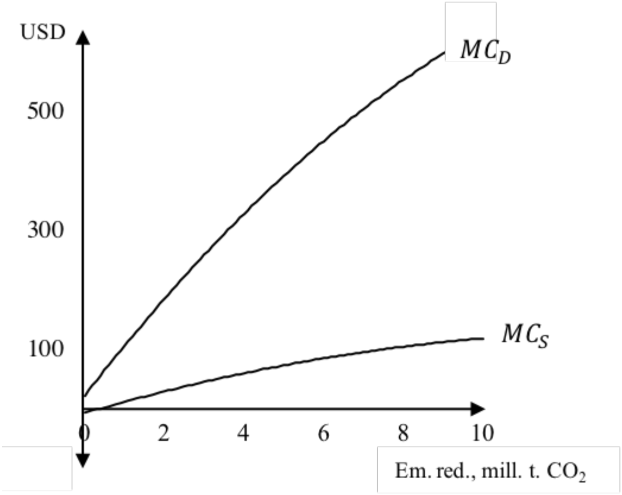
Domestic and global emission reductions, Fæhn et al (2017)

Domestic and global emission reductions, Fæhn et al (2017)

	OPEC: Dominant producer		OPEC: Competitive producer	
	Supply side	Demand side	Supply side	Demand side
Gross emission reduction	1	1	1	1
Oil market leakage	-0.546	-0.454	-0.507	-0.493
Coal/gas market leakage	-0.088	0.088	-0.096	0.096
Domestic extraction	0.028	0	0.028	0
Foreign extraction	-0.041	0.041	-0.043	0.043
Net emission reduction	0.353	0.676	0.383	0.646

Marginal abatement cost curves, Fæhn et al (2017)

Marginal abatement cost curves, Fæhn et al (2017)



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  - The carbon leakage on the supply side versus on the demand side.
    - $Leakage_S > Leakage_D$
- *Global emission reduction of* 5 *Mt. of* CO_2*:*

  2/3 *supply-side cuts,* 1/3 *demand-side cuts.*

Technological development

Technological development

- Learning by doing

Technological development

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- Directed technical change (Acemoglu, 2002; Acemoglu et al., 2012; Acemoglu et al., 2016)

Technological development

- Learning by doing
- Directed technical change (Acemoglu, 2002; Acemoglu et al., 2012; Acemoglu et al., 2016)
  - Reduced access to fossil energy globally will push the technological development in favor of renewable energy sources and energy efficiency.
  - Over time, the technological development *lowers* the carbon leakage from supply-side climate policy.

Does cost-effective Norwegian climate policy include reduced oil extraction?

Both theory and empirics tell us it does.

Katinka Holtsmark

Supply-side climate policy in Norway

Comments

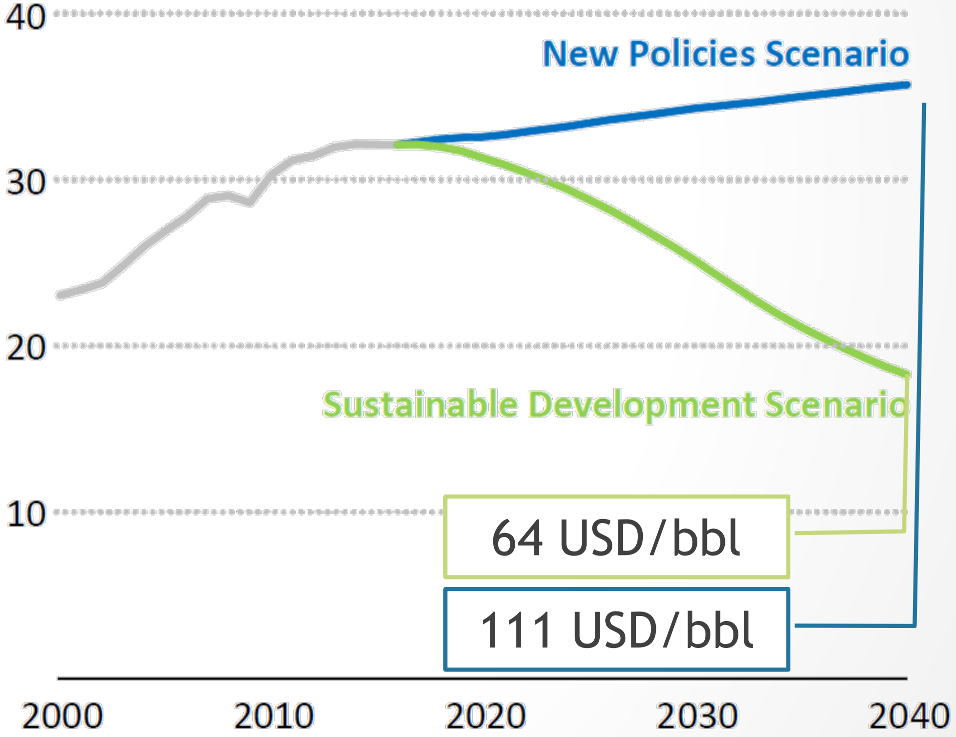
Klaus Mohn, Professor
University of Stavanger Business School
http://www.uis.no/Mohn
Twitter: @Mohnitor

NEPR Conference on climate policies and the Nordics
Stockholm, 24 October 2018

University of Stavanger

The Paris agreement

Policy and market implications



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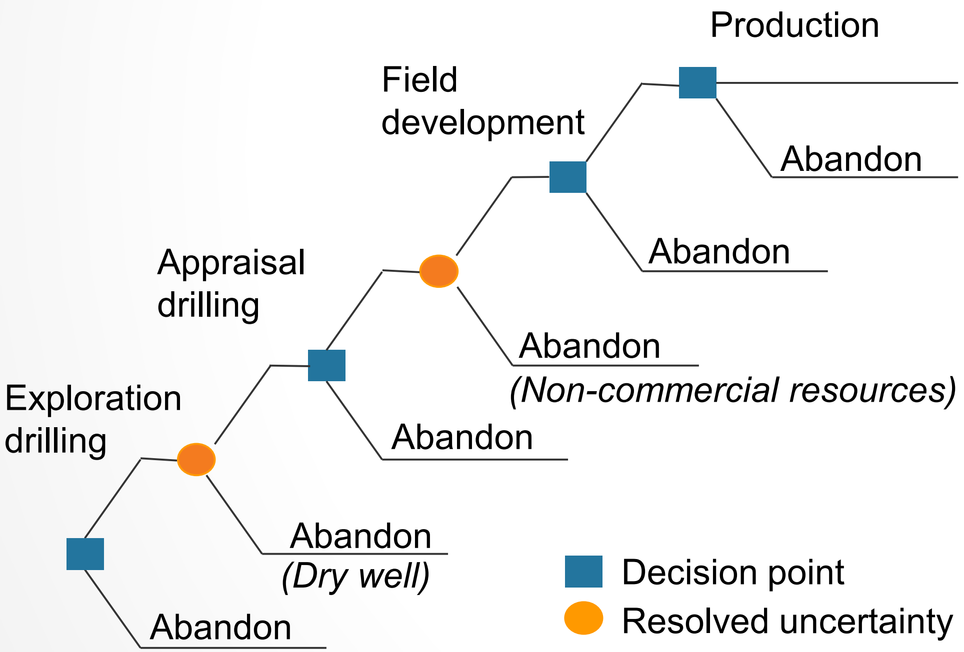
Source: International Energy Agency. 2017. *World Energy Outlook 2017*. IEA. Paris.

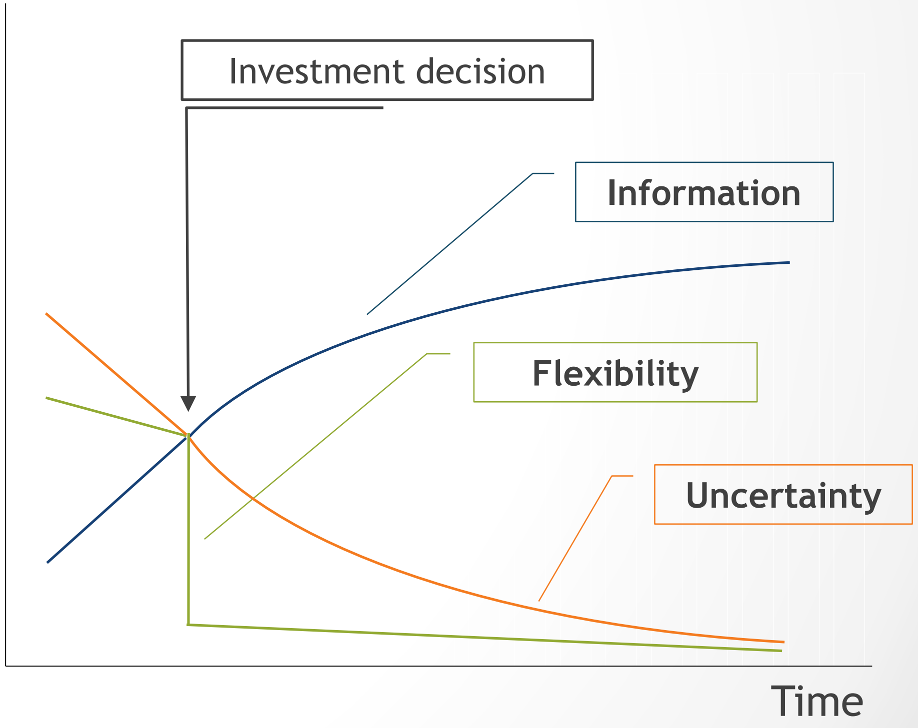
Oil investment: A sequence of decisions

… involving uncertainty, information, and flexibility

Decision tree
Information revealed over time



Information and flexibility
Evolution over the project cycle



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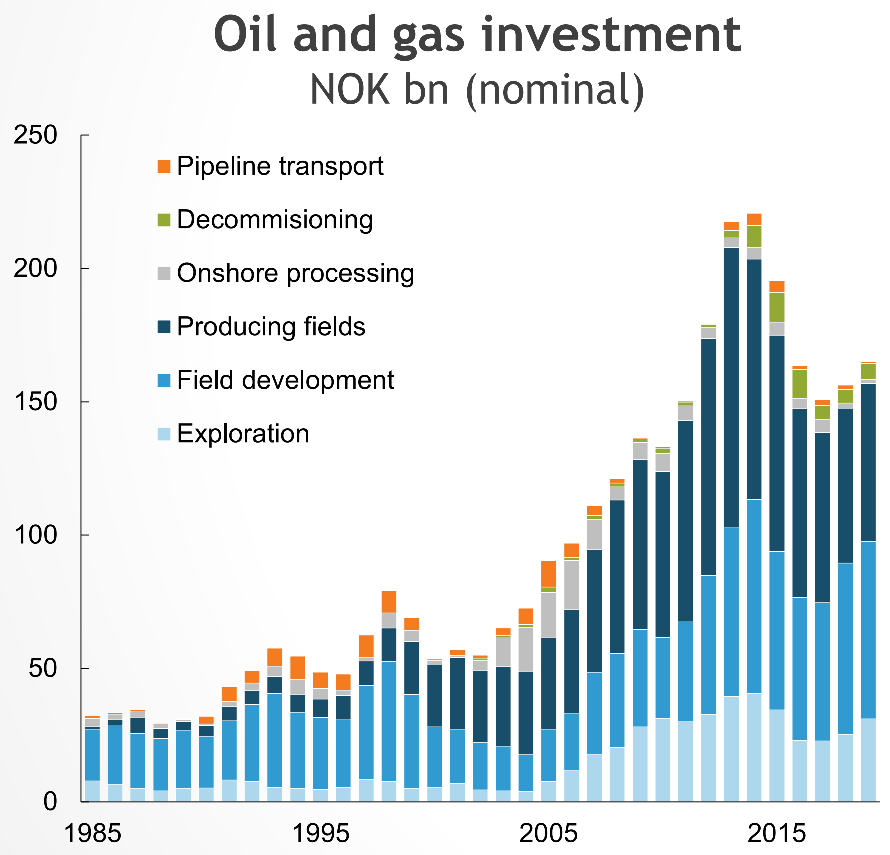
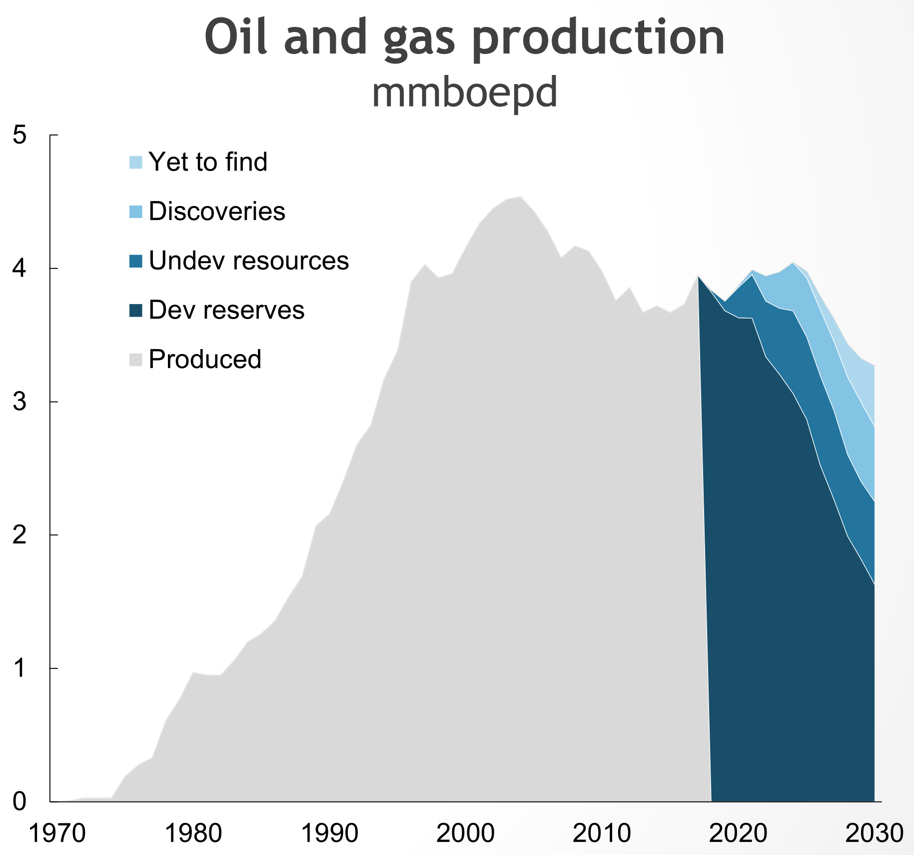
Investment and production

