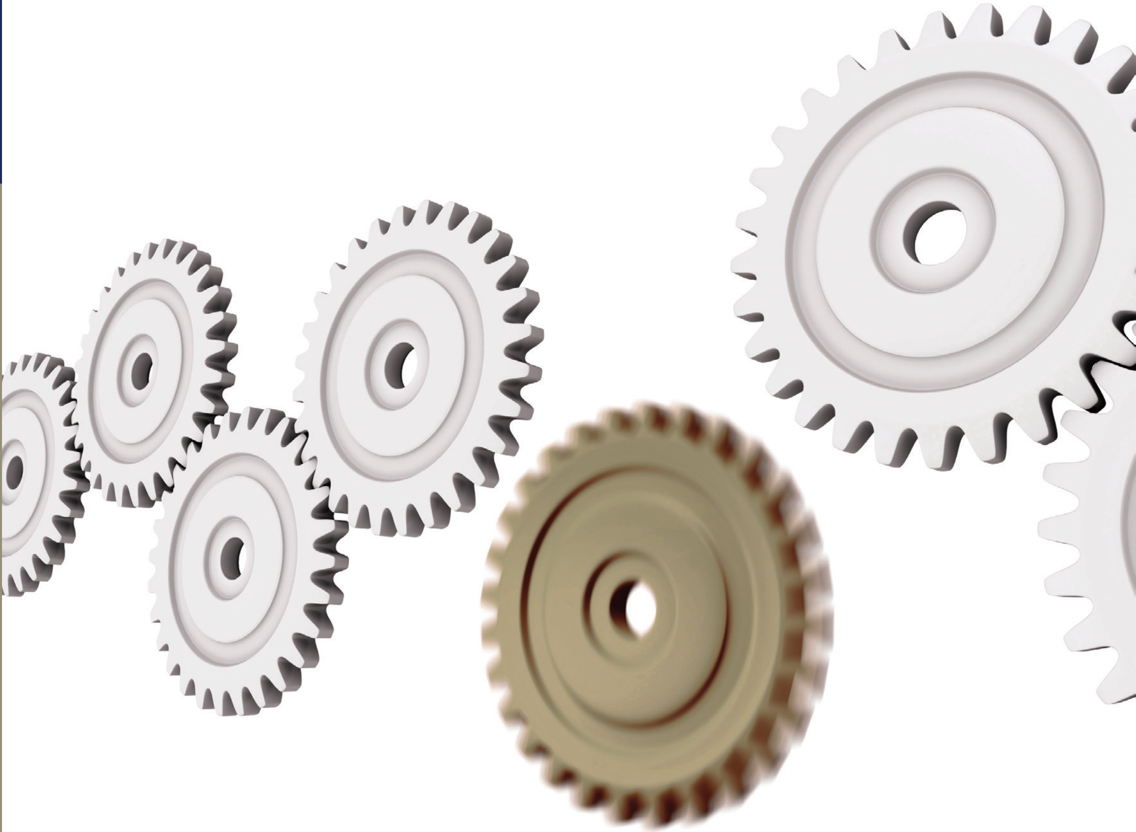
E3G

CHATHAM HOUSE

Innovation and Technology Transfer

Framework for a Global Climate Deal

Shane Tomlinson, Pelin Zorlu and Claire Langley



An E3G report with contributions from Chatham House

November 2008

About E3G

E3G is an independent, non-profit European organisation operating in the public interest to accelerate the global transition to sustainable development. E3G builds cross-sectoral coalitions to achieve carefully defined outcomes, chosen for their capacity to leverage change. E3G works closely with like-minded partners in government, politics, business, civil society, science, the media, public interest foundations and elsewhere. More information is available at www.e3g.org

About Chatham House

Chatham House is one of the world's leading institutes for analysis of international issues. It is an independent organisation that brings together people from government, politics, NGOs, business, the academic world and the media to be at the forefront of developments in an ever-changing and increasingly complex world. The organisation has a strong track record in carrying out research and facilitating meetings and processes and that enables governments and other actors to address major challenges on the international agenda.

