

# Why technology?

Heleen de Coninck - ECN-IVM symposium  
Amsterdam - 18 september 2009



## Take-home messages

International environmental agreements are about reciprocity

Emission reduction agreements and cap-and-trade provide cost-effectiveness but very limited reciprocity

Paradigm shift from market-based instruments to technology and domestic policy plans

Consequential complexity

## International institutions

Build a coalition to address a collective action or cooperation problem

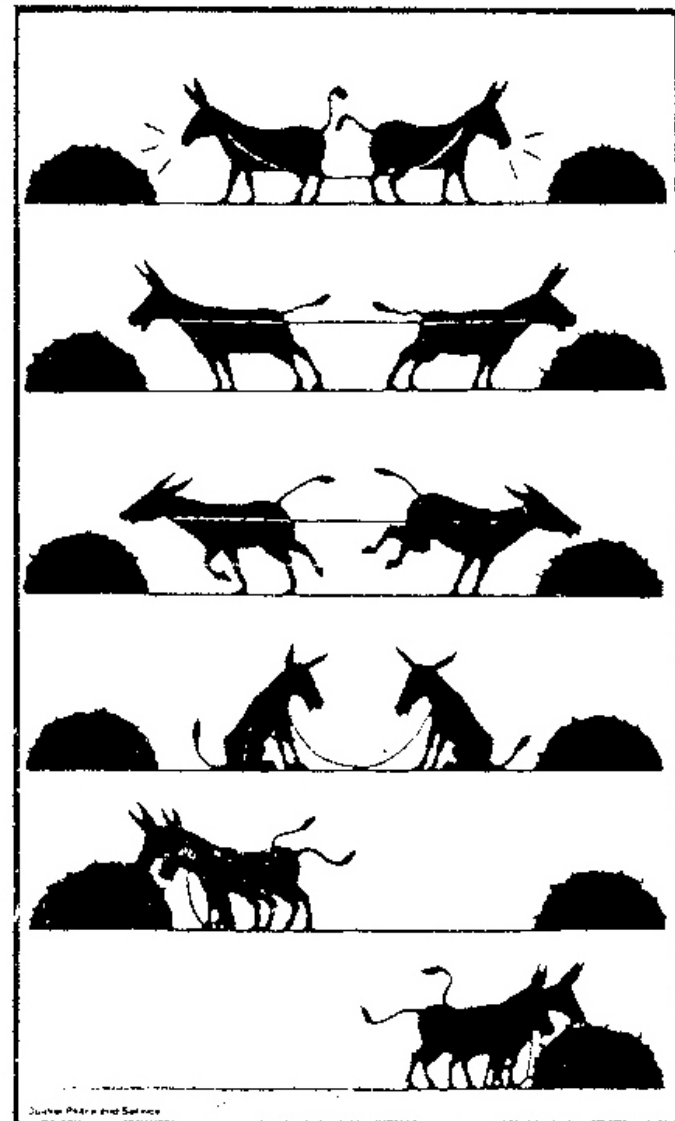
In the UN, actors are exclusively states

International agreements: Characterised by non-enforceability

- Only exceptions: UN Security Council and WTO
- International environmental agreements: soft power and self-enforcing

Preventing climate change: global public good problem

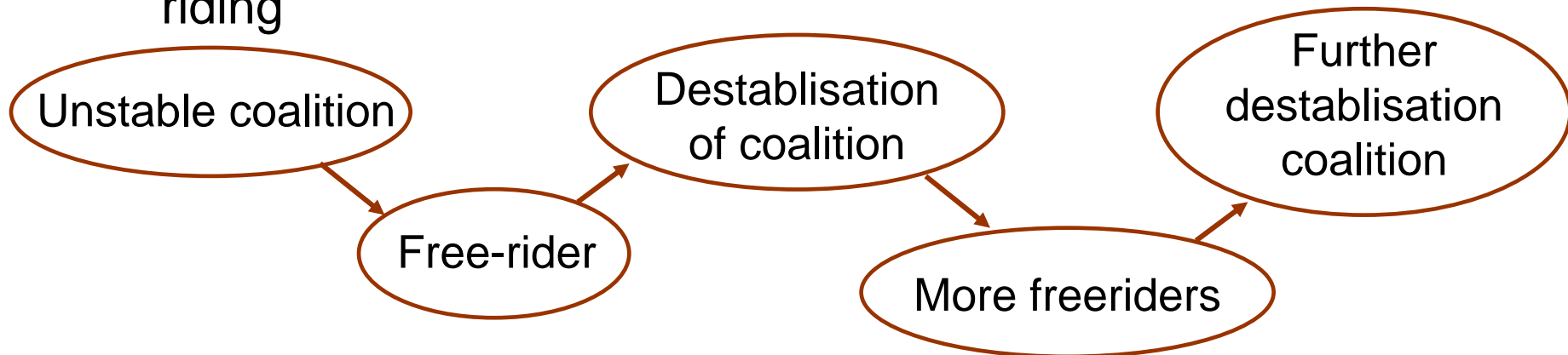
- Non-excludable benefits
- incentives for free-riding