A variety of investment types – and production responses





Sources: Statistics Norway (investment) and the Norwegian Petroleum Directorate (production).

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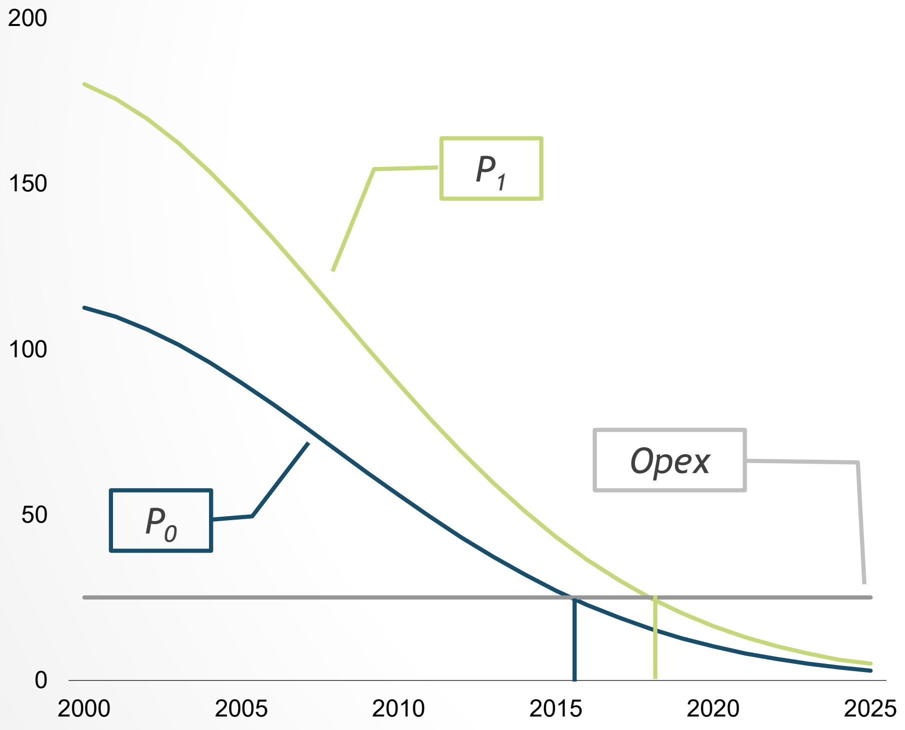
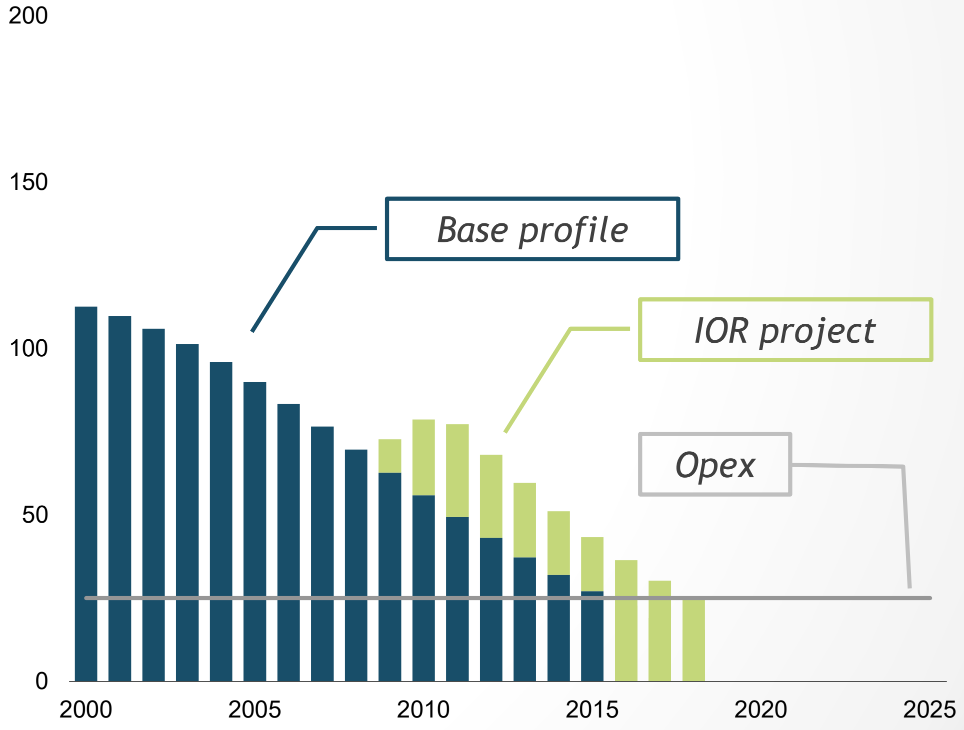
The oil price matters…

… for activity, production, and recoverable reserves

Oil price and reserve potential
Revenues, cost, and field-life



Oil price and IOR activities
Revenues, cost, and field-life



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Taxation framework

… and government cash-flows from petroleum activities

Calculation of petroleum tax

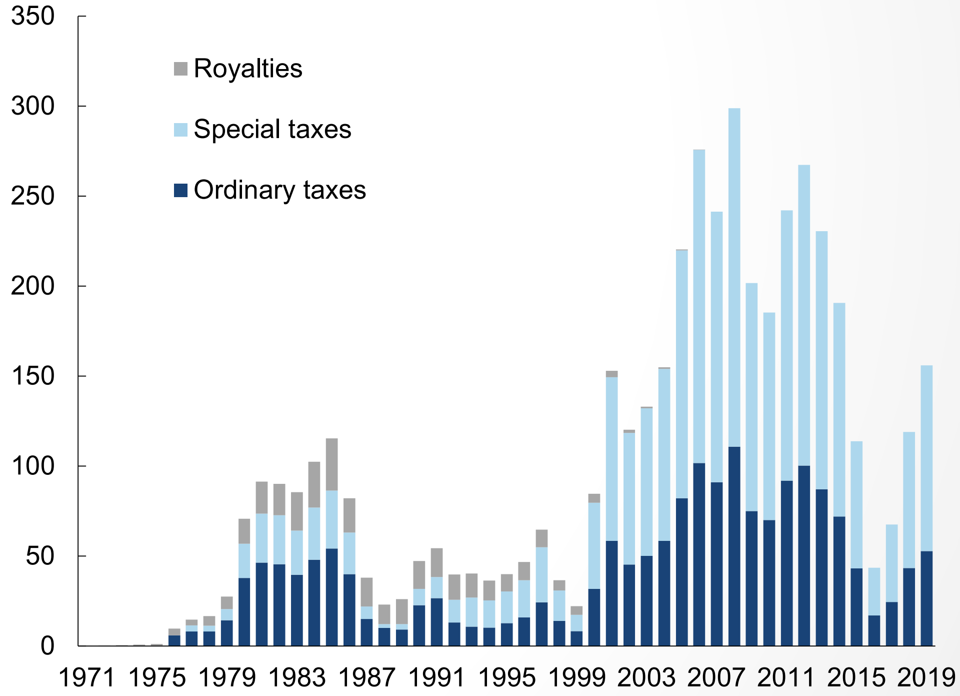
Operating income (norm prices)
- Operating expenses
- Linear depreciation for investments (6 years)
- Exploration expenses, R&D and decom.
- Environmental taxes and area fees
- Net financial costs

= **Corporation tax base (23%)**
- Uplift (5,3% of investments for 4 years)

= **Special tax base (55%)**

Government net cash-flow…

…from petroleum activities (NOK bn)



University of Stavanger

Source: Norwegian Ministry of Petroleum and Energy, Norwegian Petroleum Directorate.

Thank you!

Klaus Mohn, Professor
University of Stavanger Business School
http://www.uis.no/Mohn
Twitter: @Mohnitor

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University of Stavanger

Towards a more efficient European carbon market

Frederik Silbye, Secretariat of the Danish Council on Climate Change

Peter Birch Sørensen, Danish Council on Climate Change and University of Copenhagen

Paper presented at the *Nordic Economic Policy Review* conference in Stockholm, October 24, 2018

UNIVERSITY OF COPENHAGEN

Issues

- Has the European Emissions Trading System (ETS) fulfilled its mission so far?
- What are the prospects for the European carbon market after the 2018 reform of the ETS?
- Are national policies aimed at reducing emissions from the ETS sector ineffective?
- How can the future performance of the ETS be improved?

Main messages

- The surplus of ETS emission allowances is likely to persist for several decades even after the 2018 reform
- The new Market Stability Reserve fundamentally changes the ETS by endogenizing allowance supply. Implication: National policies that reduce the demand for allowances may reduce emissions permanently
- For an EU member state wishing to take the lead in climate policy, a policy that promotes renewable energy via subsidies or carbon taxes is far more cost-effective than annulment of ETS emission allowances
- The endogeneity of allowance supply is driven by fundamental political economy factors
- The next ETS reform should introduce a floor and a ceiling for the allowance price