Third Generation Environmentalism (E3G)
4th floor, In Tuition House
210 Borough High Street
London SE1 1JX
Tel: +44 (0)20 7234 9880
Fax: +44 (0)20 7234 0851
www.e3g.org

The Royal Institute of International Affairs
Chatham House
10 St. James's Square
London SW1Y 4LE
Tel: +44 (0)20 7957 5700
Fax: +44 (0)20 7957 5710
www.chathamhouse.org.uk

Acknowledgements

This report has been produced by E3G and Chatham House. The research was led by Shane Tomlinson and Pelin Zorlu of E3G with contributions from Antony Froggatt and Shilpa Viswanath of Chatham House. Nick Mabey from E3G provided overall direction and conceptualisation to the project and report.

The report benefited greatly from the extensive comments and input of Bernice Lee (Chatham House) along with Jennifer Morgan and Matthew Findlay (E3G).

The research towards this paper has benefited from the thoughtful research support of Claire Langley, and Taylor Dimsdale, of E3G, to whom the project team would like to extend their sincere appreciation.

In addition to the above, the support of Martin Rands and Shin Wei Ng towards the publication is also appreciated. Particular gratitude goes to Meera Shah for her support and patience throughout the production process.

Chatham House would like to thank the UK Department for International Development (DfID) for their generous contribution toward the project.

The authors would like to acknowledge the courtesy and generosity of The World Bank on sharing the underlying dataset: Andrew Burns, Teng Jiang, and Antonio David of World Bank Global Economic Prospects 2008 team.

Finally, the authors wish to thank all those who have been involved, on calls and in meetings, to discuss, challenge and push further our evolving thinking.

Further details about this paper, translated versions, downloadable resources and news of related activities are available at www.e3g.org.

Executive Summary

Faster and broader innovation is critical for delivering climate security while preserving energy security

Faster and broader innovation of new technology is critical for achieving low carbon and climate resilient development. Stabilising global temperature increases below 2°C will require global emissions to peak and reduce in the next 10-15 years.[1] Achieving this pathway reduces the probability of exceeding 4°C of warming – where crossing catastrophic climate change tipping points is highly likely – to under 1%; delaying global peaking by 20 years would increase the probability of 4°C to 10%.[2]

Meeting these goals poses a unique public policy challenge: delivery of new technologies and massive shifts of investment on a global scale inside a specific timeframe. The urgency of developing new technology is compounded by the existing global energy system investment cycle. The next 20 years will see an unprecedented increase in energy investment as developed countries replace power plants built in the 1960s and 70s, and rapidly industrialising economies accelerate their construction of modern energy systems. The US, Europe and China will each build around 800-1,000GW of new power stations by 2030. Concerns over energy security and prices are also driving defensive investments in high carbon sources, such as tar sands and coal-to-liquids.

Failure to provide workable low carbon alternatives for these investments will mean much of the world becomes "locked in" to carbon intensive development. IEA scenarios to meet the 2°C target require power plants with carbon capture and storage (CCS) to make up 20% of global power investment up to 2030; from 2030 all new power plants in developed countries will need to be zero-carbon. However, there is currently no commercial scale CCS demonstration plants planned to be in operation before 2015, making this schedule highly unlikely. Even under an optimistic technological scenario the IEA estimates that 15% of existing fossil fuel plant - around 350 GW - needs to be retired before the end of their economic lifetime. Similar issues exist in all major emitting sectors: energy, transport, industry, infrastructure and buildings.[3]

While these scenarios require only an 18% increase in investment over business as usual, they imply a huge investment shift from high to low carbon technologies.[4] The additional investment needs in clean energy technologies and energy efficiency are 18 times the current level of investment in these areas. A significant amount of the

---

[1] Barker et al., 2007

[2] Meinshausen, 2005

[3] IEA, 2008a

[4] IEA's BLUE Map Scenario in IEA (2008a)

additional $45 trillion investment needed to 2050, around 70%, will occur in the transport sector as it shifts to more expensive low carbon vehicles with lower fuel costs.

Avoiding carbon lock-in will require countries to immediately adopt low carbon development pathways and increasingly invest in technologies which provide emissions reductions while enhancing security of supply. It will be important to plan ahead, even for countries with no binding reduction commitments; for example, by making all new fossil fuel plants carbon-capture ready or capable of biomass co-firing. This will allow retrofitting when targets deepen and technologies are further developed.

Innovation and diffusion of low carbon and adaptation technologies will require concerted action along the innovation chain. Innovation will also be needed to drive radical market transformations, to rapidly adapt technology to developing country conditions and drive effort on 'orphan' research areas, such as drought resistant crops. This will require incentives for innovation in new areas and in a wider set of countries than at present.

