REPORT ON GLOBAL WARMING AND ASSOCIATED IMPACTS

(PHASE V)

TATA ENERGY RESEARCH INSTITUTE
NEW DELHI

ARC HIV 97265 phase 5
REPORT ON GLOBAL WARMING AND ASSOCIATED IMPACTS

(PHASE V)

Submitted to the
International Development Research Centre, Canada

Tata Energy Research Institute
New Delhi
Examining the Replacement of coal by natural gas in utility and industrial application

Ms Mala Damodaran
### Project Team

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Prodipto Ghosh</td>
<td>Senior Fellow</td>
</tr>
<tr>
<td>Dr Ligia Noronha</td>
<td>Fellow</td>
</tr>
<tr>
<td>Dr Ajay Mathur</td>
<td>Fellow</td>
</tr>
<tr>
<td>Ms Amrita N Achanta</td>
<td>Research Associate</td>
</tr>
<tr>
<td>Mr Akshay Jaitly</td>
<td>Research Associate</td>
</tr>
<tr>
<td>Ms Mala Damodaran</td>
<td>Research Associate</td>
</tr>
<tr>
<td>Ms Neha Khanna</td>
<td>Research Associate</td>
</tr>
<tr>
<td>Ms Prema Mahadevan</td>
<td>Private Secretary</td>
</tr>
<tr>
<td>Ms Meena Kumari</td>
<td>Private Secretary</td>
</tr>
</tbody>
</table>
## Contents

I  Examining the Replacement of coal by natural gas in utility and industrial application

II  Legal liability versus Administrative Regulation in Multilateral Approaches to Global Warming

III  An elaboration of the concept of incremental costs of GHGs abatement

IV  Technology transfer and IPRs Issues in Multilateral Approaches to climatic change

V  Strategies to sustain energy efficiency enhancement in India

VI  Energy and Sustainable Development in developing countries: Paradoxes and Constraints
Technology Transfer in the Context of
Global Environmental Issues

Amrita N Achanta
Prodipto Ghosh
1. **Introduction:** Multilateral regulation of the global environment sought to be accomplished through Conventions and Protocols, (for example, the Conventions on Climate Change and Biodiversity adopted at Rio in June 1992, and the earlier Montreal Protocol on Ozone depletion, 1990), involves two broad classes of technology transfer issues for Developing Countries (DCs). First, technology transfers are essential in order that DCs may meet their differentiated responsibilities (not necessarily mandatory) in abating environmental damage. For example, a less greenhouse gases (GHGs) intensive growth path in the case of India and China may involve switches from Conventional Pulverized Coal Thermal Power technologies to more energy efficient or "advanced" Coal Power technologies. Research and Development in respect of the latter have, for the most part, been carried out in Industrialized countries (ICs), whose firms accordingly own the relevant IPRs. Technology transfer from the owners to the relevant agents in DCs will be necessary, and the important questions here relate to the terms (depth) of, who pays for, and how much, for such transfers. Second, most clearly in the case of biodiversity conservation, environmental protection (and perhaps traditional knowledge) will furnish important positive externalities to the process of technology generation (e.g. pharmaceutical products, agricultural crops) and the question is how to enable DCs to realize payments for these external benefits to technology producers. This issue is distinct from the question of paying the opportunity costs of biodiversity conservation. Each of these broad issues is spiked at the core with considerations of equity between nations, and across generations. However, this paper is not primarily an exploration of such equity issues. Injecting a little terminology for convenience, we refer to the first
set of issues as the "transfer question", and the second set as the "rent sharing" question.

In the next section we look briefly at the theoretical under-pinnings of IPRs, including a brief restatement of DCs perspectives.

