

**UK-INDIA COLLABORATION TO OVERCOME BARRIERS
TO THE TRANSFER OF LOW CARBON ENERGY
TECHNOLOGY: PHASE 2**

Scoping Phase Outline and Approach

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1. INTRODUCTION

This report outlines the approach being taken to the initial scoping phase of the UK-India Phase II study. This draws on a combination of the initial project proposal, the Steering Group meeting held in Delhi in September 2007, the workshop held at the UNFCCC COP in Bali in December 2007 and the project kick-off meeting held in March 2008 a week after the project contract was finalised.

The scope of Phase II is defined around three main tasks:

1. The development of a taxonomy of barriers to low carbon technology transfer;
2. Further work on intellectual property rights (IPRs), including the development of policies that could help to overcome IPR barriers; and
3. Developing recommendations of mechanisms and technologies to foster joint research, development, demonstration and deployment (R,D,D&D) between developed and developing countries.

Detailed descriptions of these three main tasks and the ways in which the different tasks overlap with one another are provided below.

i. Taxonomy of barriers to low carbon technology transfer

This first task will develop the context for the Phase II study. The selection of case studies for Phase I was based on the taxonomy illustrated in Figure 1. This taxonomy acknowledges the fact that many low carbon technologies are pre-commercial or supported commercial. A key implication of this is that low carbon technology transfer will be vertical (from RDD&D to commercialisation) as well as horizontal (from one country to another). The barriers to horizontal technology transfer will therefore be affected by whether or not there are also vertical transfer issues involved.

Figure 1. Taxonomy for selection of low carbon technologies for case studies used in Phase I

Sectors	Status of technology		
	<i>Pre-commercial</i>	<i>Supported commercial</i>	<i>Commercial but slow diffusion</i>
<i>Low-carbon power generation technologies</i>	Coal gasification including IGCC	Biomass including fuel supply chain issues	Improving combustion efficiency
<i>Network / infrastructure technologies</i>			
<i>Low carbon end use technologies</i>	LED lighting	Hybrid vehicles	

The taxonomy that will be developed in Phase II will go beyond the taxonomy developed in the first study. The aim will be to develop a more detailed view of the extent to which barriers (and policies to overcome them) can be related to particular types or classes of low carbon technology. The desired output is a practical framework that decision makers can use

to guide their thinking on the likely issues that will be encountered during specific technology transfer initiatives and what actions could be taken to overcome them.

The task will begin by isolating the different criteria for the taxonomy e.g. stage of technology development, sector, speed of deployment etc. The key considerations developed in the initial study will then be used to guide analysis of different potential barriers and approaches to overcoming these.

For example, our initial work highlighted the fact that costs, risks and absorptive capacity are likely to be more important for pre-commercial technologies than commercial, slowly diffusing technologies. We will aim to build on the work of the Carbon Trust which has developed a partial taxonomy of renewable energy technologies (for example their four stages of technology evolution in 'Policy Frameworks for Renewables'). Our taxonomy will not only encompass vertical issues (from RDD&D to commercialisation) and horizontal issues (country to country) but also 'diagonal' issues, involving elements of both vertical and horizontal transfer.

The analysis that will underpin the development of this framework will be guided by the case study analysis undertaken in the initial study. It will also benefit from the analysis of technologies within tasks 2 and 3 detailed below. We will also aim to undertake further case study work on an internationally comparative basis. Selection of cases will be guided by the initial development of the taxonomy. There is potential to compare this with further work on Indian case studies and perhaps Chinese case studies to build a picture of internationally comparative issues.

ii. Intellectual Property Rights (IPRs)

The first phase of work concluded that access to intellectual property rights was important. It also suggested, however, that resolution of IPR issues might be a necessary but not sufficient condition for successful low carbon technology transfer. This task will consider IPR issues in further detail by focusing on a range of specific technologies.

The selection of technologies will include some successes, where IPRs have been an issue, with a focus on how the problems were overcome and will also look at examples where IPR issues were not overcome, and try to explain how these differ from successful examples. Explanations are likely to include a range of factors, including the parties involved in negotiations, how the issues were pitched, differing domestic policy environments in host countries, different commercial interests in industrialised countries etc.