A brief history of the ETS

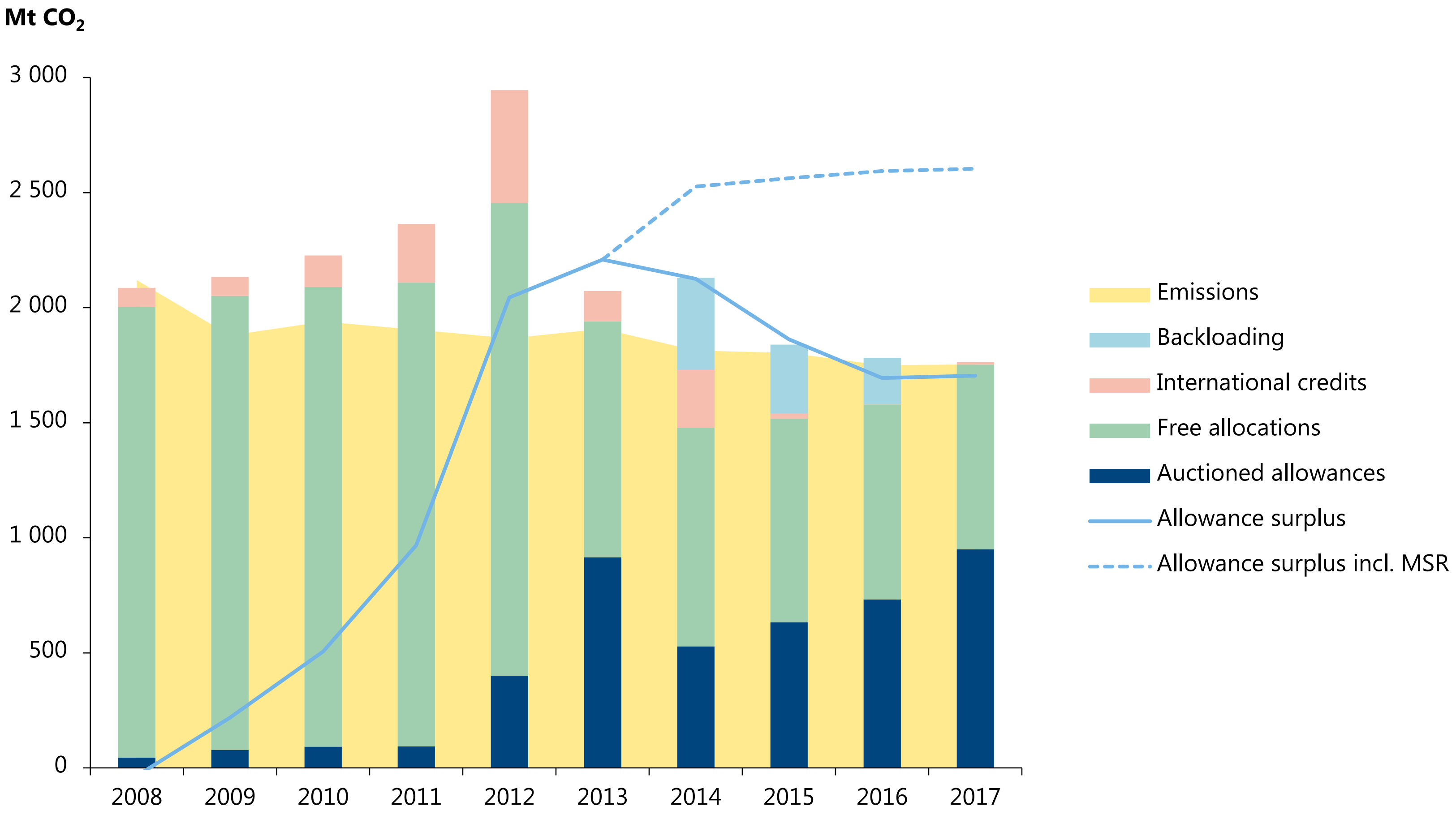
ETS – Facts and figures

- Covers the (still) 28 EU Member States plus Iceland, Liechtenstein and Norway
- Covers approximately 11,000 power stations and manufacturing plants as well as civil aviation within the ETS countries
- Covers the greenhouse gases carbon dioxide (CO_2), nitrous oxide (N_2O), and perfluorocarbons (PFCs)
- Around 45% of total EU greenhouse gas emissions are regulated by the ETS

Mechanics of the ETS

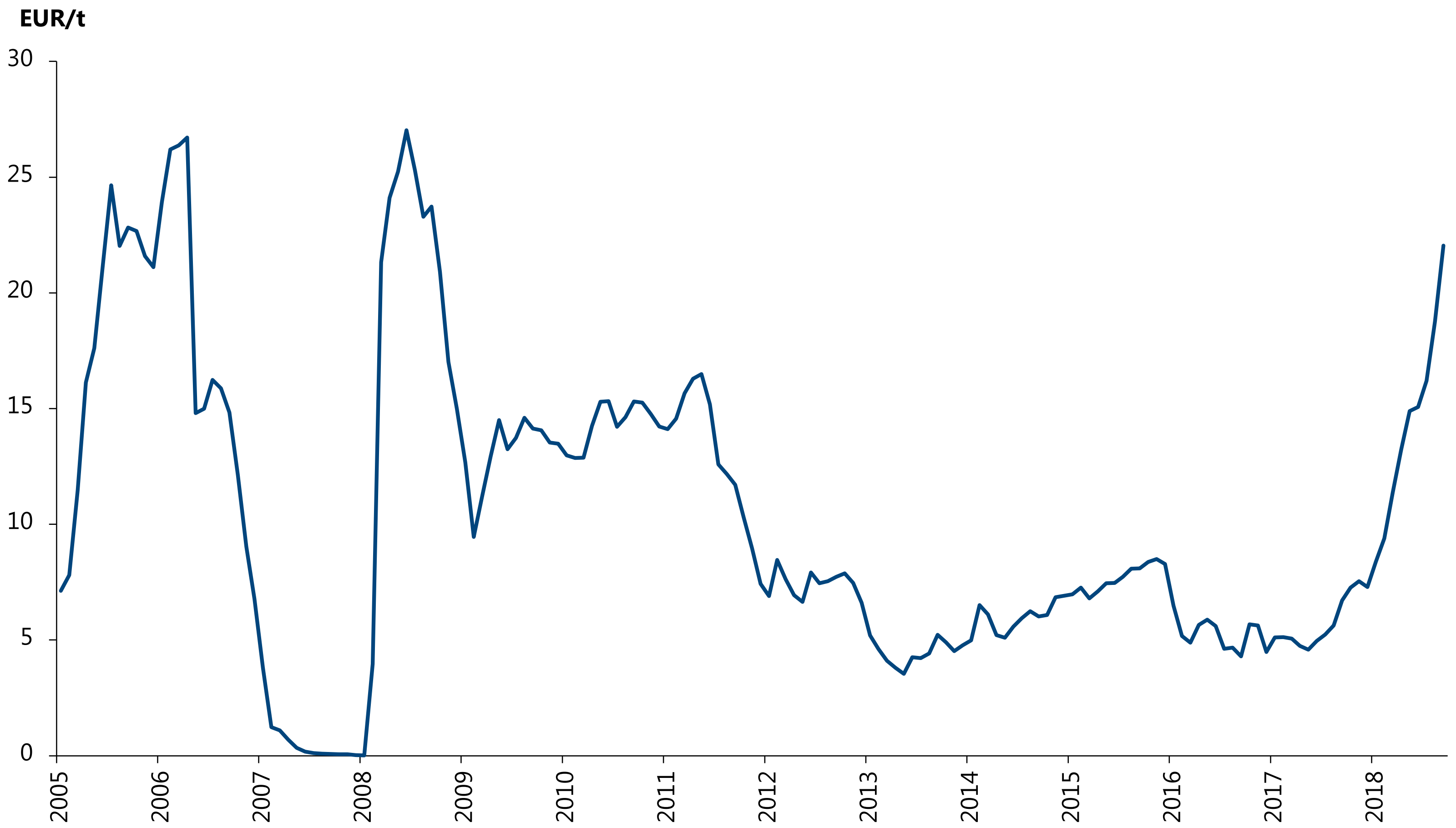
- For every emitted ton of CO_2, an installation within the ETS must surrender an allowance
- Surrendered allowances are cancelled
- New allowances are issued each year at a declining rate
- Some new allowances are auctioned, others are allocated cost-free
- Allowances are tradable
- Allowances can be banked for later use

Allowance supply, emissions and allowance surplus in the ETS



The spot price of ETS allowances

(Euros per ton of CO_2, monthly averages)



The controversy on the ETS

Defenders:

- The system works: Emissions are below the cap
- The allowance surplus reflects efficient intertemporal smoothing of abatement costs
- National subsidies to renewable energy are ineffective and distortive

Critics:

- The system has been flooded with questionable credits from outside Europe
- The allowance price is too low and volatile to support sufficient investments in renewable energy
- National subsidies to renewables can (to some extent) reduce EU-wide emissions from the ETS sector

A simple model of the ETS

The demand for emission allowances (I)

The representative ETS firm minimizes the present value (PV) of its total emissions-related costs given by

$$PV = \sum_{t=1}^{h} (1+r)^{-(t-1)} \left(p_t X_t + TAC_t \right),$$

$p =$ price of emission allowance

$X =$ purchase of emission allowances

$TAC =$ total abatement costs

$r =$ discount rate

$h =$ planning horizon

The demand for emission allowances (II)

The total abatement cost is

$$TAC_t = \frac{1}{2b}\left(\bar{E}_t - E_t\right)^2, \qquad b > 0,$$

$E =$ actual emission of CO_2

$\bar{E} =$ emission in the absence of abatement

The allowance surplus S evolves as follows:

$$S_t = S_{t-1} + X_t - E_t, \qquad S_t \geq 0, \qquad S_0 > 0 \text{ given.}$$

The demand for emission allowances (III)

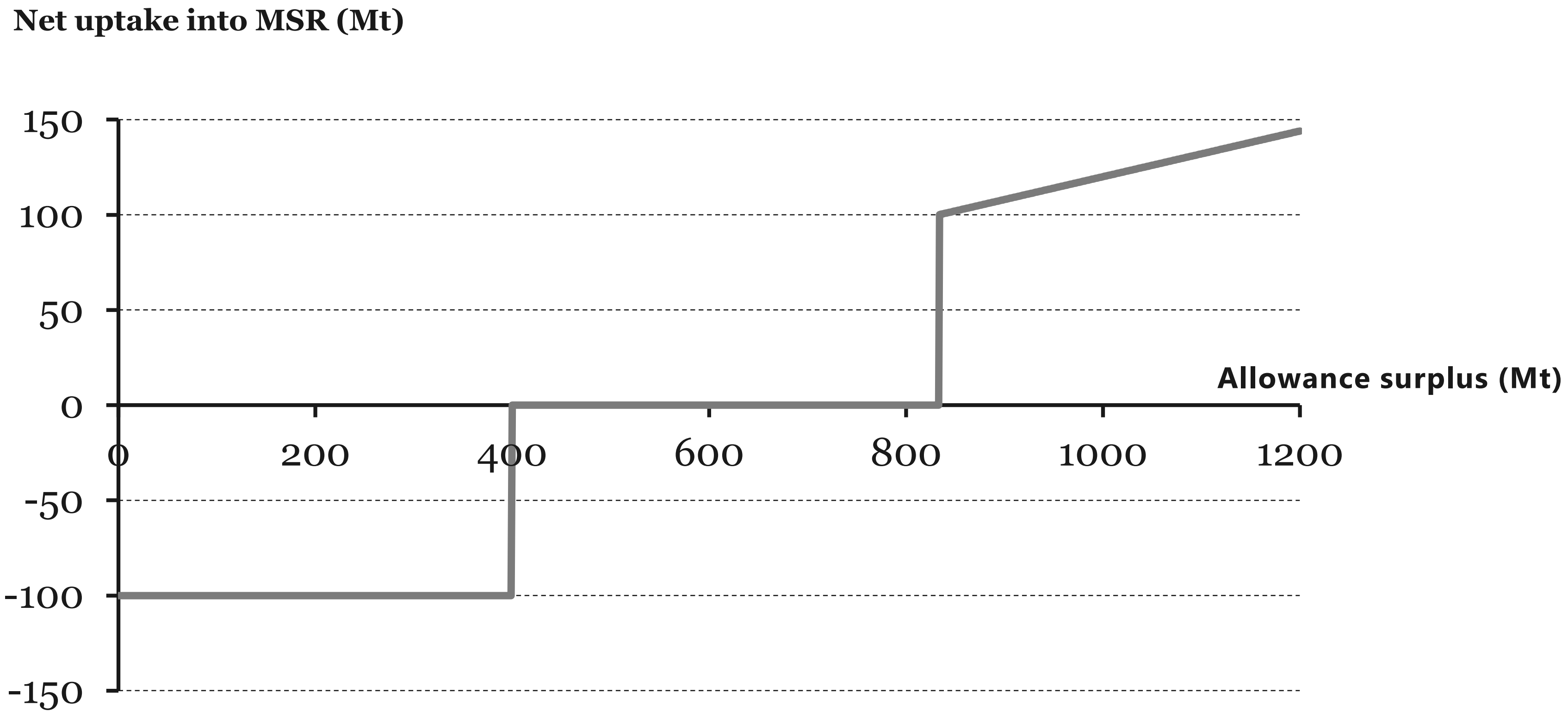
The solution to the firm's problem implies

$$E_t = \overline{E}_t - bp_t, \qquad E_t \geq 0,$$

$$p_{t+1} = \left(1+r\right) p_t \quad \text{for} \quad S_t > 0,$$

$$p_{t+1} \leq \left(1+r\right) p_t \quad \text{for} \quad S_t = 0.$$

The supply of allowances:
Mechanics of the Marginal Stability Reserve (MSR)



Rate of MSR uptake 2019-2023: 24% of allowance surplus exceeding 833 Mt
Rate of MSR uptake after 2023: 12% of allowance surplus exceeding 833 Mt