The basic economic and technical systems exist to deliver these technological advances; the global economy has shown its ability to deliver transformative solutions in areas from the space race to the pharmaceuticals industry. The critical issue is how to provide the right policy frameworks and incentives to focus this innovative capacity on solving multiple climate change, energy security and climate resilience problems. National policies alone are unlikely to support the global public good aspects of low carbon innovation, and there will be a global undersupply of innovation in many areas. Multilateral action is required to give incentives for additional national actions, drive international collaboration and help correct critical market and policy failures.

Current low carbon innovation programmes are not adequate to manage the risk of policy failures and higher ranges of climate sensitivity

There is widespread agreement that current low carbon innovation programmes are not adequate to meet the climate change challenge. Despite some recent increases, public energy R&D funding has fallen by up to 50% in real terms in major developed countries over the last 25 years.[5] Energy RD&D as a share of total RD&D in OECD countries has declined from 11% in 1985 to 3% in 2005.[6] Public spending remains a higher proportion of research spending in the energy sector than in other areas, and up to 60% of public funding is spent supporting private sector R&D. Studies such as the Stern report have called for a doubling of R&D funding, and a much larger increase in deployment funding. Unfortunately, estimates for adaptation innovation needs are

---

5 IEA, 2008a

6 Ibid.

virtually non-existent, and represent a major gap in knowledge which must be prioritised in the international climate change process.

These figures probably underestimate the amount of R&D needed, as they assume an efficient least-cost pathway to known levels of global emission reductions. In reality future mitigation pathways are highly uncertain. The IEA estimates that over 50% of abatement by 2050 will come from energy efficiency measures, but experience shows these savings are often hard to capture and policies often fail; savings from reducing deforestation rates also face very challenging policy delivery environments. Estimates of climate sensitivity to greenhouse gases may continue to worsen; increasing the rate of emission reductions needed to meet temperature stabilisation goals. Some technologies which play a large part in many scenarios, for example, advanced biofuels, advanced nuclear power, may fail to emerge owing to technological failure or public acceptance issues. In all cases a larger range of low carbon energy alternatives - especially in power generation and transportation – will be needed earlier than current models predict.

Aggressive innovation efforts across a portfolio of critical technologies is part of a responsible risk management approach which hedges against climate policy failures, technology failures and worst case scientific scenarios. Failure to incorporate these potential scenarios into future mitigation plans will dramatically lower the likelihood of successful climate stabilisation.

Delivering a portfolio of critical low carbon options by 2020 will require large scale demonstration of key technologies, the building of lead markets and rapid development of large scale supply chains. This will often be beyond the capacity of individual countries to achieve; as shown by the 2008 G8 proposal for a global programme of 20 large scale CCS demonstration plants. Other technologies which will require similar scale and focused support include solar thermal power, distributed grids, power storage, advance flood management and low carbon vehicle technology. Enhanced international cooperation is needed but must be rigorously prioritised – focusing on portfolios of technologies critical to achieving aggressive mitigation scenarios, and areas requiring large-scale investment with high public good components; especially those with high benefits to developing countries.

The Stern report and the UNFCCC estimate that research, development and demonstration (RD&D) funding into low carbon technology would need to be increased by an additional $10 billion per annum, although it is acknowledged that these estimates are highly uncertain. Taking into account the need for a wider portfolio of technologies to give adequate risk management and funding to accelerate the demonstration of critical technologies, a global RD&D increase of $15-$20 billion per annum would seem a more adequate average for the next 10-15 years. This sum is not without precedent for accelerated public RD&D programmes by the USA alone, as it lies between the peak RD&D spending on the War on Terror ($12bn) and the Apollo Programme ($20bn in 2002 prices).

The unique nature of the climate change problem requires a more active public approach to risk management and investment in a portfolio of low carbon solutions, only some of which will prove successful at a large scale. The market – even with a strong carbon price – will not automatically bring technologies forward at the pace required, and will not account for worst case scientific scenarios or possible policy failures. Climate security is a global public good, and delivery can only be secured by public action working through markets. As with government spending on defence R&D, an interventionist approach is needed to ensure a high probability of delivering climate security; in this way climate innovation policy differs sharply from standard innovation policies focused on increasing national competitiveness.