## Consensus is necessary...

Coalitions to provide global public goods are unstable because:

- Often there is asymmetry in country's interests, so complicated deals have to be struck – careful balance
- Non-excludable benefits encourage free-riding
- No supra-national authority to punish or even discourage free-riding



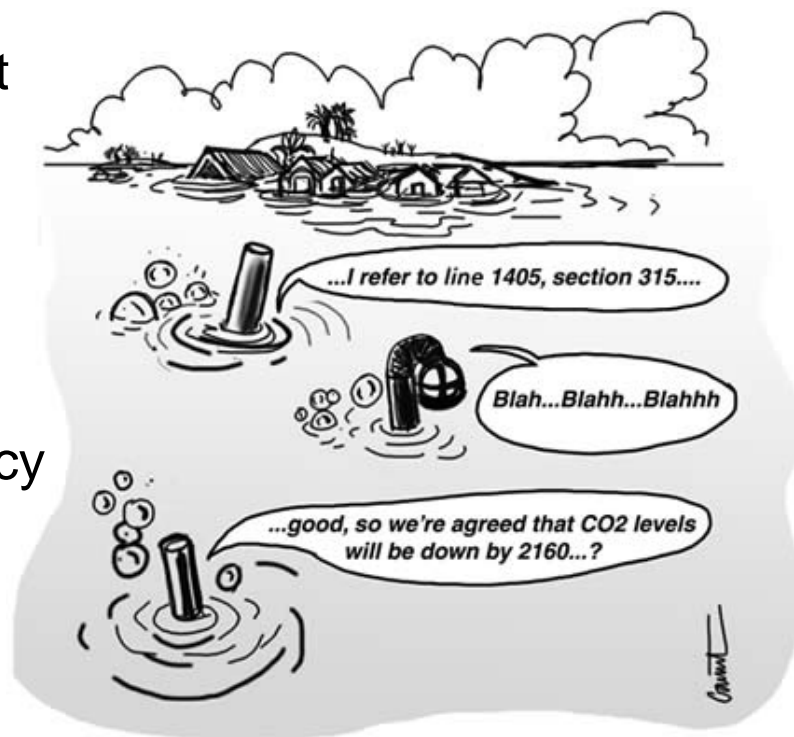
→ **Non-participation and defection threat to agreement**

## ... but slow

Agreeing on Kyoto took only two years, but entry into force took ten since 1995

Negotiation process lengthy:

- Getting every single country on the same level of knowledge
- Agreeing on the problem and urgency
- Time needed to examine the consequences
- Political approval processes
- Agreeing on the solution
- Changing governments and political preferences




## Why is reciprocity important?

Political strength:	Strong victim	Weak victim	Examples
Symmetric externality	Issue-specific reciprocity		Whaling among whaling nations Ozone depletion among ozone depleting nations
Asymmetric externality	Coercion (negative linkage) OR Exchange (positive linkage)	Exchange (positive linkage)	Ozone depletion between industrialised (strong victims) and developing nations Whaling between whaling and non-whaling states (strong victims) Rhine river chloride between France/Germany/Switzerland and the Netherlands (weak victim)



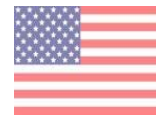
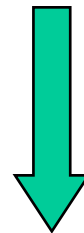
## Situation for Copenhagen

 Developing countries: want everyone to mitigate and pay for adaptation



 EU: 2015  
China: per capita income is so low, no justification for action. Annex I first!

