Innovation and partnership models

Matthew Bateson

wbcsd energy & climate

Contents

- Key findings
- Framing the challenge
- Drivers of private sector investment in RD&D
- RD&D public policies to complement private action
- The role of collaborative RD&D to fill the gaps
- Business cases

wbcsd energy & climate

Appropriate public policies can accelerate low-carbon innovation

1. Long-term policy frameworks
2. A value for carbon
3. Public funding to address RD&D risks
4. Intellectual Property Rights (IPR) protection
5. Competitive RD&D for differentiated products or services
6. Collaborative RD&D for technologies far from commercialisation; supporting infrastructure, standardisation or cross-sectoral projects
7. Human capital and RD&D infrastructure, with long-term experience, not created ad-hoc for specific projects
8. Dialogue and cooperation between public research institutions and the private sector
9. Streamlined public R&D programs

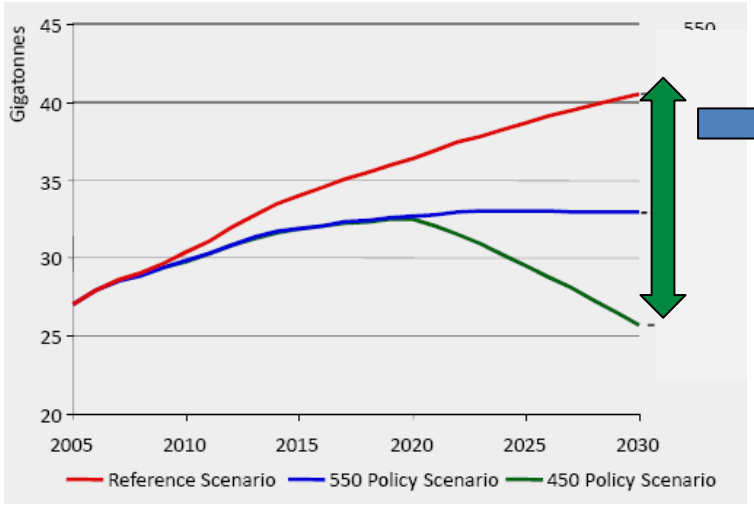