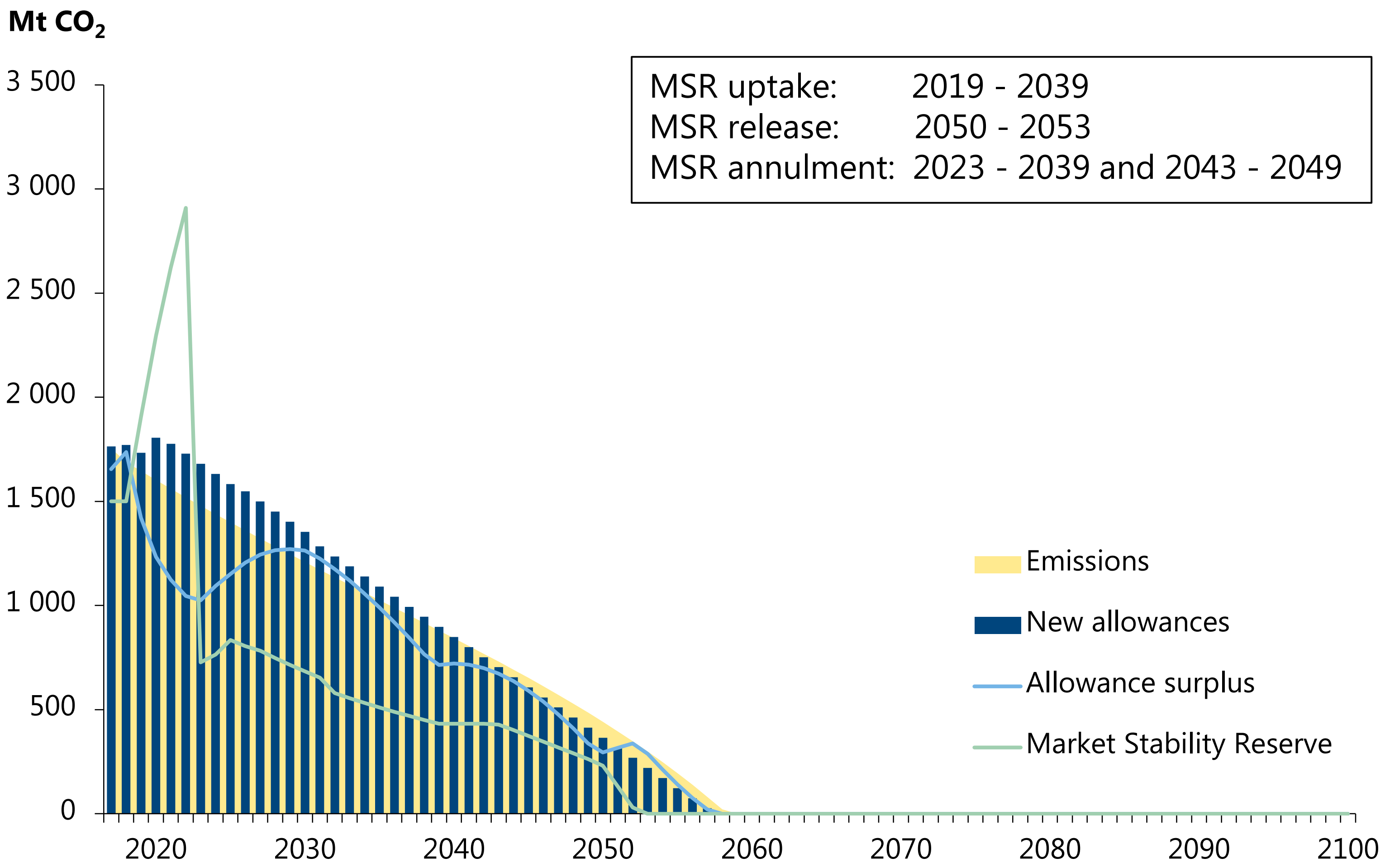
The 2018 ETS reform introduces a cap on the amount of allowances held in the MSR

- The MSR cannot hold allowances in excess of the amount of allowances auctioned during the previous year. Allowances exceeding this amount will be *permanently annulled*

- **Implication:** Whenever this cap is binding, any annulment of allowances undertaken by *individual member states* will be ineffective, whereas national policies that reduce the demand for allowances (thereby increasing the allowance surplus) will be fully effective: The waterbed effect disappears!

Prospects for the ETS after the 2018 reform

Forecast of emissions and the ETS allowance surplus with the MSR rules agreed in 2018



Effects of national climate policies

Coefficients of emissions reduction after the 2018 ETS reform $(\rho = 0.01)$

Policy horizon (H)	Demand reduction undertaken in:			Annulment undertaken in:			Annulment FM undertaken in:		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
2030	0.98	0.92	0.88	0.00	0.01	0.00	0.08	0.05	0.01
2040	0.97	0.90	0.84	0.01	0.03	0.05	0.22	0.19	0.15
2050	0.95	0.86	0.75	0.03	0.07	0.13	0.48	0.45	0.41
2060	0.94	0.80	0.63	0.05	0.13	0.25	0.83	0.81	0.77

Note: The table considers policy experiments where 1 million allowances are annulled; alternatively renewable energy is subsidized to the extent needed to crowd out 1 Mt CO_2, given the initial allowance price. The numbers show the present value in 2018 of the change in emissions occurring up until year *H*.

The cost-effectiveness of national climate policies after the 2018 ETS reform

Policy horizon	Demand reduction undertaken in:			Annulment undertaken in:			Annulment FM undertaken in:		
	2020	2025	2030	2020	2025	2030	2020	2025	2030
2030	4.1	4.3	4.5	4,329.1	3,321.9	11,980.6	235.1	534.2	3,914.4
2040	4.1	4.4	4.7	1.583.6	883.4	784.6	86.0	142.1	256.3
2050	4.1	4.6	5.3	727.5	374.0	287.0	39.5	60.1	93.8
2060	4.2	4.9	6.2	415.7	207.8	152.7	22.6	33.4	49.9

Note: The table considers policy experiments where 1 million allowances are annulled; alternatively renewable energy is subsidized to the extent needed to crowd out 1 Mt CO_2, given the initial allowance price. The numbers reflect an estimate of the average 2018 allowance price and the 2018 cost of subsidizing off-shore wind energy in Denmark.

The political economy of the ETS

Explaining the endogeneity of allowance supply

The ETS experience suggests that EU policy makers trade off a desire for emissions reductions against a desire for low energy prices. A simplistic formalization of this idea is that policy makers behave as if they seek to minize a social loss function of the form

$$SL = \frac{1}{2}V_1^2 + \frac{\alpha}{2}p_1^2, \qquad \alpha > 0$$

$V_1 =$ present value of CO_2 emissions

$\alpha =$ relative preference for low allowance prices

Explaining the endogeneity of allowance supply

Minimization of the social loss function *SL* subject to the link between emissions and allowance prices described by our model of the ETS implies that

- Any annulment of allowances at the national level will be fully offset by an increase in allowance supply decided at the EU level (note: the cap on MSR has roughly this effect!)

- An increased supply of renewable energy will *not* be fully offset by a decrease in allowance supply decided at the EU level (intuition: expansion of RE improves the trade-off between emissions cuts and a low allowance price; part of the welfare gain is reaped via lower emissions)

A blueprint for future ETS reform

The superiority of a mix between price and quantity control of emissions

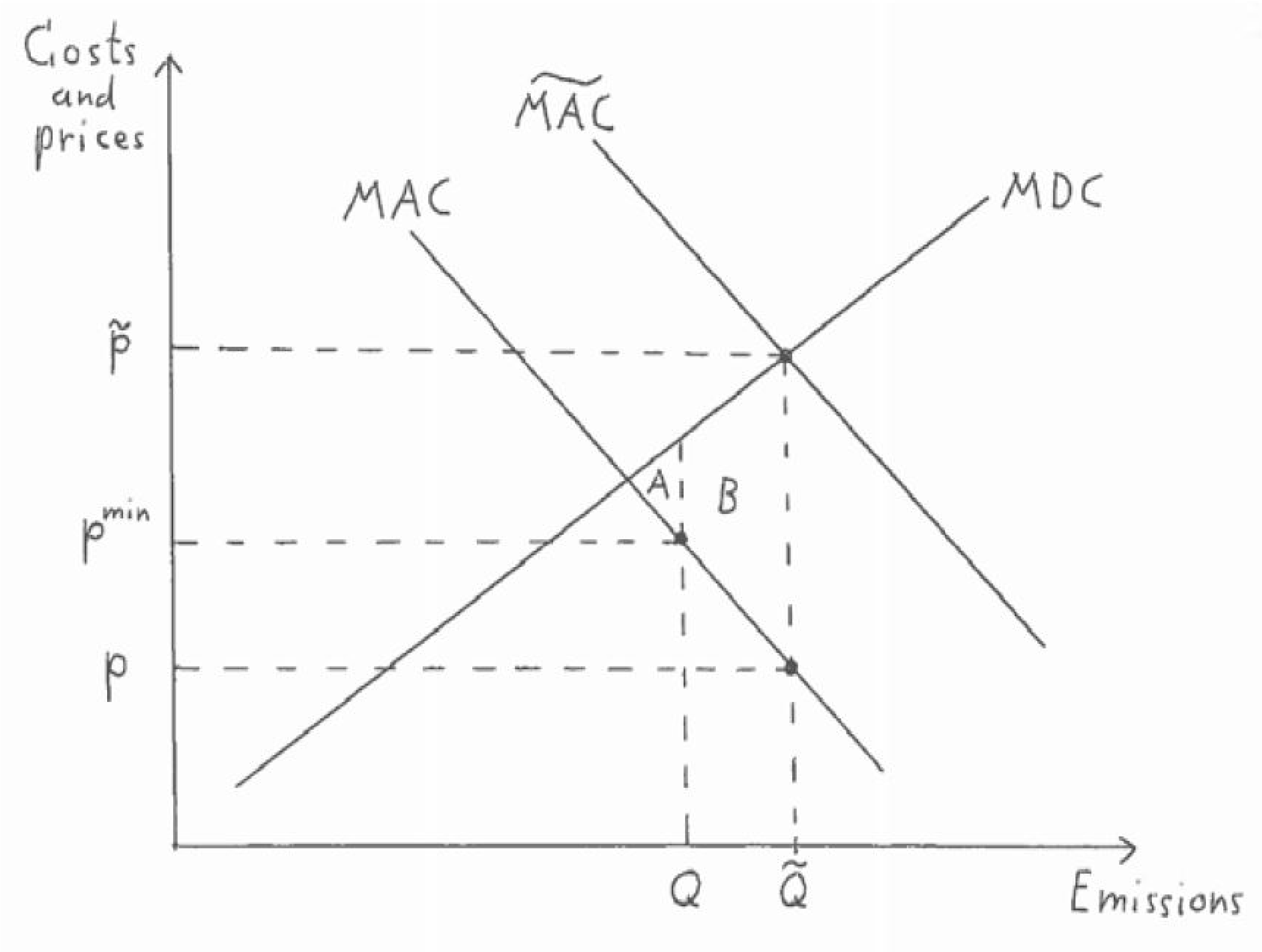
The theory of optimal pollution control strongly suggests that

- If a choice between a carbon tax and a cap-and-trade scheme for control of CO_2 emissions has to be made, the carbon tax is more efficient

- A pure carbon tax and a pure cap-and-trade scheme are dominated (in efficiency terms) by a mixed system that imposes a price floor and a price ceiling on the allowance price under cap-and-trade. This can be implemented via the auctioning procedure

Our simple political economy story suggests that such a mixed system would be politically viable

Illustration of the welfare gain from a minimum allowance price



Wrapping up

Conclusions

- The surplus of ETS emission allowances is likely to persist for several decades even after the 2018 reform
- The new Market Stability Reserve fundamentally changes the ETS by endogenizing allowance supply. Implication: National policies that reduce the demand for allowances may reduce emissions permanently
- For an EU member state wishing to take the lead in climate policy, a policy that promotes renewable energy via subsidies or carbon taxes is far more cost-effective than annulment of allowances
- The endogeneity of allowance supply is driven by fundamental political economy factors
- The next ETS reform should introduce a floor and a ceiling for the allowance price

Supplementary slides

ETS time line

Phase 1 → **2005**
- Learning phase
- Way too may allowances were issued

Phase 2 → **2008**
- Banking allowed
- Economic downturn -> huge surplus of allowances

Phase 3 → **2013**
- Aviation included
- Faster reduction of emission cap

Phase 4 → **2021**
- New Market Stability Reserve
- Even faster reduction of emission cap

2030

The waterbed effect

Unilateral Danish support to renewable energy

↓

Demand for allowances declines

↓

The allowance price decreases

↓

Emissions increase somewhere else – now or later

↓

Total European emissions are unaffected

The waterbed effects is popular among economists, but is it true?