The analysis will be informed by a range of energy related technologies not necessarily limited to low carbon technologies. It may also draw on insights from other sectors such as pharmaceuticals where IPRs have been an issue. Attention will be given to what extent insights from other sectors are applicable in the field of low carbon technologies. For example, the 'research margin' in the prices of energy technologies is typically much lower than for pharmaceuticals implying that IPR issues might be relatively less significant for energy technologies. Legal challenges might therefore typically involve a large firm adopting innovations that (might) infringe patents held by a small firm. Legal actions to protect patents, probably in the US, could offer a means to identify such cases. Large firms can afford the legal costs of a defence more than small firms can afford the costs of prosecution for infringement. The result may be a settlement, abandonment of the action due to the cost, or bankruptcy of the small firm. Since some of the biggest PV manufacturers are very large

firms (BP solar) it might therefore, for example, be possible to find more cases in that industry than in wind or wave energy.

iii. Joint research, development, demonstration and deployment (RDD&D)

Joint RDD&D between institutions in developed and developing countries has been identified as one mechanism to build up technological capacity in developing countries. It may also help to overcome IPR barriers to low carbon technology transfer and deployment. This task will focus on specific mechanisms for facilitating joint RDD&D between developed & developing countries that include private sector involvement. One aim would be to develop assessment criteria for analysing the likely success of different mechanisms. The task will also analyse existing technological capacities in low carbon technologies amongst Indian firms in order to be able to make firm recommendations as to which technologies have the highest potential to benefit from collaborative RDD&D initiatives.

The analysis will explore the experience of, and potential for, ‘win-wins’ – i.e. joint activities that improve technological capacity *and* overcome IPR barriers. One possibility is that the generation of new intellectual property within such joint programmes would provide economic resources for further collaboration. However, thought needs to be given as to how this would work in practice, e.g. what kind of incentive structure would induce private companies to be involved if the IPRs will ultimately be openly available to their competitors?

There has been relative neglect of technology demands/needs in developing countries in the technology transfer debate and this joint RDD&D work would also be combined with attempts to match RDD&D initiatives with identified demands/needs for technologies. This might draw on UNFCCC initiatives such as the TT:CLEAR database, the work of the Expert Group on Technology Transfer (EGTT) and developing country Technology Needs Assessments.

Project timeline and key stages

The project is divided between three key stages, namely a scoping phase, data collection phase and analysis. The timeline for completion of these activities is detailed in figure 2 below. The remainder of this report focuses on outlining activities to be undertaken during the scoping phase.

Figure 2. Project timeline.

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Scoping phase											
Data collection											
Analysis											
Meetings & presentations			Discussion of scoping phase					Discussion of draft report			Present study findings
Reporting			Scoping phase summary			Progress report		Draft findings	Finalising changes to report		Final report

2. SCOPING PHASE AIMS AND PURPOSE

There is a considerable amount of work to be done in order to identify relevant case study material and also to clarify the most effective means by which case study material should be collected and analysed. In the case of the IPR analysis in particular, data identification and collection may not be straight forward. The scoping phase will therefore play an integral role in identifying potentially fruitful cases that the study will focus on as well as developing effective approaches for data collection and analysis. As a result, the activities undertaken during the data collection and analysis stages of the project will be defined to a large extent by the outcome of these initial scoping activities.

A fundamental aspect of the scoping stage will be to consult with relevant individuals and organisations in the UK and India via a series of workshops. This constitutes a key part of the study's outreach strategy and will be integral to ensuring that selected case studies represent the most appropriate options for analysis.

The scoping phase will be broken down around three key aims, namely:

1. Identification of possible criteria for the taxonomy
2. Identification of relevant case studies and methodologies for informing IPR analysis
3. Identification of relevant case studies for informing RDD&D analysis

There will be considerable overlap between the three key aims during scoping and data collection activities. For example, workshops and interviews aimed at eliciting information on the treatment of IPR issues may also yield useful information with regard to joint RDD&D initiatives within the context of specific technologies.

Division of responsibility between SPRU and TERI

Case study selection during the scoping stage will be an iterative process of correspondence between SPRU and TERI with each organisation contributing their knowledge of available contacts and information on different technologies in their respective countries. With regard to literature review, the majority of the theoretical work in this regard has been done during Phase I, but SPRU will add to this in terms of a review of the literature on IPRs and collaborative RDD&D, as well as updating the Phase I literature review with any recently published material. An initial IPR literature review has now been completed by David Ockwell and is available as a separate document. The rest of the literature review will be conducted by the new research fellow that SPRU is currently in the process of recruiting specifically to work on this Phase II study.

Process for assessing case studies

Below is a list of all possible case studies that have been suggested so far (in the proposal, the steering group meeting and the Bali workshop). TERI is in the process of looking through this list and corresponding with SPRU as to which they think have most potential to benefit the analysis during the study.