wbcsd energy & climate

Framing the challenge

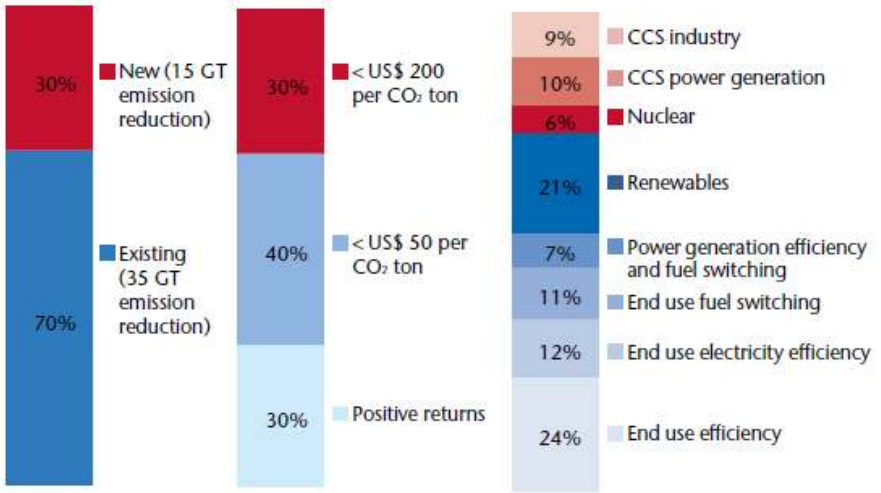
wbcsd energy & climate

30% emission reductions needed for a 450 ppm scenario require new technologies

IEA emissions reduction scenarios



Distribution of emission reductions to achieve the 450-ppm scenario



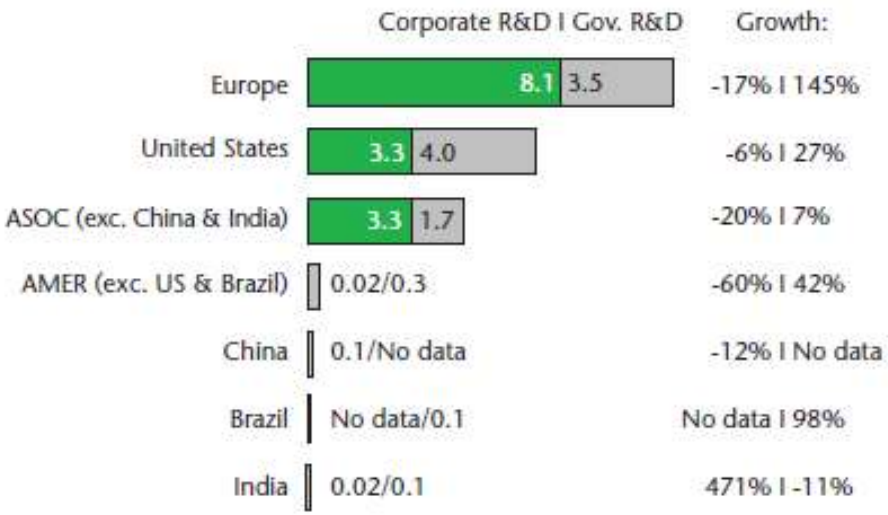
Source: IEA, 2008

- USD40-90 bln annual gap between current and required RD&D investment
- Slow capital stock turnover and long lead time for development of technologies require policies to stimulate RD&D
- Several technologies, at different levels of maturity, with different mitigation potentials, must be developed in parallel to diversify risks

wbcsd energy & climate

Private sector has a key role - private finance more accessible at later stages of technological maturity

Corporate and government RD&D investment by region and growth rate 2009 (USD Bn)

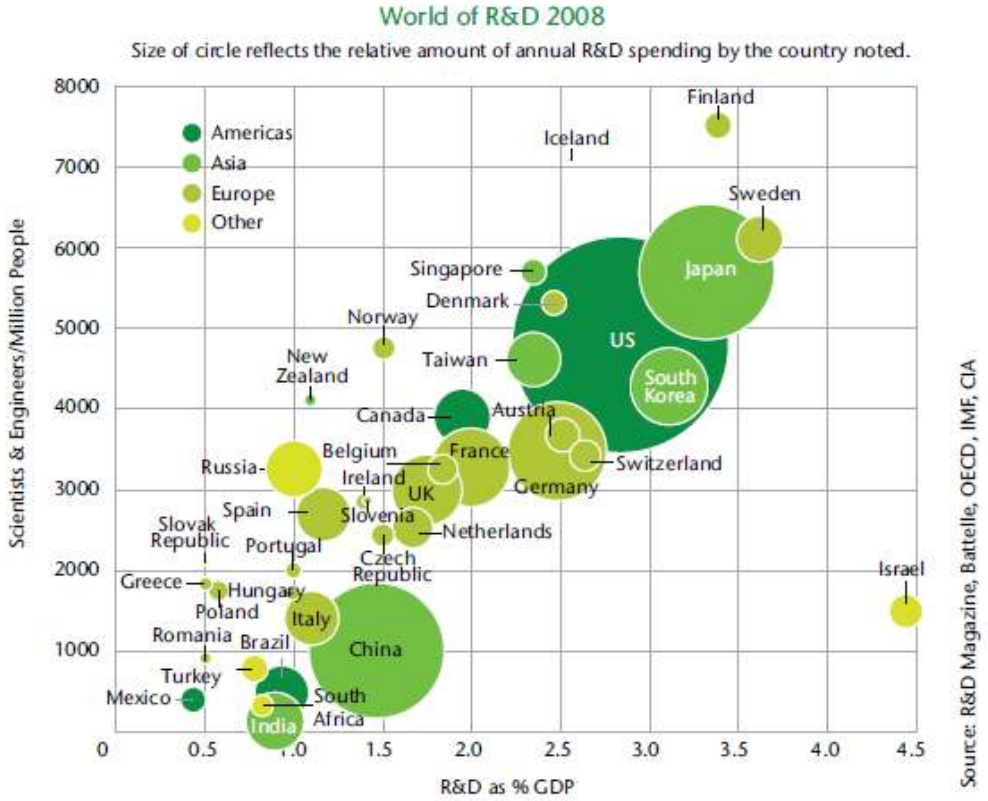


Source: UNEP, Bloomberg, SEFI (2010)