Developed countries need to shift their national strategic innovation priorities if international cooperation is to be effective

National innovation will not be sufficient, given the global public good nature of low carbon innovation. Action is required at the multilateral level to build on national policies and correct market failures. At the moment collaborative R&D is very weak, outside long term areas such as nuclear fusion. Current national innovation strategies work against effective cooperation as they are fundamentally designed around national competitiveness priorities, not to produce global public goods. For example, out of €1.3 billion worth of projects under the EU's Framework 6 research programme with Chinese participation, only €35 million went to Chinese researchers.[7] Public R&D collaboration is little better between developed countries in the energy area despite many cooperative agreements at the IEA.

A major shift in strategic innovation priorities and approaches will be needed at the national level to make international collaboration on low carbon innovation work at the scale and pace needed. Incentives for enhanced collaboration could be built into the Copenhagen agreement including through co-financing support for collaborative RD&D with developing countries, agreements on reciprocity of knowledge sharing in national R&D programmes, and MRV criteria on collaboration and knowledge sharing for making national innovation support eligible to count against international obligations.

Developing countries require support to build effective innovation systems *not* just narrow technology transfer

Despite accelerated globalisation, technology invention and innovation is dominated by the developed world; even China estimates that over 85% of patents in many of its

7 Vialatte, 2008

core high tech economic sectors are owned by developed country companies.[8] This concentration of innovative capacity in developed countries does not match the distribution of diverse mitigation and adaptation technology needs.

Traditional concepts of public technology transfer follow a relatively narrow approach with limited funding and capacity building support; private sector approaches focus on balancing market access with limited licensing to local industries, including joint ventures. These approaches are unlikely to transform the way low carbon and climate resilient technologies are diffused to developing countries, especially those without fast growing markets. Diffusion of new innovations is as much about the institutions, structures and organisations in a country as it is about narrow funding support to access specific technologies. Recent work by the World Bank[9] shows that diffusion of technologies differs markedly between countries at similar levels of income. Successful diffusion has a strong relationship with core economic attributes such as ease of doing business, trade and FDI flows and tertiary education.

This research suggests that large increases in low carbon diffusion rates can be achieved across countries at differing development stages through an emphasis on system-wide capacity building to improve internal innovation and absorption systems. This approach must be embedded in the Copenhagen mechanisms for technology transfer, through both policy incentives and direct capacity building support.

There is also a need for international support to ensure a wider spread of innovation capacity which can deliver three important types of innovation in developing countries:

- **disruptive innovation** suitable for new business models designed for developing country markets e.g. equipment to support distributed utility models; low carbon building material technology and design;

- **'orphan' areas** of research where developed markets provide few incentives for innovation e.g. drought resistant African crops; small scale desalination;

- **adaptive innovation** to make new innovations suitable for developing country circumstances e.g. adapting gasifiers to local coal sources; making efficient domestic appliances for tropical conditions; advanced biofuel technology for using local feed-stocks.

Developing countries with significant domestic innovative capacity, such as China, India, South Africa, Brazil and Malaysia have a critical role in undertaking innovation in these areas; either individually or in cooperation with developed countries. By

---

8 Liu, J., 2007

9 World Bank, 2008b

acting as pathfinders for new technologies with wide applications in developing countries they can lay the foundations for future mitigation and adaptation action consistent with countries development and poverty reduction priorities. Other developing countries also need support to build their innovation systems in line with their low carbon development pathway plans. The Copenhagen agreement must provide strong incentives for developing country innovation, cooperation, and sharing; not just technology transfer.

Delivering innovation faster and to scale requires the creation of strong new markets for innovative low carbon products and a diversity of cooperation initiatives

Fundamentally, companies will invest in low carbon innovation and accelerate diffusion into new markets if the risk/reward balance is right. While policy discussion often focuses on issues of R&D funding and intellectual property rights (IPR) protection, issues of market creation and regulation are at least as important in driving change in many areas and delivering the right balance of incentives.

The rate of innovation and diffusion is affected by both market conditions such as size and certainty of the market; size and profile of R&D investment; rate of turnover and number of competitors in a sector. For each innovation chain the balance of these factors will determine where barriers to accelerate innovation and diffusion exist. There is no one size fits all policy, but there are a limited set of factors that can be analysed to create a robust and effective low carbon innovation policy in a specific market. Policy instruments agreed at Copenhagen must be able to address the full range of necessary interventions down the innovation chain.