2. **Theoretical Basis of IPRS:** The standard justification for grant of property rights over intellectual property is that such rights furnish incentives for creative work. Further, such rights are sought to be fine-tuned so that the incentives maximize the difference between the value of the resulting intellectual property and the social cost of its creation, including administration-and transactions costs. In other words, the specifics of IPRs regimes are designed to realize economic efficiency. Some further questions are involved:

   First, IPRs regimes are premised on the belief that prospective financial returns in fact drive private creators of intellectual property. In other words, that such private creators will have sufficient incentives only if they have the ability to capture at least some of the value that users place on such property: If they are unable to do so, the amount of innovative activity may be inefficient.

   Second, there is the issue of whether innovative activity takes place at least social cost. This may depend upon the extent to which creators may borrow ideas or concepts from earlier work. For example, rights to "derivative work" are typically vested in the authors under copyright law, resulting in increased costs to subsequent authors.

---

1The following discussion borrows from Besen and Raskind (1991).
Third, somewhat related to the second issue, is whether the IPRs regime maintains a proper balance between creating and disseminating intellectual property. A particular incentive structure may result in resources being assigned to the creation of many new works. If however, these innovations are not widely used, the net societal benefits may be less than in the case where fewer resources are employed in creativity, but the intellectual property created is more widely disseminated. This issue focuses attention on two important questions on the appropriate scope of protection. One, what is the optimal duration of IPRs protection, for example in case of patents. Two, what is the optimal tradeoff between the duration and breadth of IPRs protection.

Another way of looking at this issue is in terms of tradeoffs between static and dynamic efficiency. The former would require that innovations resulting from resources invested by private agents be made widely available to all who are willing to pay the (low) marginal cost of dissemination. Accordingly, public policy should facilitate the widespread use of these assets, implying minimal property rights in them. Dynamic efficiency considerations, on the other hand would suggest that with minimal property rights, the creators may not recover their initial investment, let alone attain sufficient returns to motivate them to undertake such chancy activities in the first place. Accordingly, property rights should be stronger ("exclusive") than would be implied under static efficiency.

Formally, IPRs are domestic policy instruments, granted by national authorities. However, since innovations embodied in products (or by themselves) cross borders, the question of IPRs protection in international transfer is important. On the other hand countries have differing perspectives on the socially
optimal tradeoffs between duration and breadth, and indeed, on what categories of knowledge may be conferred IPRs protection. The question of harmonization of IPRs laws across countries and transboundary protection are important current issues of international political economy. A brief account of perspectives of DCs in this debate is furnished below:

2.1 Developing Country Perspectives ²: We take as a model of an IPRs regime incorporating typical DCs concerns, the current Indian IPRs system. This regime diverges from typical OECD countries IPRs regimes in three major aspects:

First, several categories of products and processes are excluded from IPRs protection. These include horticulture, agriculture, and food processes, and medicinal and drugs products. The reasons are that a major part of the population depends on agriculture and horticulture for its livelihood; that the purchasing power of the poor for food is limited; and because basic health care is scarce.

Second, while the system rewards innovators, it is not intended to confer monopoly rights in manufacture or imports. Accordingly, the regime permits compulsory licensing for working patents in India.

Third, the regime seeks to promote diffusion of existing technologies and innovation of technologies which create economic opportunities for a late industrializing economy. Accordingly, in several sectors (e.g., pharmaceuticals) processes may be protected while product patents are disallowed, facilitating the

² This subsection relies on Nayyar (1992)
wider use of the products as well as local R&D in alternative manufacturing processes.

These features of the Indian IPRs regime, are at bottom, expressions of equity and (technological) development concerns. Equity within the society is sought to be realized teleologically, focusing on the need to enhance entitlements to basic needs by the poor, particularly in respect of livelihood, food and medicine. This is attempted to be accomplished through the IPRs regime itself, rather than a separate overall policy framework for social welfare. Accordingly, in pursuit of equity, property rights (in respect of both duration and breadth) for creators is weakened.

The second policy imperative, that of facilitating technology development, derives from the fact that comparative advantage across countries based on knowledge requires a policy framework which accelerates knowledge (and skill) acquisition. Accordingly, this policy objective justifies narrower IPRs protection, besides exclusions from patentability.

These considerations are sought by DCs to justify differentiated IPRs regimes in ICs and DCs.