- Business conducts around 65% and funds 55% of RD&D (reduced as a result of recession)
- Business' share of RD&D is correlated to country's economic and technological development
- Business focuses on commercial development of technologies, while public sector bodies are more active in basic research

wbcsd energy & climate

Emerging economies have an increasing role in climate change innovation



- RD&D is growing more rapidly in emerging economies than in US or Europe
- Climate change RD&D is concentrated in the USA, Europe and Japan, but emerging countries are rapidly increasing their share

wbcsd energy & climate

Significant RD&D spending gaps exist in most clean technologies

IEA RD&D global spending gaps

Technology	Gap (USD Bln)
Advanced vehicles	21-43
Bioenergy	1-2
Carbon Capture and Storage	8-17
Cleaner, high-efficiency coal	0.5-2
Nuclear energy	0
Offshore Wind	2-3
Smart grids	5-11
Solar energy	1-3
Energy efficiency in buildings	4-9 (only industry)

Source: IEA(2010)

wbcsd energy & climate

Drivers of private sector investment in RD&D

wbcsd energy & climate

Low-carbon RD&D drivers distinctly need strong public sector signals

- Desire to gain a **competitive advantage** in future markets and anticipate regulations and consumer demand

- **Accelerating demand** for new low-carbon technologies
- Long-term **policy signals**

- An **enabling environment** for RD&D, including an adequate legal framework, with IPR protection and support for public open standards

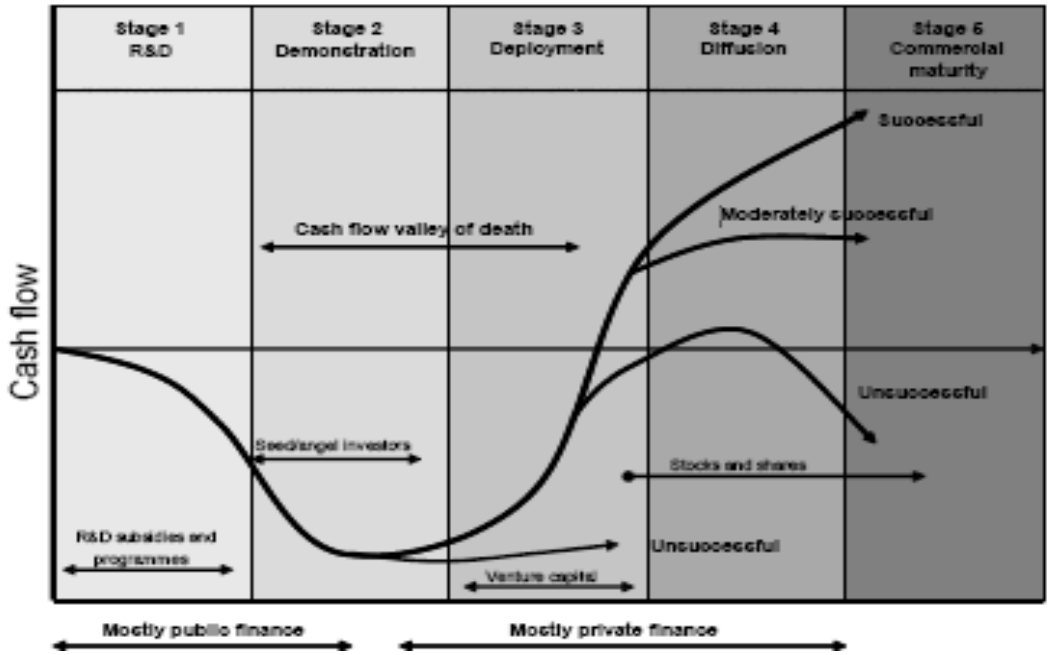
- **Vibrant science and technology sector**

- **Trained workforce** in appropriate disciplines

wbcsd energy & climate

Finance is hard to raise at the demonstration stage, public policies can help to bridge this gap

The investment valley of death



Source: UNFCCC 2009

- Commercial and technical risks perceived as too high create the gap
- Public policies can “push” demonstration of new technologies,
- Carbon prices and removal of subsidies for incumbent technologies can “pull” new technologies allowing earlier competitiveness
- Venture capital plays and important role in supporting innovation, but is subject to high fluctuations

Strong IPR drive and enable technology dissemination and deployment

IPR are a key driver for RD&D investment:

- Allow innovators to **realize the value** of successful RD&D and compensate for failed programs
- Allow companies to **distinguish their products** from those of their competitors
- Provide **commercial and economic incentives and assurances** to encourage share of technology and know-how