The equilibrium allowance price in the presence of an allowance surplus

Equilibrium allowance price in year 1:

$$p_1 = \frac{r\left(\bar{E}_T^a - S_0 - Q_T^a + M_T^a\right)}{b\left[\left(1+r\right)^T - 1\right]},$$

T = year when allowance surplus disappears

$\bar{E}_T^a$ = accumulated emissions in the absence of abatement until year T

Q_T^a = total number of new allowance issued until year T

M_T^a = total net uptake of allowances in the MSR until year T

Calibration of the model

Assumption: $\bar{E}_{t+1} = (1-g)\bar{E}_t, \qquad g > 0.$

Calibration: $b = 2.2$ (Sandbag, 2016) $\qquad r = 0.1$ (Neuhoff et al., 2012)

2017: $\bar{E}_{2017}$ and g are adjusted to match the average allowance price and the observed emissions in 2017

2018: r is reduced to $r = 0.0744$ to match the increase in the allowance price from 2017 to 2018

Measuring the effect of national climate policy: The Coefficient of Emissions Reduction (*CER*)

$$CER = \frac{\text{Present value of total cut in ETS emissions}}{\text{Cut in current domestic emissions}}$$

Annulment of allowances: $$CER_H^Q \equiv \sum_{t=1}^{H} \frac{dE_t / dQ_1}{(1+\rho)^{t-1}}, \qquad \rho \geq 0.$$

Promotion of renewable energy: $$CER_H^R = 1 - CER_H^Q.$$

$Q_1 =$ initial annulment of allowances

$\rho =$ discount rate for future emissions

$H =$ policy horizon

Measuring the cost-effectiveness of national climate policies

$$\text{Cost-effectiveness ratio} = \frac{\text{Social cost}}{\text{Present value of total cut in ETS emissions}}$$

$$= \frac{\text{Cut in current domestic emissions}}{\text{Present value of total cut in ETS emissions}} \times \frac{\text{Social cost}}{\text{Cut in current domestic emissions}}$$

$$= \frac{1}{CER} \times \frac{\text{Social cost}}{\text{Cut in current domestic emissions}}$$

Measuring the cost-effectiveness of national climate policies

Cost-effectiveness ratio for annulment policy: $\theta_H^Q \equiv \frac{1}{CER_H^Q}\sum_{t=1}^{H}\frac{SC_t^Q}{\left(1+r^s\right)^{t-1}}$

Cost-effectiveness ratio for renewables policy: $\theta_H^R \equiv \frac{1}{CER_H^R}\sum_{t=1}^{H}\frac{SC_t^R}{\left(1+r^s\right)^{t-1}}$

Social welfare: $SW_t = CS_t + PS_t + p_t Q_t^d - \left(c_t^R - q_t\right)R_t$

$SC^Q =$ social cost of annulling one ton of emission allowance

$SC^R =$ social cost of crowding out one ton of CO_2 via renewable energy

$CS =$ consumer surplus

$PS =$ producer surplus

$Q^d =$ emission allowances auctioned by the domestic government

$R =$ domestic renewable energy production

$c^R =$ unit cost of renewable energy production

$q =$ price of energy

Measuring the cost-effectiveness of national climate policies

For a small open economy we obtain the following results:

Annulment policy: $$\theta_H^Q = \frac{p_1}{CER_H^Q}$$

Renewables policy: $$\theta_H^R = \frac{p_1}{1 - CER_H^Q} \underbrace{\left(\frac{c_1^R - q_1}{p_1} \right)}_{\text{Subsidy rate}}$$

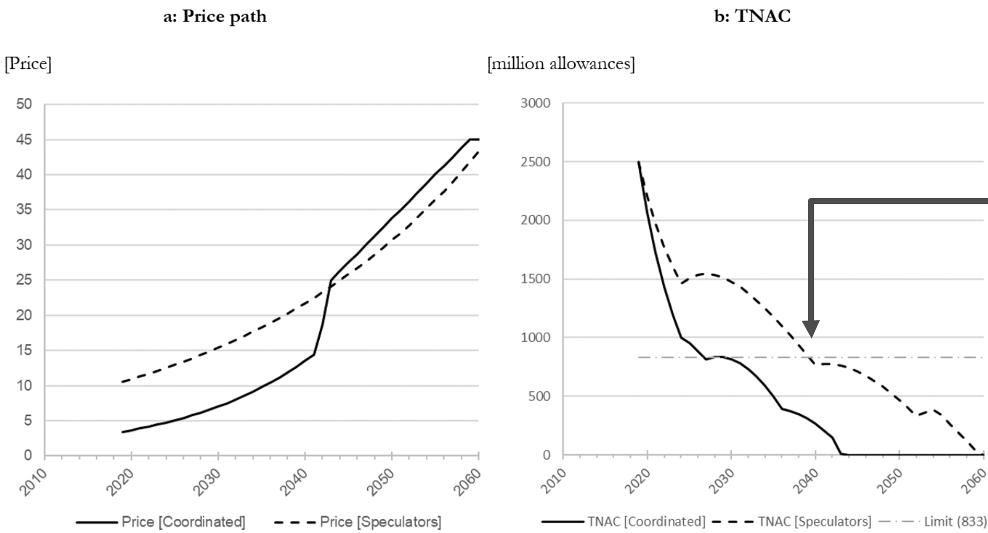
Towards a more efficient European carbon market

Comments

Svante Mandell

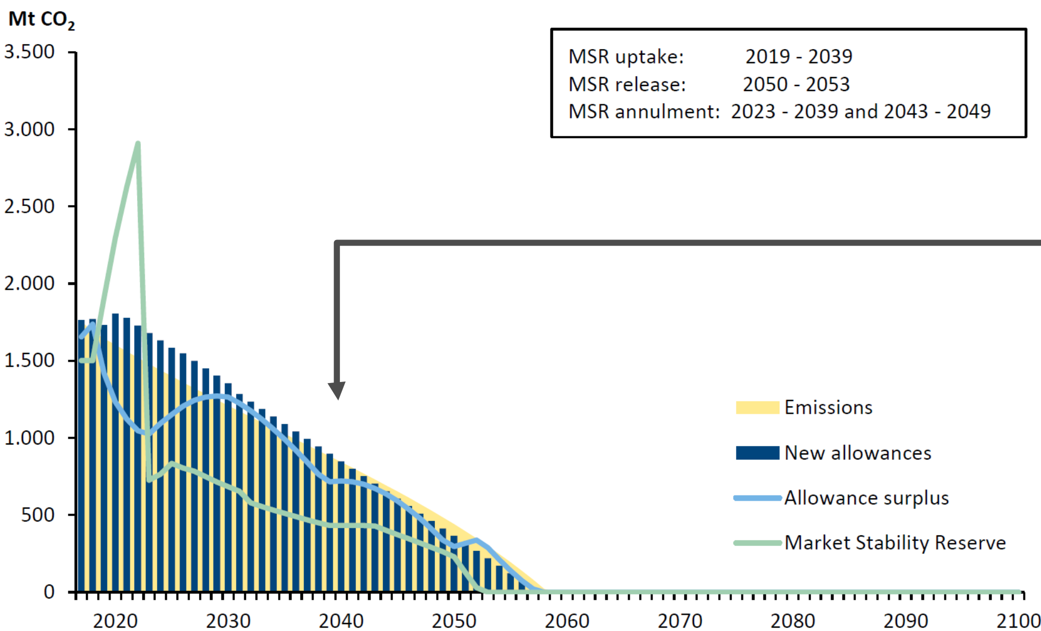
Silbye & Birch Sørensen vs NIER

Different assumptions, but remarkably similar results



TNAC falls below 833-limit in 2039

MSR uptake: 2019 - 2039
MSR release: 2050 - 2053
MSR annulment: 2023 - 2039 and 2043 - 2049



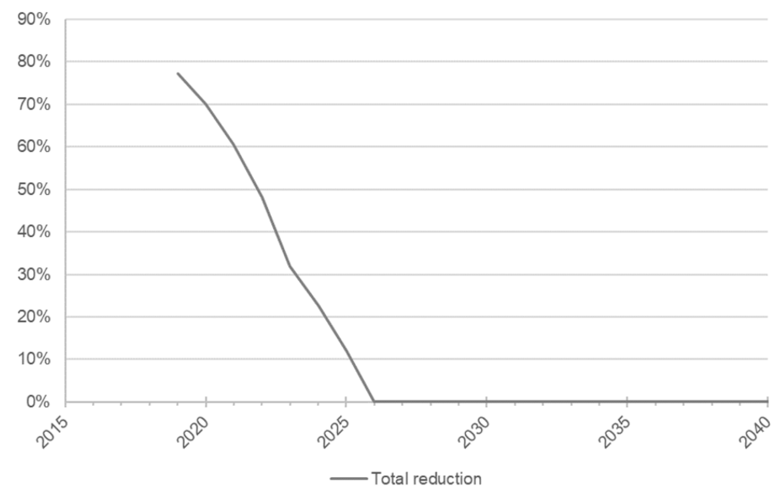
Coefficient of emission reduction 0.94 (S&B-S) vs 0.96 (NIER)

Even though, here, NIER assumes fixed BAU and lower discount rate. Counteracting effects(?)

Demand reduction – the way to go?

- The closer to when TNAC falls below 833 million, the lower the impact

Policy horizon (*H*)	Demand reduction undertaken in:		
	2020	2025	2030
2030	0.98	0.92	0.88
2040	0.97	0.90	0.84
2050	0.95	0.86	0.75
2060	0.94	0.80	0.63



- If the threshold is hit earlier (than 2039) – effects may be small or zero
- Thus, a somewhat risky strategy

The political economy part

- A large amount of allowances are cancelled thanks to the reform
- But in a rather complicated manner
- Why not just remove allowances and let the system continue as before?

- S&B-S suggest it may be becuase
  - The reform makes subsidies (that keeps energy prices down) effective while
  - Annulments (that would increase energy prices) become ineffective

- Interesting!

- We should perhaps do more political economy…

Roberts & Spence

- Yes, seems like a detour to involve TNAC if aiming for price stability
- Why not use the price information directly? (Price floor + ceiling)
- Perhaps political economy has an answer?

- A note;
- If the volatility stems from price fluctuations in fossil fuel
- Then allowance prices should decrease when fossil fuel prices increase
- Would not an allowance price floor+ceiling then increase energy price volatility?

A Nordic Green Flexible Energy System: Barriers and Opportunities

Klaus Skytte & Poul Erik Morthorst
Klsk@dtu.dk   Pemo@dtu.dk
Energy Economics and Regulation, DTU Management Engineering, Denmark

Nordic Economic Policy Review
Climate Policy and the Nordics - 24 October 2018 Stockholm

Climate & energy targets

2020	-20 % Greenhouse Gas Emissions	20% Renewable Energy	20 % Energy Efficiency	10 % Interconnection	
2030	≥ - 40 % Greenhouse Gas Emissions	≥32 % Renewable Energy	≥ 32,5% Energy Efficiency	15 % Interconnection	≥ 14% Renewables in transport

Independent of fossil fuels
2050

≥ - 80 %
Greenhouse Gas Emissions
2050

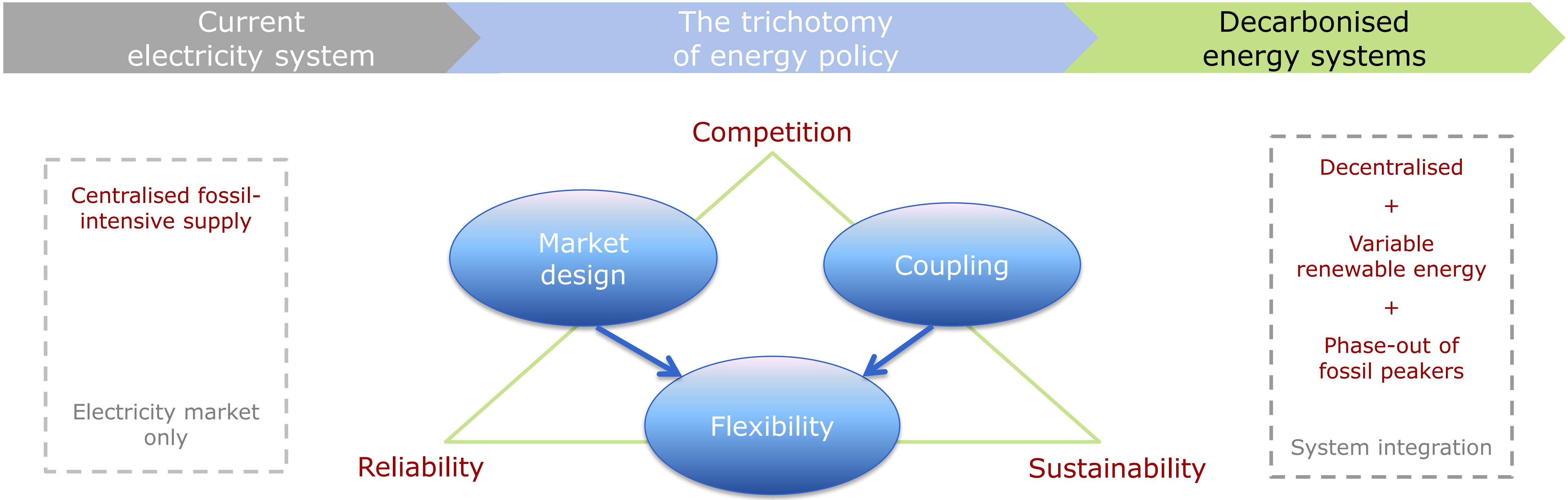
≥ - 50-75%
Greenhouse Gas Emissions
2050