**Deadlock**



US: only want to participate if China (and India) will

## Different interests play a role

Climate change is a redistribution issue

- Industrialised countries to pay; prevent consequences in developing countries
- Present generation to pay; future generations to benefit

Vested interests in present energy system

Hope: interests in new technology



Keep burning the coal you fools. Tomorrow belongs to us!

## Situation for Copenhagen

Mitigation discussions not going far

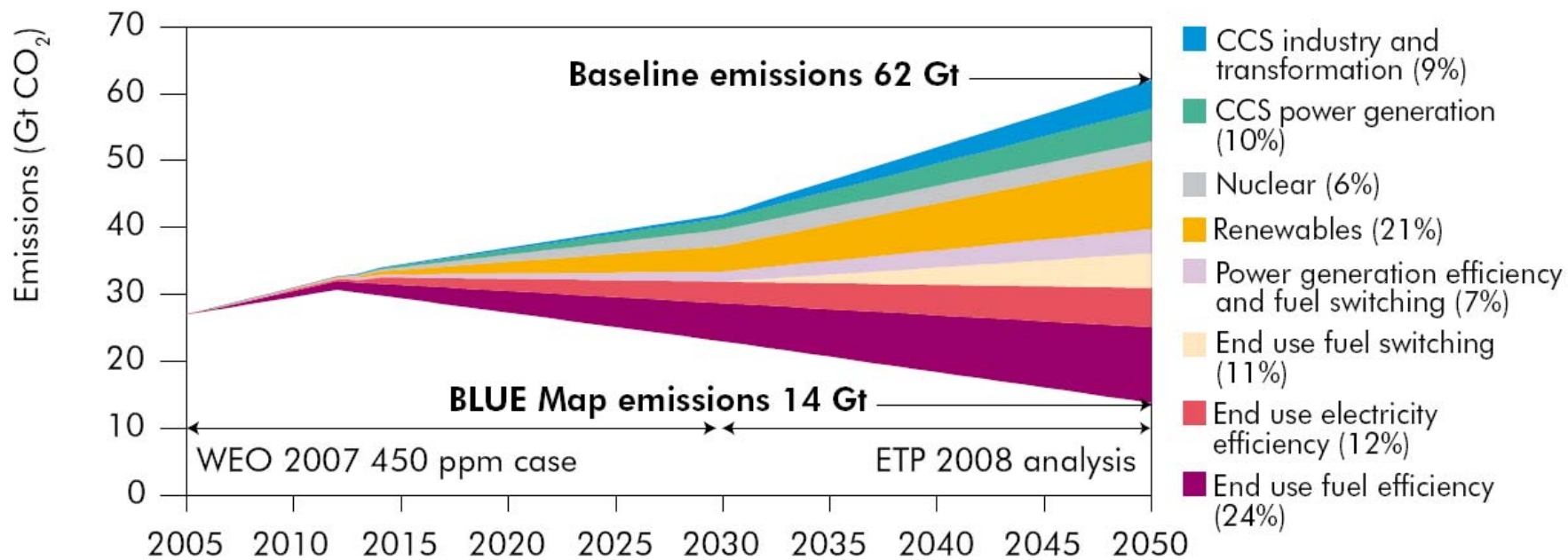
Developing countries refuse differentiation

Bali Action Plan:

- Shared vision on long-term action
- Four tracks: mitigation, adaptation, technology, finance

Less controversy expected for technology and finance

# Technology at the heart of the climate challenge



# Technology: rising star in climate negotiations

UNFCCC (Art. 4.1c, 4.5)

- Parties should cooperate on advancing technology
- Annex-I should transfer technologies to non-Annex I

Current Convention sources and vehicles for technology transfer finance

- Technology Needs Assessments – demand for technology
- Global Environment Facility – fund for technology transfer
- CDM (and JI) – market mechanisms