DCs scholars have argued that the draft agreement on IPRs at GATT (the "Dunkel Draft") neglects these concerns, focusing instead on the interests of ICs. Thus the proposal "seeks to expand the scope of the IPRs system, increase the life of privileges granted or rights conferred, extend the geographical spread where the privileges or rights can be exercised, reduce the restrictions on the use of rights conferred and, above all, create an enforcement mechanism with retaliation across sectors" (Nayyar, 1992). More specifically, exclusions from
patentability would be restricted to life-forms, implying that exclusions on product patents would be disallowed. Further, the burden of proof in suits for violation would be reversed with the onus on the alleged infringer. In addition, compulsory licensing would be severely restricted, and imports deemed as working the IPRs. The period of protection would be extended (from 14 currently in India) to 20 years. These are important deviations from, for example, current Indian patent law. Serious consequences are prognosticated: Essential technologies may become unaffordable; the emergence of domestic technological capacity may be stymied; transfers of technology may be retarded; and restrictive business practices by TNCs may increase. These impacts would accentuate inequalities between ICs and DCs.

Some other scholars (e.g. Sengupta, 1991), on the other hand, have argued that strengthening IPRs protection in DCs (albeit not on the lines of the Dunkel draft) would ensure continued Foreign Direct Investment. This is because of a perception in the international business community that investing in countries with weak IPRs protection is risky. Empirically however it has been noted, that the laws governing foreign investment and technology transfer, as well as the general industrial environment, play a greater role in determining investment and technology flows than IPRs protection levels. Accordingly strengthening IPRs protection may neither adversely affect developmental concerns, nor necessarily attract foreign investment and technology flows.

In the next two sections, we present descriptive accounts of some key IPR instruments, as well as modes of technology transfer.
4. **Principal types of IPRs:** The two principal types of intellectual property, relevant for technology transfer in the global environmental policy context are "patents" and "trade secrets".

4.1 **Patents:** A patent may be granted by designated public authorities in a country on "any new and useful process, machine, manufacture, composition of matter, improvement and plant as well as to new, original and incremental design for an article of manufacture" (Chisum, 1989). In India, patents are granted under the Indian Patent Act 1970, which was based on the report of the Tek Chand/Iyengar Commission on the subject. There are important departures in the Indian statute from typical patent laws in OECD countries, relating largely to duration, and patentability, i.e., exactly what kinds of innovations may be patented. These differences are discussed elsewhere in this paper. What exactly are the terms of the property right conferred on a patent holder? In exchange for disclosure of the subject matter of the innovation to the public (which would include actual and potential rivals), the patent holder (patentee) is enabled to exclude all others from making, selling, or using the subject matter of the patent for a specified period. During this term, any use of the subject matter of the patent requires permission of the patentee, usually by means of a license involving royalty payments. The patentee can even prevent an independent subsequent inventor of the same subject matter from making, using or selling it. At the end of the period of protection, the subject matter enters the public domain.

Many questions about patents are still widely debated. There is little agreement among economists on the impact of patent protection on the growth
of technology (Kitch, 1986), or on the optimal (dynamically efficient) duration of patents (McFetridge and Ratiuzzaman, 1986). Further, the evidence on whether patents have helped cartelization is inconclusive (Hall, 1986).

Patents are frequently the subject of court proceedings, often by suits by patentees alleging infringement. Courts may interpret the patent claim literally, or infringement may be found if there is a "substantial, functional identify between the patent claims and the contested item" (Besen & Raskind, 1991) i.e., the "doctrine of equivalents". In fact, one important legal issue is whether a patent effectively covers more than the literal disclosure in the patent application, or also includes the prospective technology that follows.

Four principal lines of defence are open to alleged infringers. The grant of the patent may itself be challenged as, first lacking the requirements of novelty and non-obviousness. Second, fraudulence by the patentee may be alleged by misrepresenting the prior art in the patent application. Third, a patent is invalid if it was patented elsewhere or described in a printed publication. Finally, the "doctrine of misuse" relates to the use of a patent beyond its statutory scope. For example, if the license involves a tying arrangement, i.e., the licensee must purchase another product from the patentee.