Carbon neutral
2050

No net greenhouse gas emissions
2045

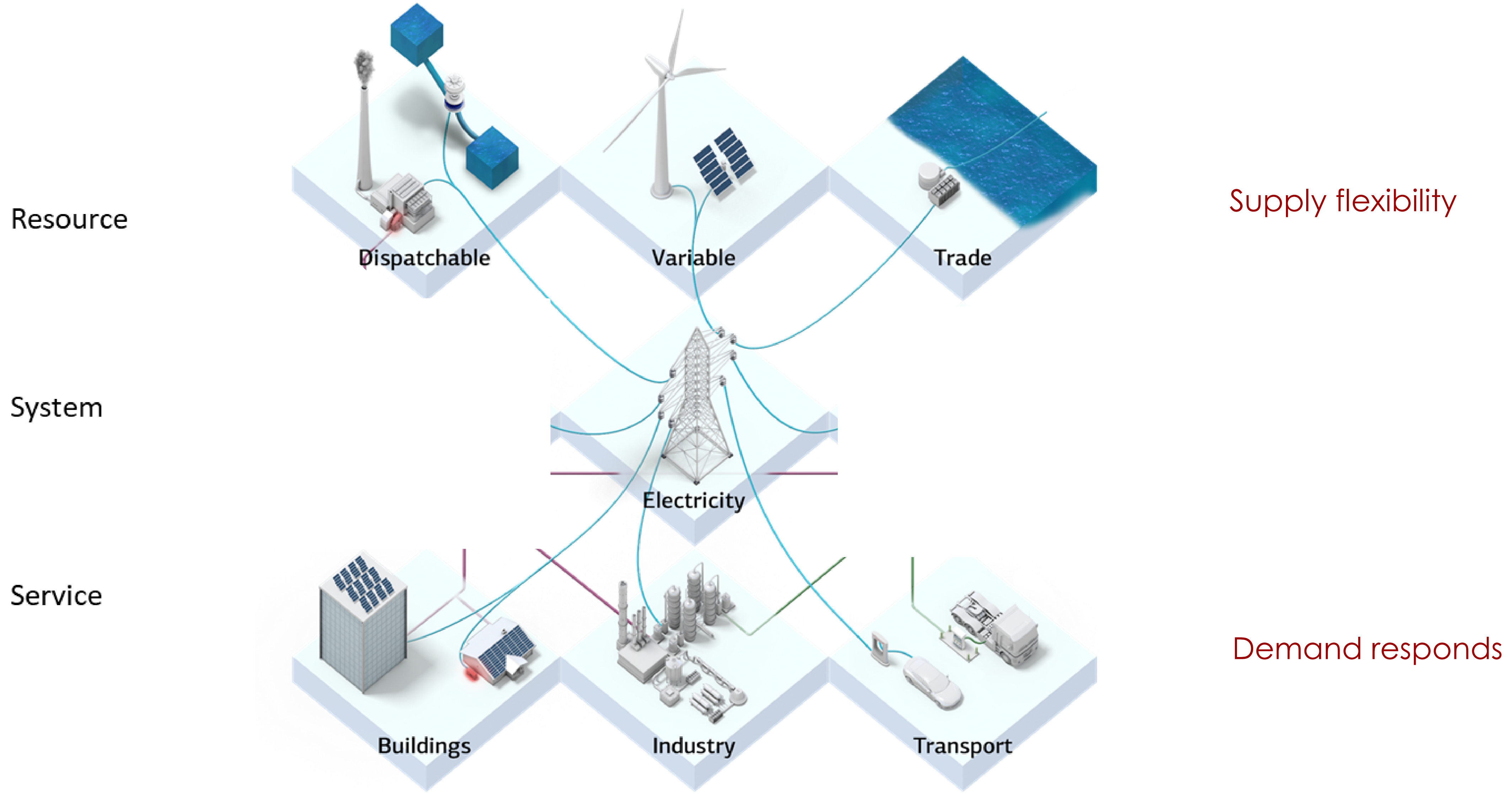
The Future Energy Market

Goals and RE-thinking of the Nordic energy co-operation



Nordic energy co-operation

Finding ramping capabilities in the electricity infrastructure



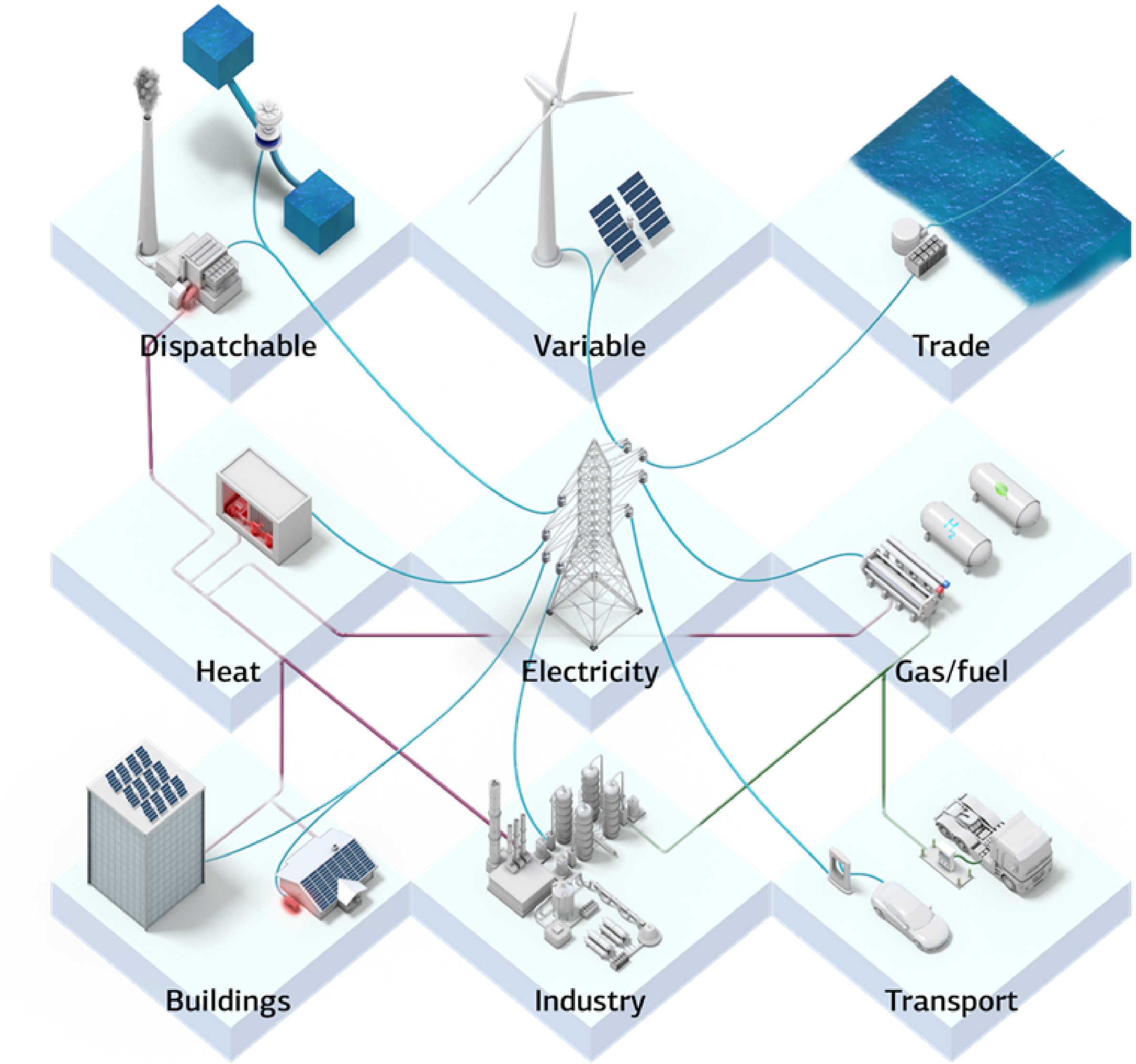
Nordic energy co-operation

Finding ramping capabilities in coupled infrastructures

Resource

System

Service



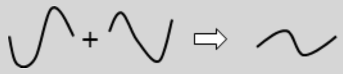
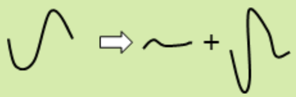
Supply flexibility

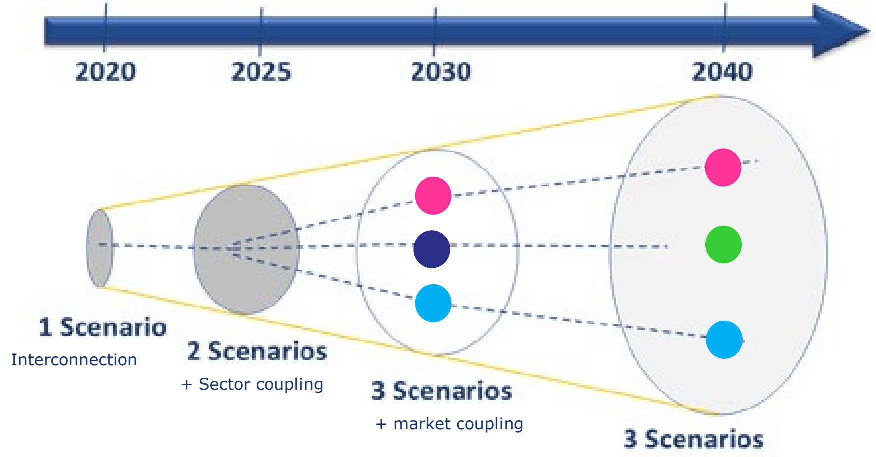
Sector coupling/
Electrification

Demand responds

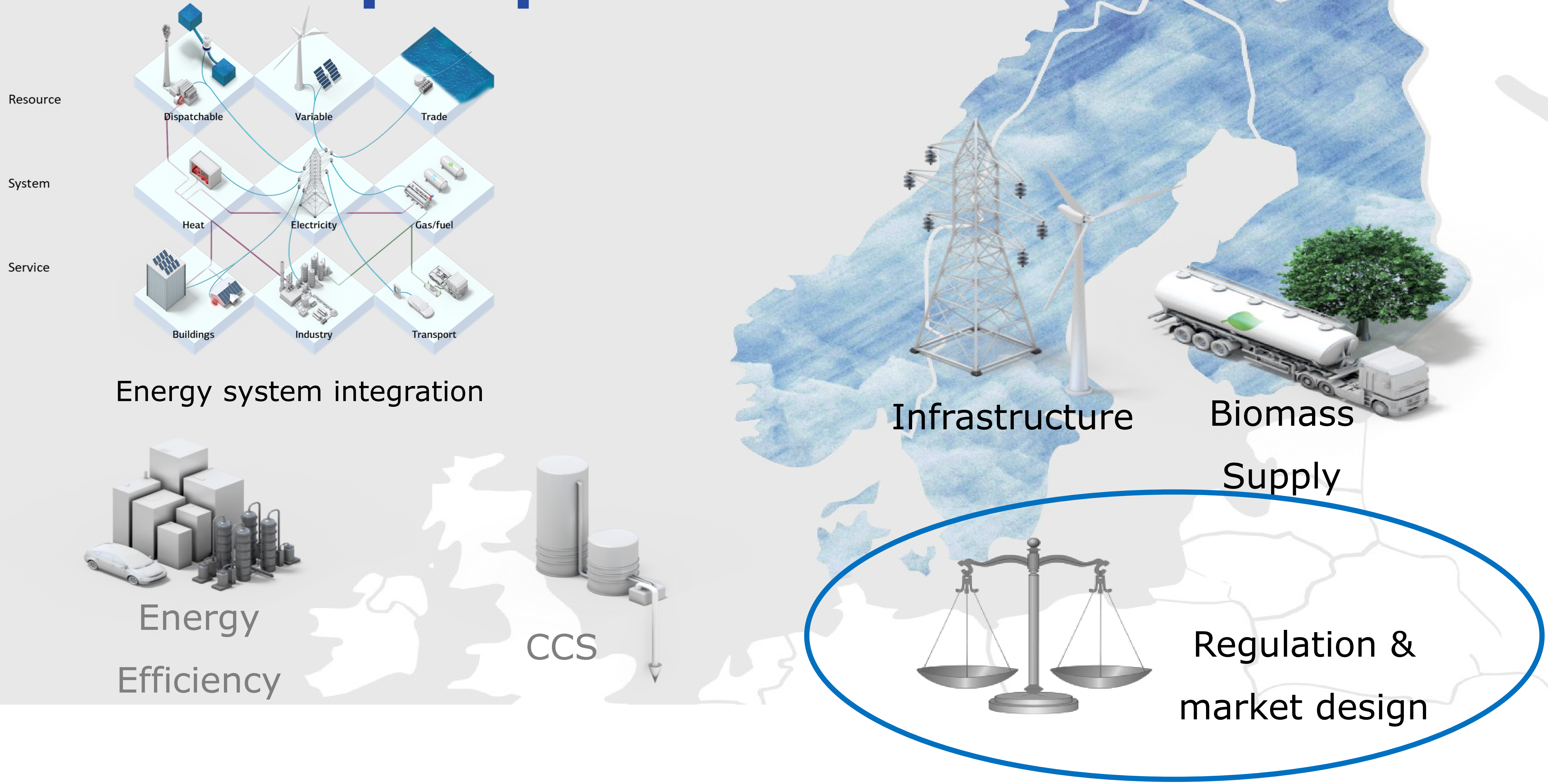
Nordic Energy Co-Operation

Policy Scenarios towards 2050

	Scenario	Coupling/ connectivity	Incentives for flexibility	Price variations	Driver	Impact
	Business-as-usual	-	-		-	-
Transmission	**Interconnection**	**Geographical connections**	Price differences between regions		Different technology mix	Increased imports and exports
Electricity/gas/heat Transport/storage	**System integration**	**Sector coupling**	Price differences between energy sources and technologies		Increased business opportunities	Increased national demand
Markets for RES Reliability/capacity markets Local community markets	**Targeted markets**	**Market coupling**	Price volatility in the electricity market		More actors	Differentiated pricing