Stage of maturity	Technology application	Convention sources				Technology programmes and IEA Implementing agreements				
		TNAs	GEF	CDM	JI	Japan	US	EU	APP	IEA-IA
R&D	Biomass fuel-cell and CCS power generation	No	No	0	0	No	No	No	No	No
	Power storage	No	No	0	0	Yes	Yes	No	Yes	Yes
	Solar nanotechnology photovoltaic	No	No	0	0	Yes	No	No	No	Yes
	Ocean Power (saline gradient (osmosis), thermal gradient (OTEC), wave)	No	No	0	0	No	No	Yes	No	Yes
Demonstration	Offshore Wind (Floating)	No	No	0	0	Yes	Yes	Yes	No	Yes
	Geothermal – Enhanced Geothermal Systems	No	No	0	0	No	Yes	No	Yes	Yes
	Concentrated Solar Power/Solar Thermal	No	Yes	0	0	No	Yes	Yes	Yes	Yes
	Offshore Wind (fixed)	No	No	0	0	Yes	Yes	Yes	No	Yes
Deployment	Biomass IGCC, gasification and pyrolysis	Yes	Yes	578	16	No	Yes	No	Yes	Yes
	Biogas	Yes	No	429	2	No	Yes	No	Yes	Yes
	Solar Photovoltaic	Yes	Yes	13	0	Yes	Yes	Yes	Yes	Yes
	Concentrated Solar Power/Solar Thermal (parabolic trough)	Yes	Yes	1	0	No	Yes	Yes	Yes	Yes
	Tidal (barrier, stream)	No	No	1	0	No	Yes	No	No	Yes
	Onshore Wind	Yes	Yes	504	16	Yes	Yes	Yes	Yes	Yes
Diffusion	Run of river hydropower	Yes	Yes	676	2	No	Yes	Yes	Yes	Yes
	Geothermal - Conventional	Yes	Yes	13	0	No	Yes	Yes	Yes	Yes
Commercial	Hydropower (dam)	Yes	No	334	3	No	Yes	Yes	Yes	Yes
	Biomass co-firing	Yes	Yes	578	16	No	Yes	No	Yes	Yes

Stage of maturity	Technology type	Technology application	Convention sources				Technology programmes and IEA Implementing agreements				
			TNAs	GEF	CDM	JI	Japan	US	EU	APP	IEA-IA
R&D	Alternative fuels	Synfuels - CCS - Biomass	No	No	0	0	No	Yes	No	Yes	Yes
		Alternative fuels	No	No	0	0	No	No	No	No	No
	Aviation	Hydrogen	No	No	0	0	Yes	No	Yes	No	Yes
		Biofuels	No	No	0	0	No	No	No	No	No
		Alternative fuels	No	No	0	0	No	No	No	No	No
	Shipping	Renewable energy	No	No	0	0	No	No	No	No	No
		Hydrogen fuel cells	No	No	0	0	Yes	Yes	Yes	No	Yes
Demonstration	Alternative fuels	Hydrogen/fuel cells	Yes	Yes	0	0	Yes	Yes	Yes	Yes	Yes
		Reducing vehicle loads	Yes	No	0	0	No	Yes	No	No	No
	Transport systems	Non-motorised transport	Yes	Yes	0	0	No	No	No	No	No
		Aviation	Lightweight materials	No	No	0	0	Yes	Yes	No	No
	Reducing vehicle loads	Aerodynamics	Yes	No	0	0	No	Yes	No	No	No
		Mobile Air Conditioning	Yes	No	0	0	No	No	No	No	No
	Deployment	Improved drive train efficiency	Advanced Direct Injection	Yes	No	0	0	No	No	No	No
Hybrid drive trains			Yes	Yes	0	0	Yes	Yes	No	No	Yes
Alternative fuels		Biofuels	Yes	No	0	0	Yes	Yes	Yes	Yes	Yes
		Electric vehicles	Yes	Yes	0	0	Yes	Yes	No	No	Yes
Transport systems		Eco-driving	No	Yes	0	0	No	No	No	No	No
Diffusion	Rail	Lightweight materials	Yes	No	0	0	Yes	No	No	No	No
		Aviation	Aerodynamics	No	No	0	0	Yes	Yes	No	No
	Transport systems	Engine fuel efficiency	No	No	0	0	Yes	Yes	No	No	No
		Transport management systems	Yes	Yes	0	0	Yes	Yes	No	No	No
	Intramodal shifts	Freight shifts	Yes	Yes	0	0	Yes	No	No	No	No
		Freight efficiency	Yes	Yes	0	0	Yes	No	No	No	No
		Rail	Aerodynamics	Yes	No	0	0	Yes	No	No	No
Shipping	Aviation	Air traffic management	No	No	0	0	No	No	No	No	No
	Hydrodynamics	No	No	0	0	Yes	No	No	No	No	
		Optimal routes/speeds	No	No	0	0	No	No	No	No	No

# Technology: rising star in climate negotiations

UNFCCC (Art. 4.1c, 4.5)