Assessment criteria

The case studies need to be selected so as to inform the aim of the study which are:

1. Development a taxonomy of barriers to low carbon technology transfer;

2. Conduct further work on intellectual property rights (IPRs), including the development of policies that could help to overcome IPR barriers; and
3. Develop recommendations of mechanisms and technologies to foster joint research, development, demonstration and deployment (R,D,D&D) between developed and developing countries.

Within this context, the scoping stage of the study aims, via a combination of desk based research and interviews, to:

1. Begin to identify possible criteria for the taxonomy of barriers
2. Identify relevant case studies and methodologies for informing IPR analysis
3. Identify relevant case studies for informing RDD&D analysis

Things to bear in mind when selecting case studies are:

- How much information is likely to be readily available regarding the technology?
- How likely is it that industry representatives in India and in the host country will speak openly with the project team? TERI has a key role to play in this regard. Members of the Steering Group may also offer assistance in this regard.
- Are there any technologies or sectors (e.g. Indian SMEs or the Phase I case studies) that the research team has existing expertise in / knowledge of and that would therefore be likely to yield greater insights or easier access to industry via existing contacts?
- It is anticipated that the identification of criteria for the development of the taxonomy will develop organically via cross-fertilisation from the case studies that form the basis of the other two topics (IPRs and joint RDD&D). However, it is still important to question at this stage whether there are any issues that might warrant investigation with regard to the taxonomy which require looking at specific technologies for this purpose.

More specifically, for the IPR case studies need to span the following areas:

- Energy technologies, not necessarily low carbon
- Technologies where IPRs have been prohibitive
- Technologies where IPRs have not been prohibitive
- Comparisons with other sectors e.g. pharmaceuticals, steel

Possible case studies

Possible case studies are listed below. This is intended to facilitate discussion and guide investigation during the scoping phase rather than to form an exhaustive list either of possibilities or concrete proposals. Based on the assessment criteria above, the case studies do not yet cover all the desired criteria so additional suggestions might be required.

A decision also needs to be made as to how many case studies we need / are feasible to look at. At this stage, however, it is probably best to begin by analysing which case studies are most likely to be most informative against the aims of the study.

A final point that was raised in the kick off meeting was the need to distinguish between case studies and generic issues. For example, regarding IPRs, as well as case study technologies the team may also wish to research potential new approaches to changing IPR regimes.

IPRs

These include those listed in the kick off meeting followed by those that were flagged up in the Bali workshop:

- LEDs
- Biomass – as discussed in the meeting, this might focus on biofuels and will need some judgement with regard to the political interest / controversy over this technology
- Hybrid vehicles
- IGCC
- Underground coal gasification
- Wind turbines
- Biomass pellets
- Indian SMEs – perhaps the foundry industry including technologies such as heat and/or renewables
- Industrial/power sector thermal technologies – TERI suggested in the kick off meeting that there was not much more to learn by focussing on these technologies. It was, however, suggested that supercritical technologies are generating a lot of interest at the moment and it would be interesting to understand the extent to which IPRs are an important issue here.
- Building sector technologies e.g. insulators & advanced chillers
- Non-CFC / low global warming potential refrigerants
- Conversion of cellulose to glucose for fuel cells
- Solar PV
- The may also be currently commercially viable technologies where cost is not prohibitive that the team could look at to understand why IPRs have/haven't been an issue

Bali workshop outputs (together with contact details of people who suggested the case studies if provided – note that these are the views of participants and are yet to be corroborated by the project team):

Examples where IPRs HAVE been a barrier to technology transfer:

- GEF supported concentrated solar power plants have been very slow to develop in part because the price offered by the bidders was much higher than GEF expected. Maybe this is the cost of proprietary knowledge of the four manufacturers?
Cedric.philibert@iea.org
- Possibly the transfer of catalytic converters
- Pharmaceuticals
- New advances in solar (recent activity in U. S. might incite change in the composition of solar capture)
- IT
- The Creative Commons licence used in the arts industry has been successful and may warrant investigation

Examples where IPRs HAVE NOT been a barrier to technology transfer:

- Free software
- Some life-saving drugs and HIV aids drugs have been exempted from IP protection

- Similarly some high yielding varieties of crops have been exempted from IP (Vivek Kumar, TERI).
- Solar powered LED products.
- Almost every technology that has been used in CDM projects
- The expansion of solar water heaters in China, often a model (evacuated tubes) originally developed by an Australian university. No patents were ever secured. cedric.philibert@iea.org
- Wide scale dissemination of PV home systems in many developing countries.
- The GEF projects for efficient industrial boilers (coal-fired) in China. The IP relative to manufacturing these boilers were bought by the GEF and given to three Chinese boiler makers. cedric.philibert@iea.org
- Waste water management.
- Renewable energy development.
- According to the ICTSD (John Barton) study they have not been a barrier to transfer of biomass, solar or wind to India, China and Brazil.