Intense competition amongst and between clean technologies and sectors mean diverse IPR portfolios, ensuring that no single company holds all patents and keeping prices low

wbcsd energy & climate

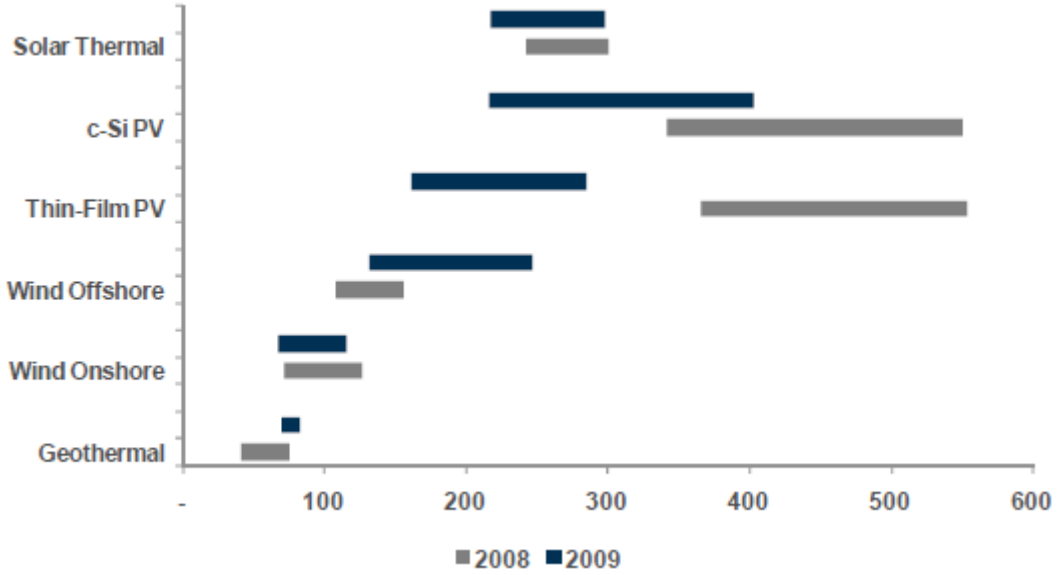
RD&D public policies to complement private action

wbcsd energy & climate

The timeframe for new energy technologies to reach commercial maturity justifies public sector support

Costs of clean energy technologies compared

*The dollar rates represent the price at which a development company would have to sell power from its project in order to earn an average IRR of 10%.



Source: Bloomberg 2010

- The time required to achieve competitive parity with the power grid differs per technology
- Solar PV and wind projects will take around 40 years to be competitive from the first large scale commercial plants

wbcsd energy & climate

Public policies can contribute to the underinvestment in RD&D

Barriers to low-carbon RD&D:

- **Cost of carbon** is not internalised
- High **knowledge spillovers** that benefit the public as a whole and not only the innovator
- **Large capital investments and long timescales** in the energy sector
- Lack of **product differentiation** in the energy sector
- Low **energy prices**
- Widely deployed and optimised **incumbent technologies**
- Limited **first-mover advantages**

wbcsd energy & climate

Policies should focus on reducing risks that discourage private investment

- **Commercial risks:** ownership of assets and liabilities; risks and revenue sharing; contractual and operational responsibilities; IPR
- **Regulatory risks:** legal framework for emissions control and for access to infrastructure
- **Political risks:** political stability and permanence of government commitments
- **Absence of general infrastructure:** Government assurance of investments in infrastructure where it is lacking
- **Absence of RD&D infrastructure:** human capital, universities, national labs, regional partners