Increasing the size and certainty of the global carbon market will be essential to pull technologies down the innovation chain. However, the carbon market will not necessarily deliver when other barriers prevent uptake of low carbon technologies; this is particularly acute for energy efficiency where market failures are critical. Other mechanisms will be needed to provide market certainty for innovative products and services. Within the UNFCCC framework sectoral agreements have the potential to catalyze such action:

- technology-driven sectoral agreements, as part of developing countries enhanced action commitments e.g. renewable energy standards; niche market zero-carbon building standards and supply chain creation;

- setting international standards and regulation (multilateral or plurilateral) to provide large and certain markets for innovative products and drive down costs;

- innovation in globally competitive carbon intensive sectors such as steel, cement and aluminium where high efficiency and low carbon solutions, including CCS, need direct support for development and deployment.

In many of the key markets for mitigation and adaptation the public sector is a vital actor in driving patterns of consumption, either through regulation or public procurement; for example, infrastructure, buildings, vehicle standards and public transportation. Public sector purchasing agreements are a vital tool to accelerate innovation and diffusion in these key sectors, but have not been used that widely to date.

The need for tailored approaches to accelerate individual low carbon and climate resilient technologies in particular markets argues for a flexible approach to including these in the Copenhagen framework. Bilateral and regional cooperation agreements should be "registered" in the UNFCCC framework if they conform to agreed criteria, rather than an overly centralised approach where all cooperation passes through a UN process which will become a bottleneck for action and potentially inhibit innovation.

A failure to constructively tackle IPR and competitiveness issues will limit the pace of innovation and diffusion and potentially poison the international climate negotiations

In addition to market issues, technology specific IPR related factors (such as the ratio of R&D to total costs, ease of copying and IPR enforcement; and patent application standards and processes) also affect the rate of innovation and diffusion. The vast majority of patents are held by private firms; on average business enterprises held nearly 80% of patents over the period 2003-2005. Climate technologies and systems will provide significant high value-added industries to the countries that gain a comparative advantage in their development and production. There is a clear – and already apparent – tension between the desire to secure these economic benefits and the need to maximise technology diffusion to protect the global climate; as shown by the discussions over whether to include projects in developing countries inside the proposed EU CCS demonstration financing instrument.

It is also clear that without effective returns from intellectual property the private sector will not continue increasing its investment in low carbon technology; with estimates of up to $9 billion just in venture capital financing as of mid-2008 (up over 30% from 2007).[10] As a proportion of global venture capital investment, it has grown up from just 1.6% of total investment in 2003 to 11% in 2008.

There is a need to explicitly revisit the balance of incentives for private innovation

[10] The Financial (2007); Environmental Finance (2008)

with those for maximising public benefit; to develop an appropriate and effective "social contract" around low carbon and climate resilient innovation. The tendency in the global climate negotiations to reduce this to the issues of transferring or purchasing IPR polarises the interests of Parties and prevents creative solutions emerging; this could have serious consequences for progress of the overall agreement.

Research carried out for this report showed that there are very few well founded empirical studies examining the role of IPR in the diffusion of particular low carbon technologies. Extensive interviews with technology experts and companies showed that most views were guided by anecdote and assumption, rather than evidence. Therefore, there is currently no sound basis for any definitive statements that IPR is - or is not - a barrier to low carbon technology diffusion across the range of key technologies. Primary research is still ongoing to provide better evidence in some low carbon sectors.

From the available evidence some conclusions can be drawn on how IPR protection may impact diffusion across different technologies, and why a flexible approach should be taken when dealing with climate related innovation and diffusion. For example, in pharmaceuticals IPR is absolutely central to the industry's business models as a single patent or copyright can capture the majority of returns for the innovator; this type of case may be relevant for biofuel catalysts, GM crops and advanced materials in turbines and fuel cells. However, in other sectors the importance of IPR may be limited either through the ease of reverse engineering processes (e.g. in information technology) or because competitive advantage is concentrated in tacit knowledge associated with its production; many complex power plant technologies seem to exhibit this structure. A final case is where a large number of small patents are used in a process, often referred to as a 'patent thicket'. Where a single company holds the majority of the patents this can create significant access issues; these cases are often seen in vehicle sector associated with pollution control technologies.[11]

Though concerns are often raised over the cost of IPR limiting access to technology in developing countries, this barrier may only apply to a small number of low carbon technologies such as catalysts. From interviews with technology companies, a more prevalent barrier to diffusion in low carbon technologies seems to come from companies restricting licensing of advanced technologies in developing countries through fears they will lose control of IPR and face export competition in home markets. This may occur even when agreements have been signed to prevent this; as has been seen on some pollution control equipment licences in China. However, while genuine risks exist, in some cases companies also seem to have strategically withheld or delayed technology from certain markets in order to maximise profits. This is not a sustainable strategy for addressing climate change as manufacturing of low carbon

[11] Barton, 2008a

technologies must be widely spread into developing countries if required rapid diffusion rates are to be achieved.