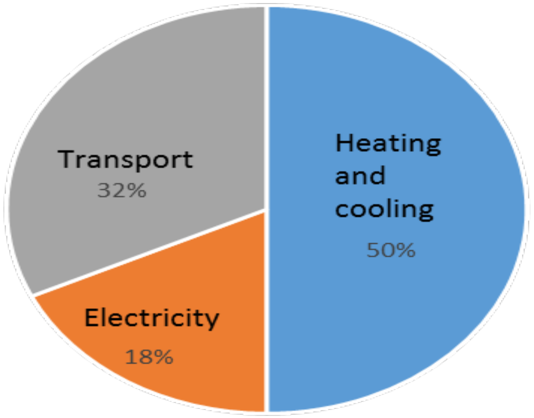


Challenges in a larger perspective



Sector coupling

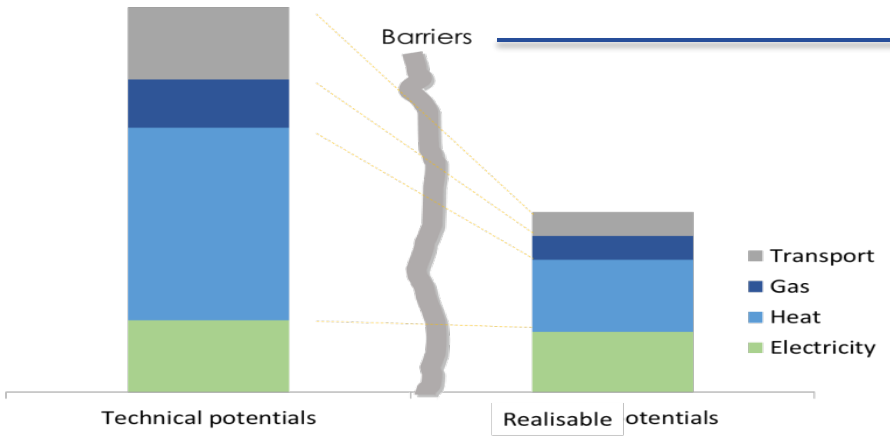
Electrification as source of flexibility



Distribution of EU energy consumption

(Source: EU Heating and Cooling strategy)

From technical to realisable potentials



Framework conditions

- Market design
- Direct regulation
- Fiscal policies
- Support schemes
- **Grid regulation**

Large flexibility potentials in electrification of the energy sectors → Hindered by regulatory barriers → Remove barriers

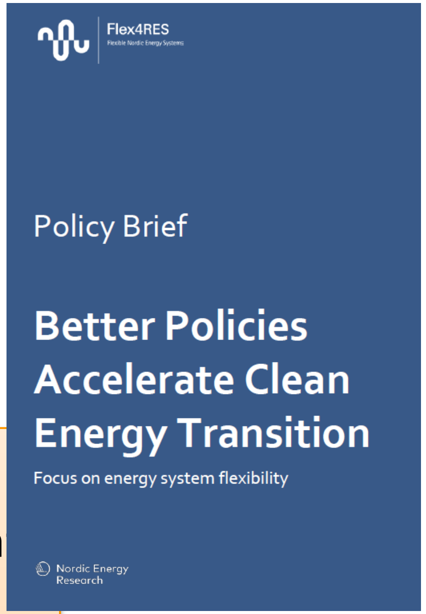
Nordic Barriers

- EU framework (Clean Energy for All Europeans)
- Nordic region greener than EU
- Traditional energy policy framework still dominate

Main barriers

B1 Insufficient market signals for some stakeholders;

B2 Uneven frameworks for different renewable energy resources.



Policy recommendations (Market-based policy framework)**:**

R1 **Create a level playing field** for all RES technologies across sectors through consisten fiscal policies;

R2 Implement electricity **grid tariffs** which allow market signals for flexibility to reach the end-users;

R3 **Dynamic taxation** of electricity (e.g. restructuring levies and taxes);

R4 Encourage **VRE operators to act flexibly** using short-term market-based incentives;

R5 Abolish RES support during negative price periods;

R6 Enhance electrification by removing the limitations on using electricity for heating;

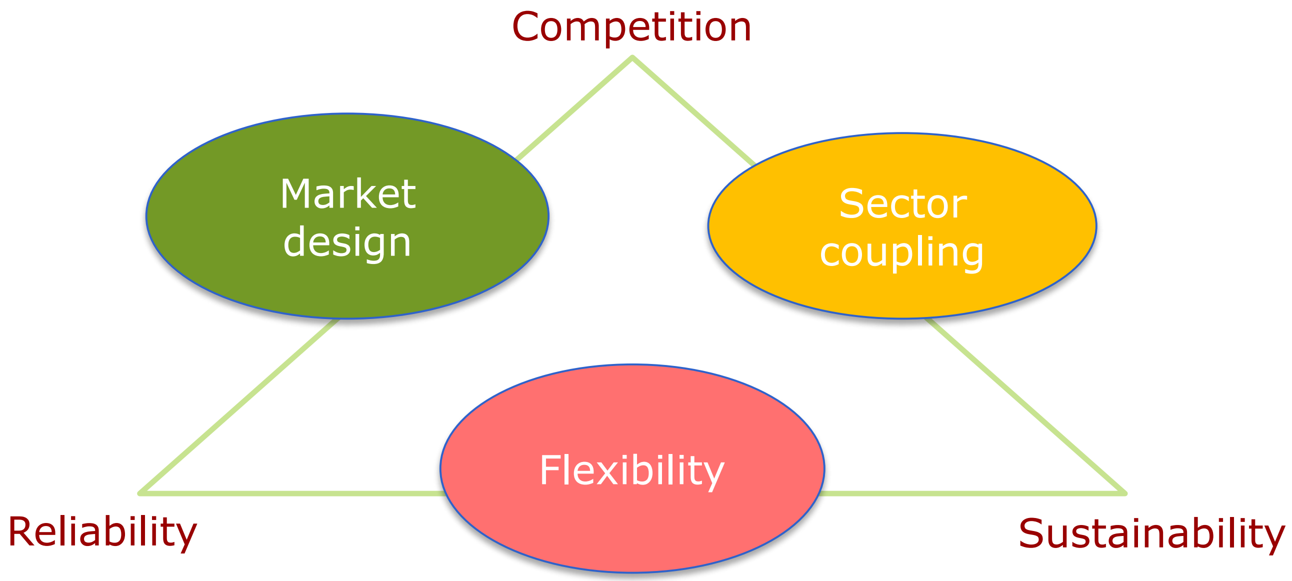
R7 Tackle investment risks in flexible individual heating through new financing and private ownership models.

Nordic commonalities with regional diversity

Recommendations	Related barrier(s)	Denmark	Norway	Sweden	Finland	Estonia	Latvia	Lithuania
R1	B2	■			■	■	■	
R2	B1	■	■	■	■	■	■	■
R3	B1,B2	■	■	■	■	■	■	■
R4	B1,B2	■				■	■	■
R5	B1,B2			■		■		■
R6	B2	■						
R7	B2	■		■	■	■		

B1 = Insufficient market signals for some stakeholders;
B2 = Uneven frameworks for different renewable energy resources

- All foresee an increase in VRE
- Common barriers, but specific conditions need consideration
- All have information deficit on flexibility and lacking policy awareness



Takeaways

Policy awareness on flexibility

Sector coupling as flexible as possible (smart)

- Remove barriers
- Improve the business case for flexible P2H/P2G

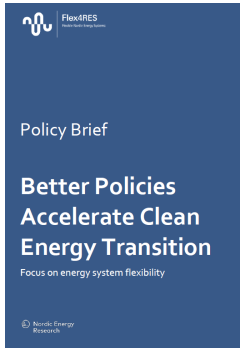
Market coupling:

- Incentives for VRE and other actors to become ***active*** electricity market actors

Soft infrastructure (Regulation/economics/institutions) as important as hard infrastructure

Coherent changes in market designs, regulatory framework conditions, and coupling of markets/sectors.

A Nordic Green Flexible Energy System: Barriers and Opportunities



Klaus Skytte & Poul Erik Morthorst
Klsk@dtu.dk Pemo@dtu.dk
Energy Economics and Regulation, DTU Management Engineering, Denmark

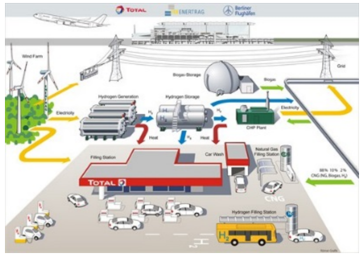
http://www.nordicenergy.org/article/better-policies-accelerate-clean-energy-transition/

Nordic Economic Policy Review

Climate Policy and the Nordics - 24 October 2018 Stockholm

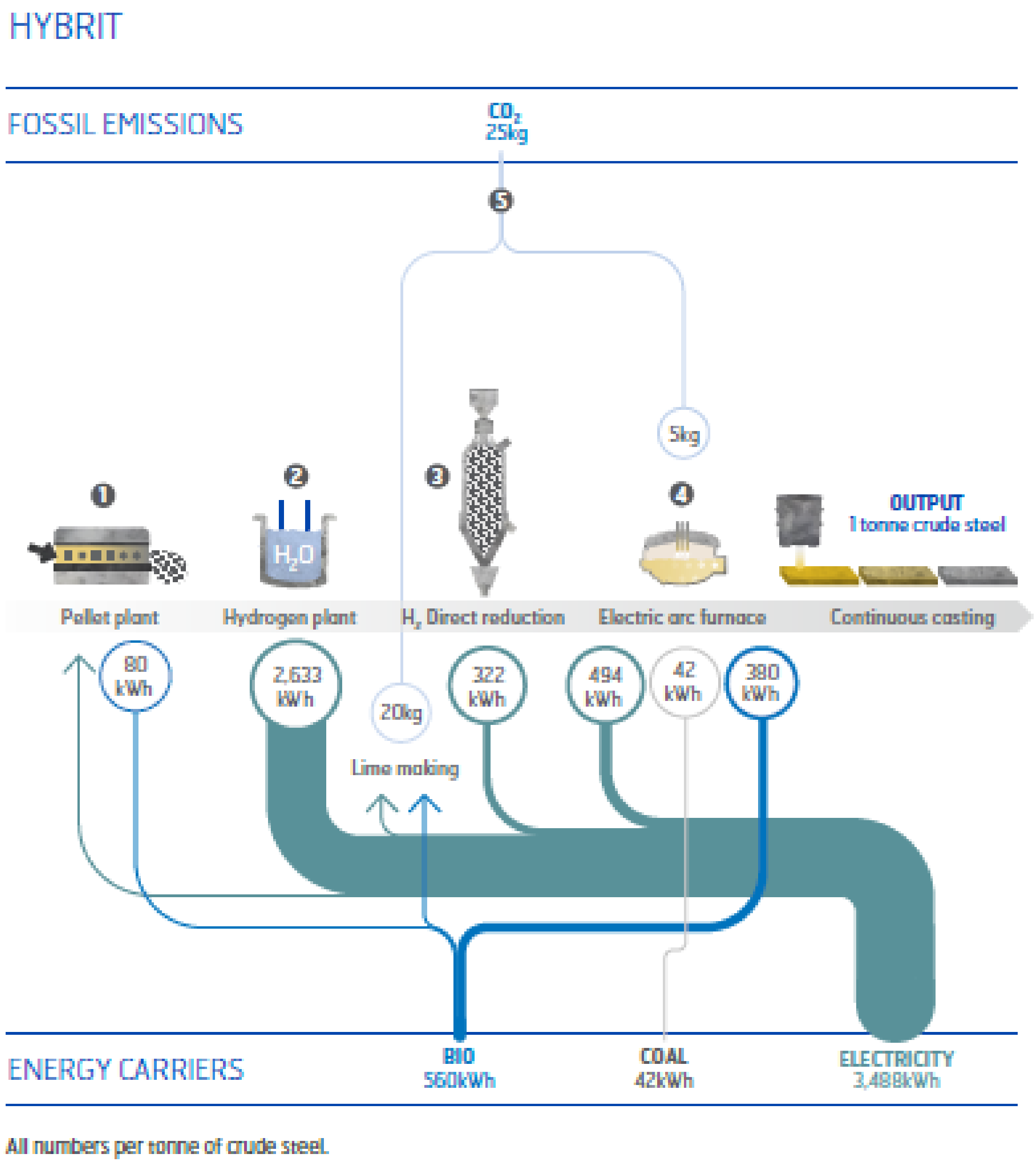
Variation management strategies required for maximizing the value of wind and solar PV