Other sectors worth looking at to understand IPRs and low carbon technology transfer:

- Agriculture, GM
- A recent World Bank study highlighted an initiative in the agriculture sector (CGIAR) that use local centres of expertise to develop and deploy improved strains of crops - deemed a success.
- Perhaps the multimedia industry and the problems it is facing.

Joint RDD&D

Again, these include those listed in the meeting followed by those that were flagged up in the Bali workshop. For all of the technologies below the team need to make a call on specific technologies under these different initiatives. Specific technologies that have been implemented in India as a direct result of a collaborative agreement would also be desirable to identify.

- Public-private R&D by US DoE (e.g. FutureGen)
- Public-private task forces under Asia Pacific Partnership
- IEA Implementing Agreements
- IEA's Networks of Expertise in Energy Technology (NEET)
- Private multi-utility research by Electric Power Research Institute
- Joint R&D under EU framework projects
- Photovoltaic Market Transformation Initiative (PVMTI)
- Refrigerants (Montreal Protocol/Technology & Economic Assessment Panel, TEAP)
- Bilateral programmes on clean technologies in Indian SMEs (this is an area TERI has a keen interest in and has already built up significant research expertise)

Bali workshop outputs (together with contact details of people who suggested the case studies if provided – note that these are the views of participants and are yet to be corroborated by the project team):

Examples of collaborative RDD&D mechanisms that are worth researching:

- IEA agreements
- US international programmes on hydrogen, methane and CCS

- Bill Gates funded projects on developing HIV vaccines
- ITER model (nuclear)
- CGIAR (agricultural network)
- EU CCS platform
- G2G
- Collaborations between national labs
- CCS (although note high upfront capital costs imply need for long-term IP protection)
- AUTM (Association of University Technology Managers) also involved in encouraging collaboration between developed and developing country research institutions
- Solar steam generation for cooking in large kitchens “Sadhia-Solar-India” (holger.liptow@gtz.de)
- Novartis in Singapore with regards to pharmaceutical products for tropical/developing country diseases
- Honeybee - a low-tech collaboration initiative in India
- A current WIPO project which has created R&D networks with shared “hubs” of IP services/resources in the health sector in six central African countries and in Colombia (Elizabeth.march@wipo.int)

Sectors that have the most potential to benefit from joint RDD&D:

- Halophytic biofuels.
- Distributed generation. There is a clear need for wider deployment (and probably developments) of technologies that allow power grids to support both large central and dispersed small-scale energy generation.
- Depends from where you come. Households (decentralised infrastructure) from a developing policy vein. Industry (production) coming from the other side of the economy.
- Second and third generation biofuels.
- CCS
- Agriculture.
- Water.
- Adaptation to climate change by engineering projects.
- IT sector has much to gain. Many firms operate in this sector without resources or know how to build effective IP portfolios.
- Sectors where very early emerging technologies, not well resourced, no clear pathway (Merylyn Hedger IDS)
- Public transportation.
- Remote sensing.
- Mixed fuel vehicles.
- Improvements on two-stroke engines.

Taxonomy

In addition to the above, the team need to analyse what criteria might be used in the taxonomy. The case study selection matrix for Phase I looked at stage of technology development and sector. There may be other criteria that need consideration, as well as specific technologies that might inform assessment of these criteria.

Barriers in supplier countries

The team has taken on board the comments of the Steering Group that that the study, unlike Phase I, ought to try and understand barriers that stem from supplier companies / countries in the technology transfer process.

Knowledge transfer activities

In an effort to maximise knowledge transfer between TERI and the University of Sussex, it has been agreed that, as well as the planned visits from SPRU to TERI, two members of TERI will visit SPRU in June 2008 when the scoping stage is due to be finalised and an interim report produced. This will provide an opportunity to discuss project findings to date, provide an opportunity for TERI to present a seminar in SPRU which will be open to others from the University, including IDS, and provide opportunities for meetings between TERI and various relevant individuals at Sussex who are not involved in the UK-India study but would benefit from such an interaction.