Action is required to break the deadlock between developed and developing countries over intellectual property. There is no firm evidence of how IPR impacts diffusion across climate technologies, and available case studies show a wide range of different scenarios. Despite disputes over issues like compulsory licensing at the UNFCCC, in reality all countries already employ a variety of contractual and legal structures to ensure the diffusion of beneficial innovation; especially when R&D has benefited from public financing and public goods are involved. For example, the EU has strict requirements on the diffusion of IPR when companies receive State Aids subsidies.[12] There is no absolute system of IPR protection in any country and historically compulsory licensing has been most prevalent in countries such as the US and Canada.

A rebalancing of the system under the UNFCCC could be based on the principles of 'protect and share'. Where IPR would be protected from unauthorised use by strengthening implementation of IPR protection systems; while balancing this with a clear framework requiring different forms of sharing through, for example licensing and parallel markets and "pay to play" agreements to meet the climate challenge. Access to international R&D funding and credit for national R&D programmes for all Parties could be made conditional on implementation of these agreed principles for protecting and sharing IPR.

Finally, although ensuring future innovation is very important, the urgency of moving to a global low carbon economy within a very limited timeframe requires that the balance of the global innovation system must be to maximise the rate of diffusion. Any potential disincentives to technology developers which could result should be balanced by targeted public incentives for continued R&D and segmented markets for new innovations. Markets must be designed to give greater incentives for continued innovation rather than to continue reaping earnings from past inventions.

Proposals for action: a new institutional framework for low carbon innovation

The analysis in this report points to critical features needed in the UNFCCC system:

- A focus on increasing absolute levels of both innovation and diffusion for adaptation and mitigation, through outcome based strategic approaches based on mitigation pathways and worst case scenarios of climate responses and impacts;

- The need for action both within the UNFCCC framework and outside it to ensure

---

[12] For example see the Norwegian Ministry of Petroleum and Energy, 2006 and EFTA Surveillance Authority, 2008

healthy diversity, and encourage continued work on innovative approaches at the regional and national level;

- The importance of developing overall innovation systems for low carbon development and the use of sectoral approaches to engage all stages of the innovation chain to accelerate technology development and deployment;

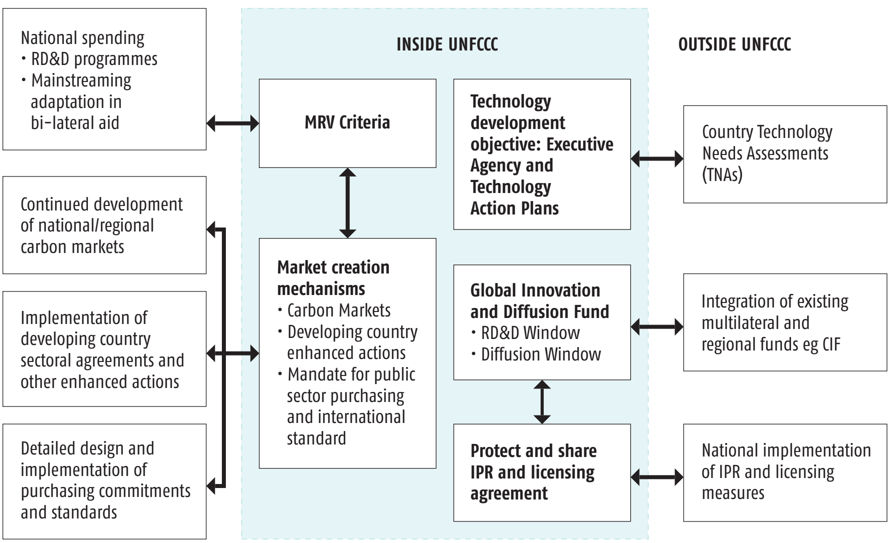
- The importance of supporting developing countries and international institutions in driving appropriate innovation in areas vital for developing economies;

- The need to explicitly rebalance the incentives for innovation and diffusion, including around the use of intellectual property rights, inside the UNFCCC.