Shifting	Absorbing	Complementing
Electricity $\Rightarrow$ Electricity • *Reduce curtailment and peak power* • *More even costs on diurnal basis*	***Electricity $\Rightarrow$ Fuel and heat*** • *Reduce curtailment* • *Fewer low cost events*	***Fuel $\Rightarrow$ Electricity*** • *Reduce peak power* • *More even costs on yearly basis*
Batteries	**Power-to-heat**	**Flexible thermal generation**
Load shifting	**Electrofuels**	**Reservoir hydropower**
Pumped hydro	**Power to gas (hydrogen)**	



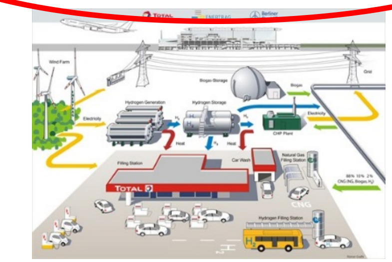
Göransson, L., Johnsson, F. Wind Energy. 2018;1–18.

Hydrogen steel making – value of wind



Variation management strategies required for maximizing the value of wind and solar PV

Shifting	Absorbing	Complementing
Electricity ⇒ Electricity • *Reduce curtailment and peak power* • *More even costs on diurnal basis*	***Electricity ⇒ Fuel and heat*** • *Reduce curtailment* • *Fewer low cost events*	***Fuel ⇒ Electricity*** • *Reduce peak power* • *More even costs on yearly basis*
Batteries	**Power-to-heat**	**Flexible thermal generation**
Load shifting	**Electrofuels**	**Reservoir hydropower**
Pumped hydro	**Power to gas (hydrogen)**	



Göransson, L., Johnsson, F. Wind Energy. 2018;1–18.

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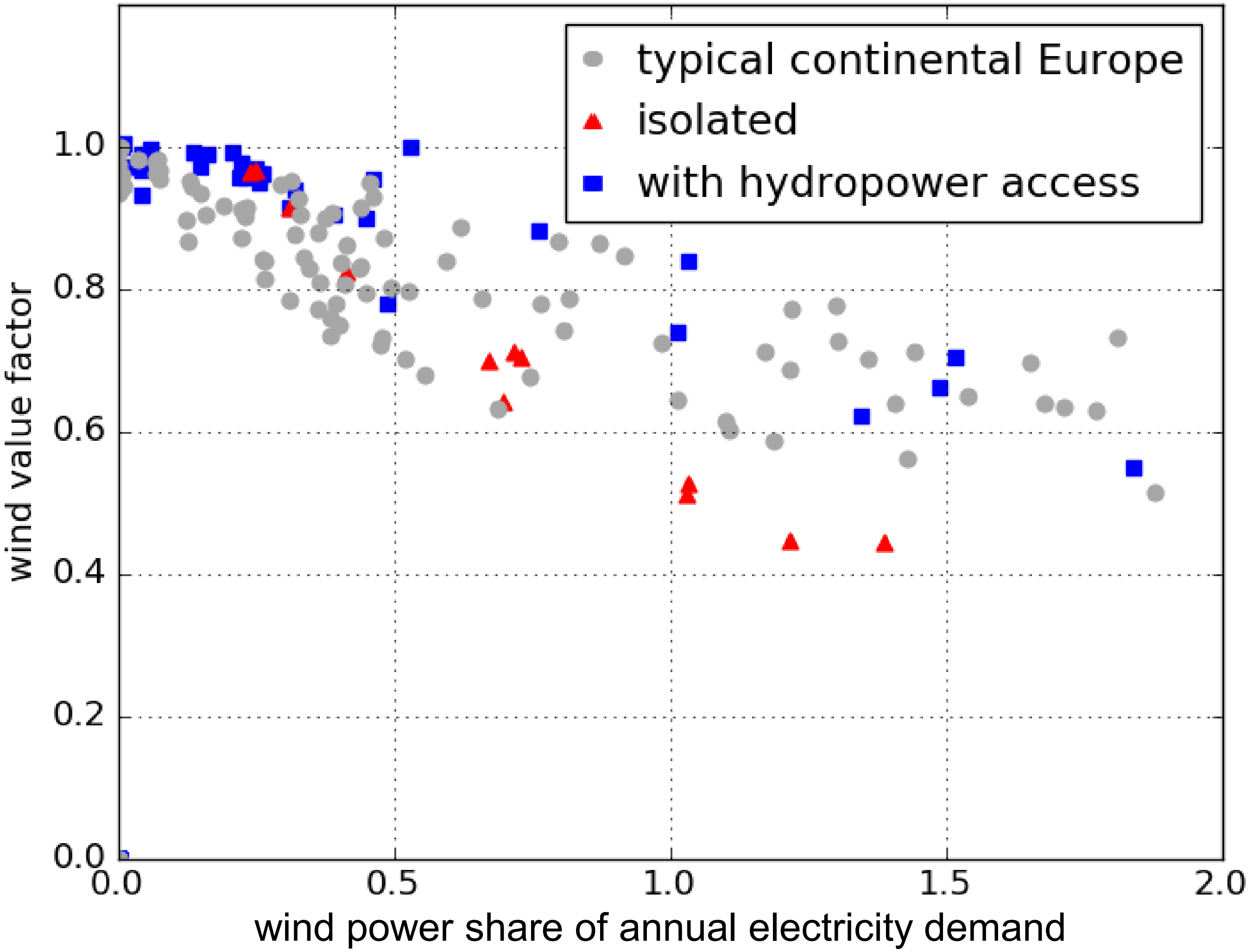
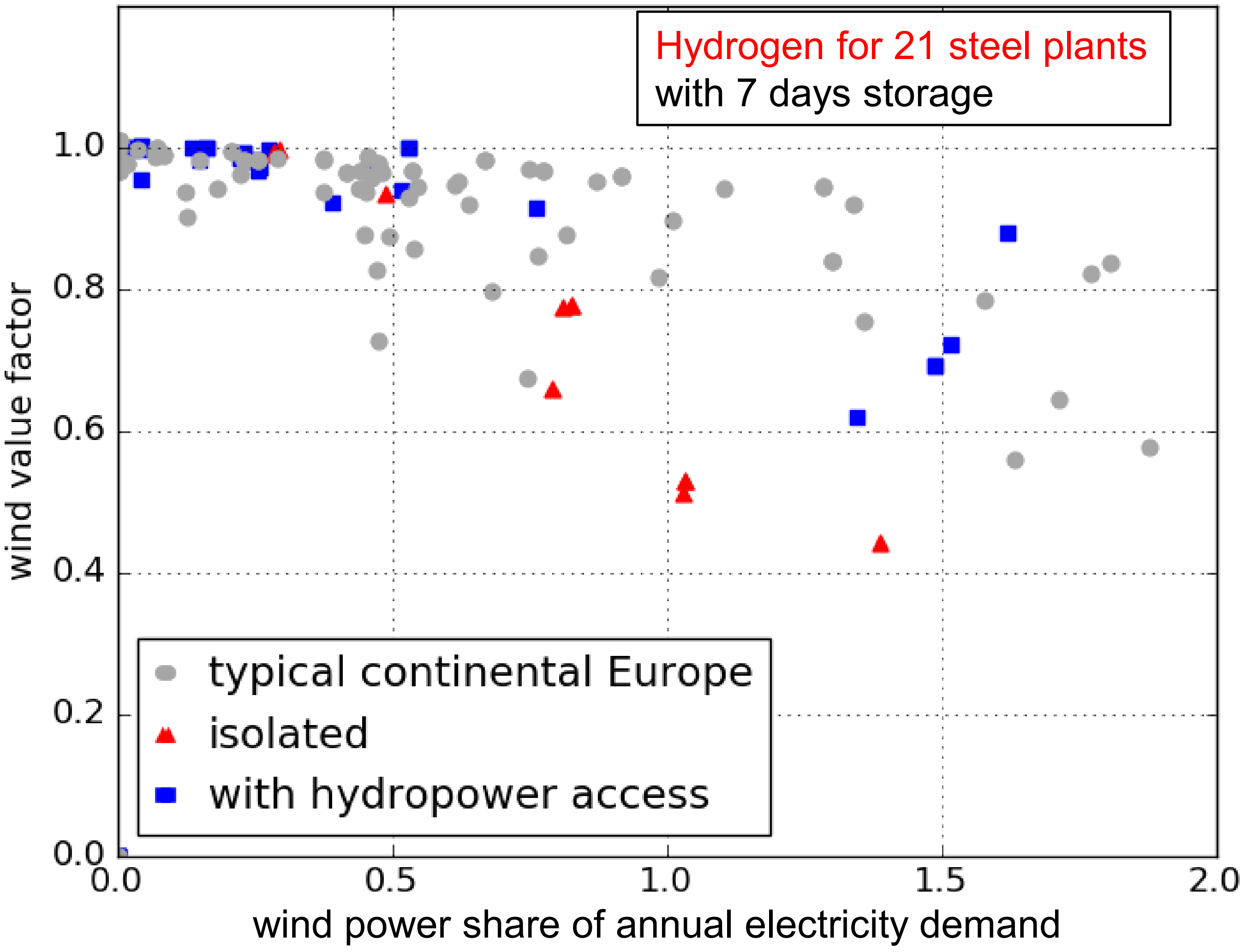
The value of wind power –without variation management



The **value factor**: ratio of the production weighted marginal cost of electricity to the time-weighted average

See also Göransson, L., Johnsson, F. Wind Energy. 2018;1–18.

The value of wind power – with variation management



The **value factor**: ratio of the production weighted marginal cost of electricity to the time-weighted average

See also Göransson, L., Johnsson, F. Wind Energy. 2018;1–18.

General comment

The paper focuses on an important topic and addresses relevant socio-economic challenges

Specific comments/remarks

In their abstract the authors argue that:

"[e]nergy policies in most Nordic and Baltic countries are still dominated by a traditional policy framework concerned not only with environmental issues but also with security and the cost of supply, while lacking policy awareness of energy-system flexibility, a prerequisite for a successful transition to a clean energy system drawing on a variety of sources." (My underlining)

A formulation that can be partly misleading. Also it downgrades the importance of costs. This since:

- Many countries have ambitious renewables energy goals for which policies have been implemented. A main motive is to cope with energy and climate issues.
- This has resulted in larger shares of intermittent energy.
- This has *caused* increased societal and policy concern about the reliability of supply and the need for more system flexibility.
- If we implement cost effective policies, we get "more for the money". Hence, if we care about the environment, we need to care about costs.

”Nordic Energy co-operation scenarios”

The paper discusses four long-term scenarios coping with different types of Nordic energy co-operation. As such the paper for example states that:

In scenario 1 “energy policies for the other sectors are implemented”

In scenario 2 “targeted markets are developed”.

- It is not clear how the scenario analysis is explicitly conducted.
- If the analysis is strictly qualitative this needs to be addressed.
- Also when incorporating for example capacity markets the paper should, with reference to previous literature, address the pros and cons of such an approach.
- This to underpin results and conclusions of the analysis.

”Nordic barriers and policy recommendations to facilitate the scenarios”

This section of the paper argues that different barriers serve as obstacles for the fulfillment of different development paths (scenarios).

The reader is left with brief policy recommendations to facilitate fulfillment of the scenarios.

- Removing all barriers is seldom socio-economically justifiable.
- We should focus on market failures (i.e. inefficiencies) and how to correct these failures cost-effectively.
- Compare different policy alternatives - they come with different socio-economic costs.

Panel Discussion: How Can the Nordics Best Contribute to Global Climate Policy?

Svante Axelsson (*National Coordinator for a Fossile-Free Sweden*), Peter Birch Sørensen (*University of Copenhagen*) and Martin Ådahl (*the Swedish Center Party*).

Moderated by John Hassler (*Stockholm University*).


Thank you!
www.norden.org/nepr