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Expert Group on Technology Transfer (EGTT) was reinforced in Bali with a new mandate

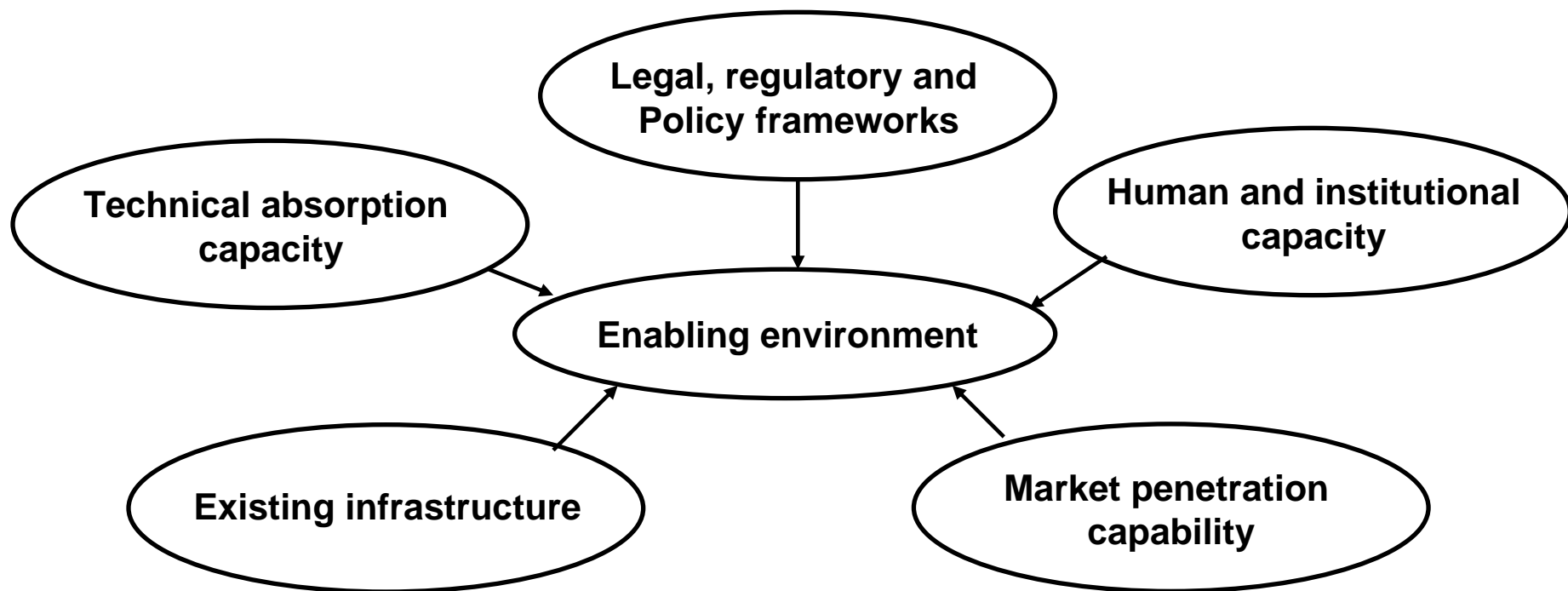
- Find ways to advance development and transfer of technology
- New dynamic: from North-South technology transfer to international cooperation

## Not starting from scratch

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## Priority elements

### Enabling environments



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Enabling environments

Intellectual Property Rights and trade issues:

- Are strong or weak IP regimes a threat to technology transfer?

## Priority elements

Enabling environments

Intellectual Property Rights and trade issues

Technology partnerships, agreements, sectoral approaches

- Partnerships: M2M, ITER, Gas flaring, IEA Implementing Agreements
- Sectoral approaches: country-specific targets, SD-PAMs, transnational, TOAs
- TOAs: Knowledge sharing and coordination; RD&D; technology transfer; mandates, standards, incentives
- SD-PAMs: precursor to Nationally Appropriate Mitigation Actions