The report below sets out a comprehensive set of proposals for action within the UNFCCC that builds on existing policies and measures to produce a framework for transforming innovation systems and delivering a 2°C world.

Given the weakness of current international cooperation in this area, and the lack of an existing competent multilateral body, the analysis also implies that new institutional structures will need to be established under the UNFCCC in order to organise and administer such an ambitious programme; especially on priority areas for international technology development and regional diffusion programmes.

Figure ES1: Breakdown of proposed action within and outside of the UNFCCC



Within the UNFCCC we recommend five key actions:

1. **Agreement to a Technology Development Objective:** The technology development objective would establish a set of critical climate change technologies (for both mitigation and adaptation) which must be developed to meet the goals of the agreement. The achievement of the technology development objective would be supported by a set of Technology Action Plans (TAPs) for each identified technology and a Technology Development Executive. The role of the Executive would be to monitor global efforts to deliver a portfolio of critical technologies – including public and private efforts - and propose complementary support and activity at the multilateral level needed to deliver agreed technology outcomes.

2. **Establish criteria for measurable, reportable, verifiable (MRV) action:** The MRV criteria should set out the conditions under which national R&D and development spending by developed countries – including on sectoral agreements – would qualify as a contribution to their UNFCCC commitments on technology, financing and capacity building support. These conditions would need to be carefully negotiated but could contain the following main elements: additionality to existing ODA and R&D spending; reciprocal knowledge sharing with other related R&D programmes; demonstrable link to a developing country's low carbon development plan; meeting criteria for enhanced developing country access to new technology; increasing developing countries' capacity to innovate and adapt; and climate proofing ODA.

3. **Market creation mechanisms:** Market creation mechanisms could include: technology-led sectoral agreements for developing country enhanced actions; international standards agreements; and public sector purchasing commitments. These may be developed inside or outside the UNFCCC system, but must be guided by its principles and procedures if they are to count towards Parties' commitments.

4. **A new multilateral Global Innovation and Diffusion Fund:** In order to implement the Technology Action Plans the Copenhagen Agreement should establish a new Global Innovation and Diffusion Fund. This fund could integrate existing activity (e.g. the World Bank Climate Investment Funds) through two windows under the new Technology Development Executive described above:

    - **The Research, Development and Demonstration (RD&D) Window:** This would be responsible for the development of new technologies with a focus on applied research and demonstration to push new technologies down the innovation chain, adapt them for use in developing countries and address orphan innovation areas;

- **The Diffusion Window:** This would be responsible for wide-scale uptake of new technologies including direct financing; patent buy-outs; and capacity building to ensure developing countries have the supporting systems necessary to use new technologies.

5. **A 'Protect and Share' agreement for IPR and licensing:** The agreement would provide government-to-government commitments to 'protect and share' low carbon technologies and encourage joint-ventures and public-private partnerships. Support would be made available under the Fund to strengthen IPR protection measures in developing countries, consistent with their existing international commitments under WIPO and WTO. Enhanced IPR protection would be balanced by a Framework Agreement for the accelerated sharing and licensing of low carbon technology to ensure rapid diffusion. This could consist of a range of standardised agreements covering five main areas:

    - Segmented/Parallel markets: to provide free licensing in certain developing country markets but prevent re-importation to developed countries for a limited period of time so innovators can earn a fair rate of return;

    - Public sector buy-out: to provide advanced purchase commitments under the Global Technology Innovation and Diffusion Fund for 'orphan' areas of research to guarantee a return to innovators and swift deployment of technology;

    - "Use it or lose it" agreements (compulsory licensing): to allow countries to take legal steps for the compulsory licensing of technology if innovators withhold technology from the market after a certain time period;

    - Pay to license: to provide direct subsidies or risk guarantees to increase licensing, and to ensure access when public funds are used to develop technology;

    - Global commons: to allow countries to provide open access to IPR where they have control of patents.

Countries that were found not to robustly protect low carbon IPR would risk having their access to the diffusion and RD&D funds blocked. Countries failing to ensure enhanced sharing of IPR and cooperative R&D spending would also be blocked from international funding and lose "MRV credit" in the agreement for their relevant technology programme.