wbcsd energy & climate

A combination of technology push and market pull policies

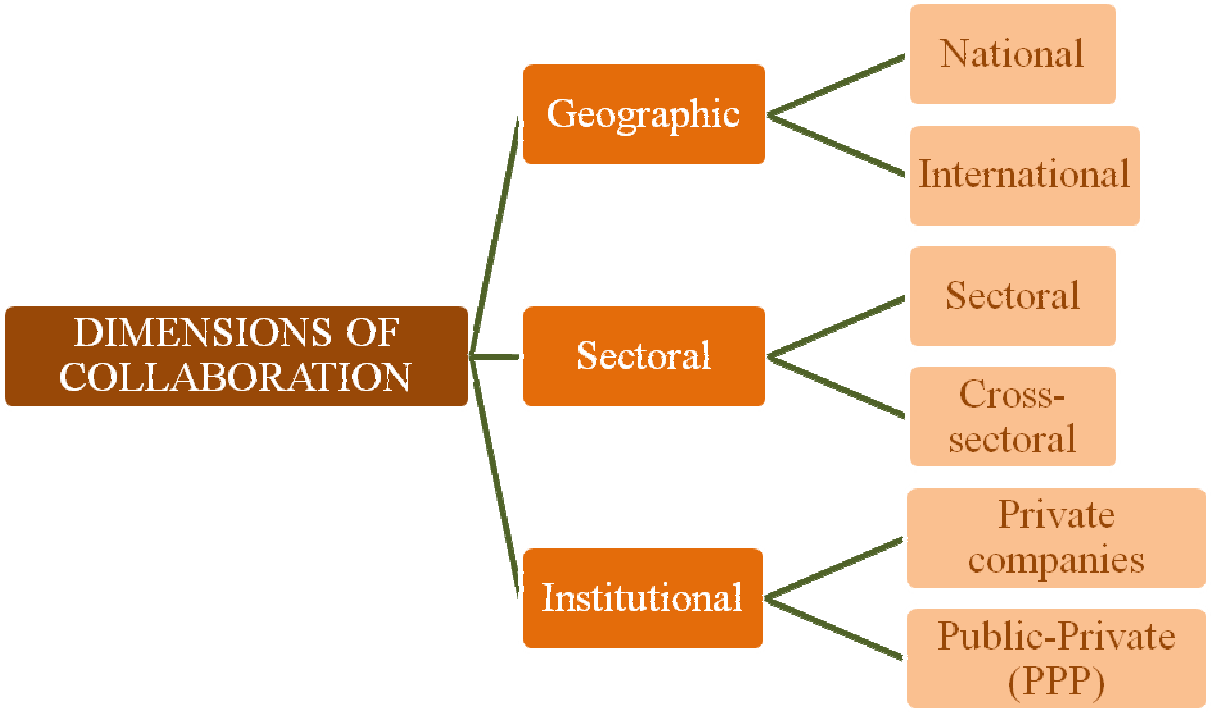
Policies to increase the supply of new knowledge: "TECHNOLOGY PUSH"	Policies to increase the demand of innovation: "MARKET PULL"
Capacity building	Targets and product standards
Infrastructure development	Cap and trade
Govt funding demonstration projects	Regulations requiring use of BAT
Public-private partnerships to share R&D risk	Feed-in tariffs
Govt sponsored R&D	Portfolio standards
Tax credits to invest in R&D	Public procurement
	IPRS protection

wbcsd energy & climate

The role of collaborative RD&D to fill the gaps

wbcsd energy & climate

Collaborative RD&D can drive low carbon RD&D sharing risks, costs and knowledge



- **PPP** can facilitate low carbon technologies given high complexity and cost of technologies and the need of cross-sector knowledge
- **International collaboration** at demonstration enables testing in different conditions, broad sharing of results and standard settings
- **Cross-sector collaboration** supports alignment of technology roadmaps

Collaborative RD&D not a “silver bullet” .... competitive RD&D is often preferred by business

Collaborative RD&D could be preferred to competitive RD&D when:

- **Technologies far from commercialisation** - as commercialisation gets closer, competition can reduce costs
- **Knowledge and infrastructure spill-overs** across companies - collaboration can avoid free-riding, eg. smart grids or power supply networks for electric vehicles
- **Infrastructure development in new markets** - enable leapfrogging older infrastructures
- **Commodity sectors** - where there are differentiated products competitive RD&D can be more efficient, eg. automobiles
- **Cross-sector** collaboration - sectors like CCS require expertise that is not held by a single company
- Mitigation of risks in the **“valley of death”** - sharing risks through PPP can help to bridge the gap

wbcsd energy & climate

Alstom global hydropower technology center (I)

Location: Vadodara, India

- Employs around 800 people in a range of technical and managerial roles
- Focuses on the particular technical needs of the Indian market.
- Includes a manufacture facility, a technical workshop and a technical laboratory
- It has become a global hub for hydro power R&D, exporting beyond the Indian market

Environmental objectives:
•Renewable energy use
•Energy efficiency

wbcsd energy & climate

Alstom global hydropower technology center (II)

Drivers

- Large demand
- Availability of hydro resources
- Exportability of knowledge gained in challenging hydrological conditions
- Well-developed infrastructures
- Favourable policy conditions
- Quality of human capital