## Priority elements

Enabling environments

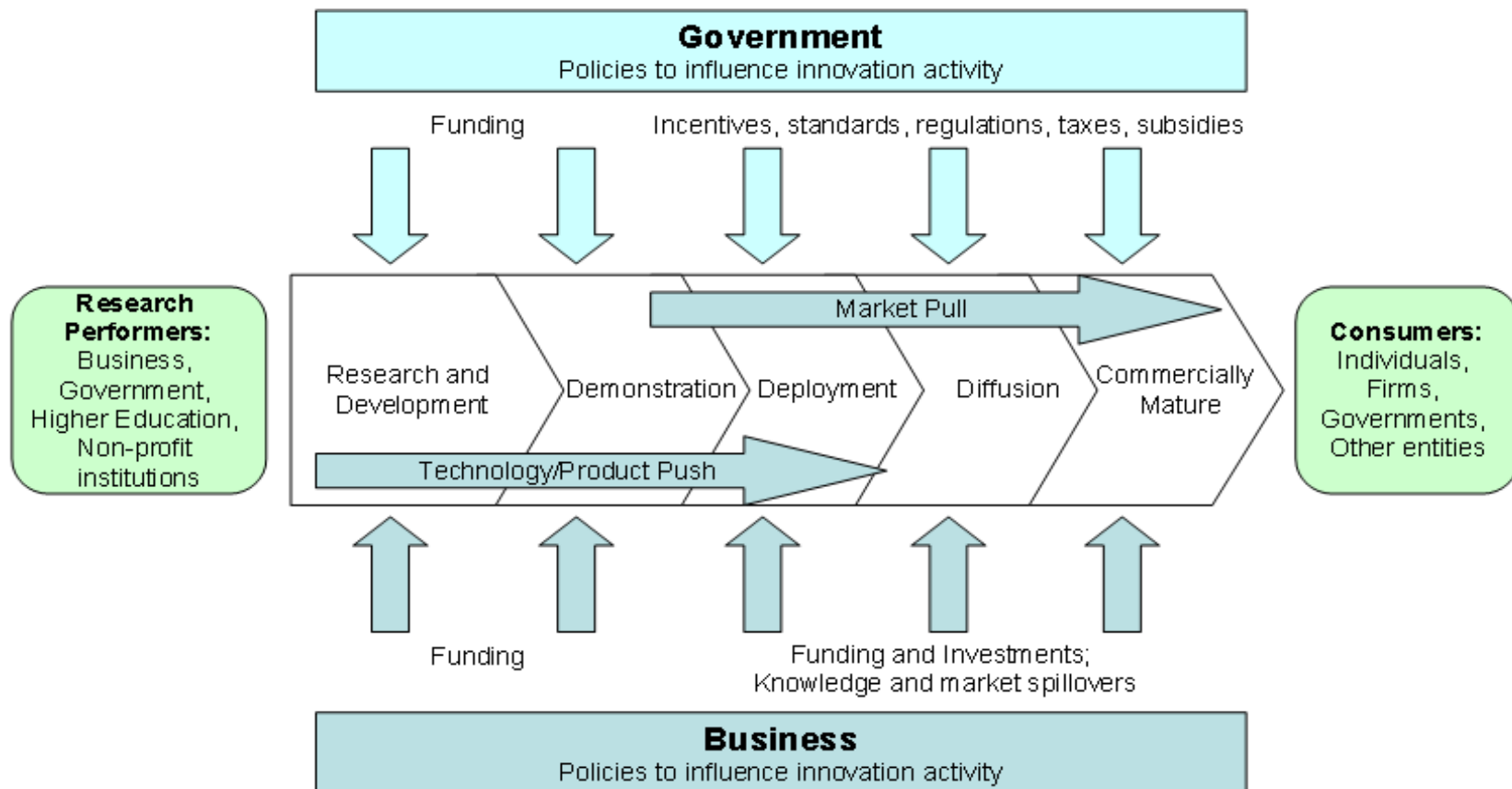
Intellectual Property Rights and trade issues

Technology partnerships, agreements, sectoral approaches

Finance for technology

- Current levels too low

# Technology framework addresses all stages



## Technology framework addresses all stages

Type 1: Knowledge sharing and coordination	<ul style="list-style-type: none"><li>• Carbon Sequestration Leadership Forum (CSLF)</li><li>• Asia-Pacific Partnership (APP)</li><li>• Methane to Markets (M2M)</li><li>• Energy Star bilateral agreements</li><li>• Task sharing in IEA-Implementing Agreements</li></ul>
Type 2: Research, Development & Demonstration	<ul style="list-style-type: none"><li>• European Organisation for Nuclear Research (CERN)</li><li>• ITER fusion reactor</li><li>• Cost-sharing in IEA-IA</li><li>• Solvent Refined Coal II</li></ul>
Type 3: Technology transfer	<ul style="list-style-type: none"><li>• Multilateral Fund under the Montreal Protocol</li><li>• Global Environment Facility (GEF)</li></ul>
Type 4: Standards, mandates, incentives	<ul style="list-style-type: none"><li>• International Convention for the Prevention of Pollution from ships (MARPOL)</li></ul>