Favourable public policies

- Fiscal incentives,
- Renewable portfolio standards
- Stable power purchase agreements
- Tariffs aligned to supply costs
- Infrastructure development

A large potential market, the quality of human capital and a combination of market-pull and technology-push policies drive R&D projects in developing countries

wbcsd energy & climate

Cross-sectoral RD&D in Carbon Capture and Storage (CCS)

Location: Germany **Partners**: BASF, RWE, LINDE

Environmental objectives:
- CO_2 capture
- Energy efficiency
- Solvent use reduction

- Collaboration to develop CO_2 scrubbing technology that could capture 90% of CO_2 from combustion gases
- Will reduce energy input in the capture process by 20%
- The new solvents feature superior oxygen stability, reducing solvent use.
- After pilot-scale plant, applied to large-scale demonstration power plants.
- Commercial use expected by 2020.

wbcsd energy & climate

Cross-sectoral RD&D in Carbon Capture and Storage (II)

Drivers and favourable policies

- Need to reduce cost of CCS
- Strong signals from the EU 20-20-20 strategy, although a longer term target is needed
- RD&D funding by the German Government

The collaboration process

- Drivers: technical synergy of the companies involved and the high technical and financial risks
- Challenges: Allocation of IPR, adapting to different working and communication styles
- Challenges can be overcome with a clear definition of responsibilities among participants and trust-building

Technical complexity requires knowledge from different sectors and when technical and financial risks are too high for a single company

wbcsd energy & climate

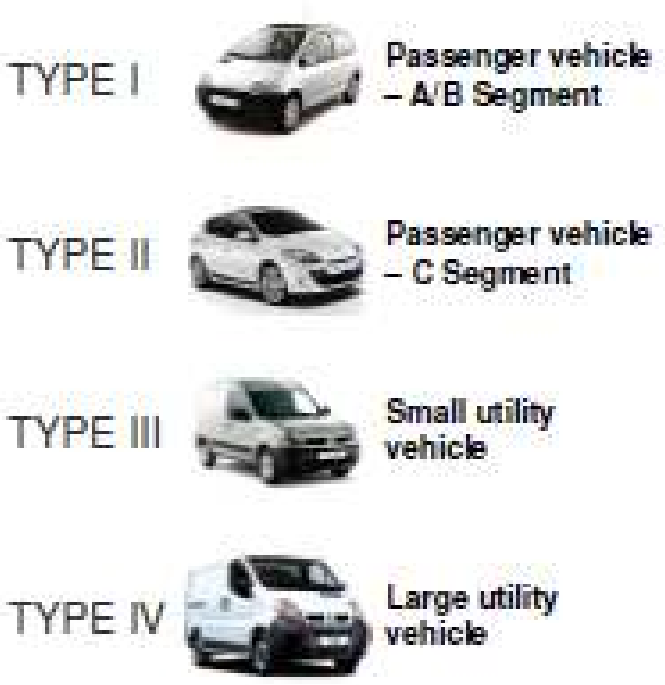
Dutch Consortium for the tender of electric cars (DC-TEC)

Location: The Netherlands

Partners: Dutch government, fleet owners, suppliers

Environmental objectives:
- Reduce CO_2 emissions
- Energy efficiency

- Consortium of blue-chip companies and govt bodies in the Netherlands
- Aims to purchase 3,000 electric vehicles with the same functionality and lifetime cost as conventional vehicles
- Goal to create a business case for the procurement of EV and to create a precedent in the Netherlands
- An EU public tender began end 2010



Types of vehicles in the tender

wbcsd energy & climate

Dutch Consortium for the tender of electric cars (DC-TEC) II

Drivers and policies

• Reduce procurement costs of electric vehicles

•Gain experience in electric mobility

•Create a critical mass that pushes infrastructure investment

•Favourable public policies: direct subsidies, participation in the consortium through public procurement and infrastructure development.

The collaboration process

•Started by two companies and one NGO to speed up implementation of EV, giving a clear signal that there is a strong demand

•Objectives to obtain funding, share costs and achieve economies of scale

Consumer initiatives can create the necessary "market pull" to speed up R&D in clean technologies

wbcsd energy & climate

More information

Innovating for Green Growth

Role of private sector in low-carbon technology research, development and demonstration (RD&D)

www.wbcsd.org

wbcsd energy & climate