## Technology framework: flurry of proposals

Technology action plans/low-carbon development strategies

Technology needs assessments

Enabling environments

Technology related capacity-building

Technology road maps

Cooperative research and development (including demonstration projects)

Measures to address intellectual property rights (payment for IPR?)

Incentive mechanism for technology transfer

Voluntary agreements

Technology information

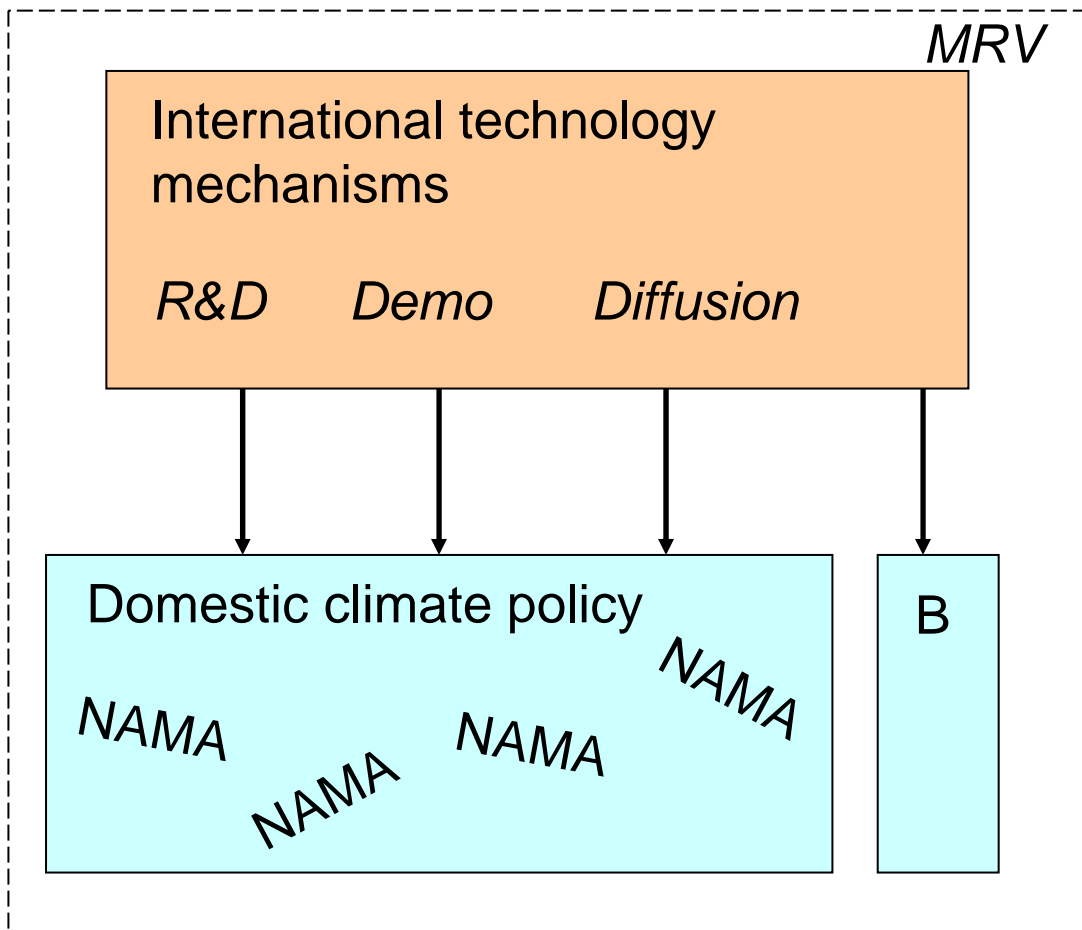
National/regional technology/innovation excellence centres or networks

A new body on technology transfer under the Convention

Co-finance for demonstration projects

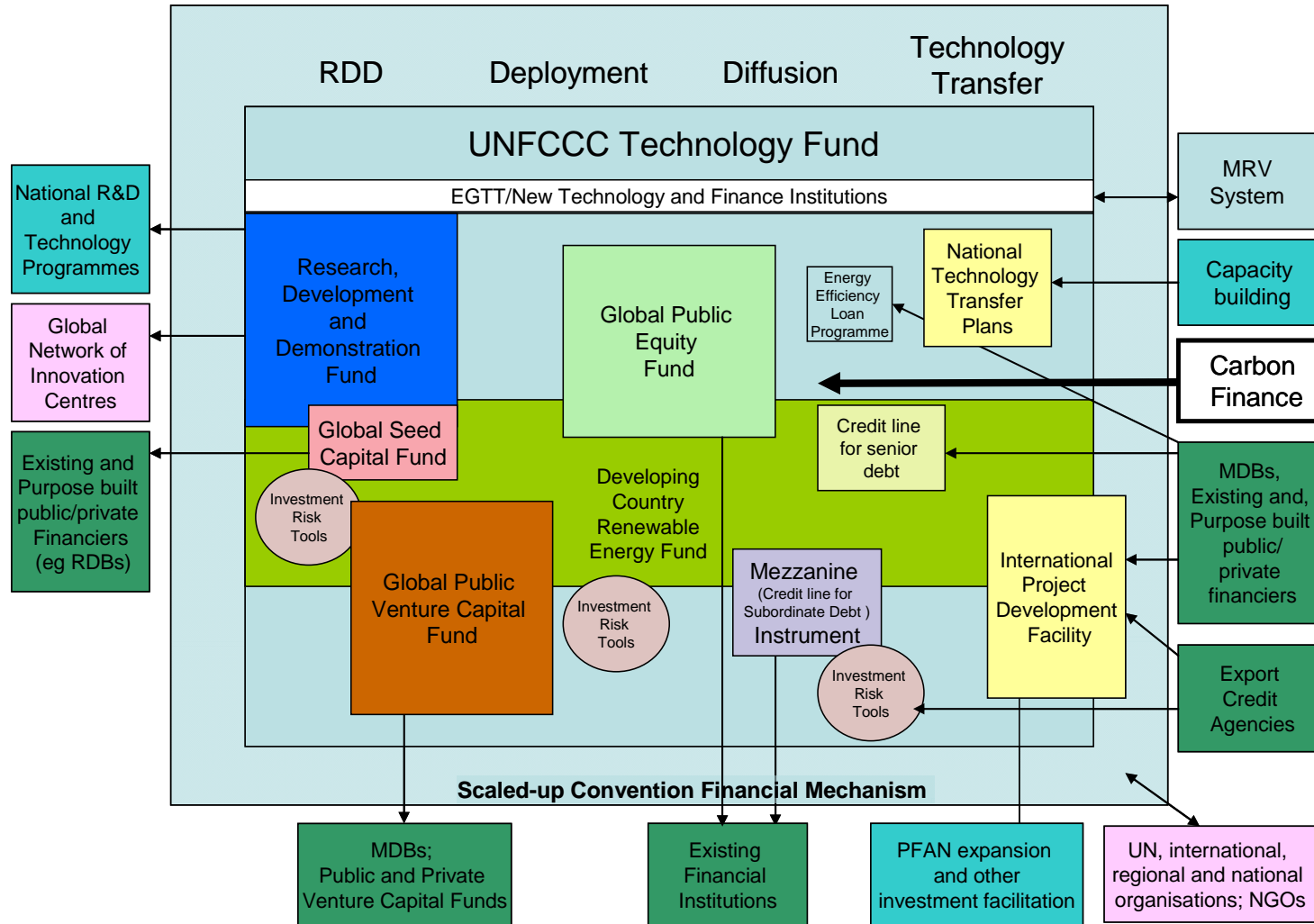
Incentives for increased joint R&D

# A possible outcome?



1. Domestic climate mitigation plans
2. Built up of NAMAs
3. International technology mechanisms
4. To address full innovation chain and
5. Support domestic measures
6. Transparent MRV framework

# Or will it get more complicated?



## A changing policy paradigm?

Cap-and-trade: from dominant international policy paradigm to optional domestic instrument

Technology and finance: essential building blocks

Remaining questions:

- Can technology provide sufficient reciprocity?
- Are industrialised countries really willing to share technology?
- Can the increasing complexity be resolved?