4.2 Trade Secrets: Trade secrets are specific commercial information. One definition (U.S Uniform Trade Secrets Act, 1979) is "information including a formula, pattern, compilation, program, device, method, technique, or process, that: (i) derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by, other persons
who can obtain value from its disclosure or use, and (ii) is the subject of efforts that are reasonable under the circumstances to maintain its secrecy."

Trade secrets are thus, by definition and unlike patents, not disclosed. Trade secret law only protects such information from "improper" disclosure, but not against independent discovery or by reverse engineering (e.g. determining the chemical formula of a pharmaceutical product through chemical analysis). The incentive to create intellectual property protectible as trade secrets derives from their potential value. Trade secrets also differ from patents in respect of subject matter and duration of protection. While innovation or novelty is required of the subject matter for patent protection, commercial value is the sole criterion for protection as a trade secret. Moreover, the duration of trade secret protection is indefinite, limited only by the accident of independent discovery (or improper disclosure).

"Improper" disclosure requires either a breach of duty by an employee (with access to the trade secret) to maintain secrecy. Alternatively, the improper act includes theft, bribery, misrepresentation, commercial espionage; in fact anything that would count as wrongful conduct even outside trade secret law. Relief against improper disclosure includes injunctions and damages.

Clearly, many categories of inventions may be eligible for protection under either patents or trade secrets law (but obviously not both). Although trade secrets law offers lesser protection, because filing a patent application involves heavy transactions costs, while the costs of preventing disclosure of a trade secret may be less, a trade secret is often the preferred course. Alternatively, the disclosure required of patent applications may convey sufficient useful information
to potential rivals engaged in a race for related or for the next generation of innovations.

5. **Modes of Technology Transfer**: Technology transfer is defined as the process by which technology, knowledge and/or information developed in an organization, in a given area, or for a particular purpose is applied and utilised in a different setting or context.

Bell (1990)\(^3\) distinguishes categories of transferrable technology and has identified them as three flows:

i. **Flow A**: Capital goods, Services and Design Specifications embodying technology.

ii. **Flow B**: Skills and Know-How for Production.

iii. **Flow C**: Knowledge and Expertise for Generating and Managing Technical Change.

**Flow A**: Capital goods, Services and Design Specifications: Technology here refers to hardware or machinery and equipment, which is acquired and brought into operational use during investment projects. Other technological and managerial services included in investment projects cover execution of planning and feasibility studies, types of design engineering, project management services, etc.

---

The flow of capital goods and services add to the transferee's production capacity, or in the case of equipment designs, provide domestic capital goods producers with specifications for setting up similar facilities.

**Flow B: Skills and know-how for production:**

Included in most technology transfer agreements is the flow of know-how required to operate and maintain new or improved production facilities. There are two main components in this flow:

**a. 'Paper embodied technology':** in the form of manuals, schedules, flow charts, including operating procedures, maintenance and repair procedures, routine quality control, and possibly procedures for marketing outputs and purchasing inputs.

**b. 'People embodied technology':** refers to knowledge and expertise required to carry out procedures, which in turn includes training of individuals in requisite skills, or in dealing with situations not covered in manuals and routines.

This flow (which includes know-how and expertise) also adds to the production capabilities of the transferee.

Although Flow A and Flow B add to the production capacity of the transferee, they do not contribute substantially to his 'technological capacity'. Neither do the transfer of capital goods or of know-how (which aid in production of a product) add to the expertise and experience required to change,
adapt and develop the product or process in the future. The prospects of subsequent improvements are neglected in Flow A or Flow B.

Flow C: Knowledge and expertise for generating and managing technical change ("Know-why"):

Like Flow B, it also consists mainly of information and people embodied knowledge and expertise. It differs from Flow B, in that it is concerned with changing technical systems. There is obviously some overlap between Flow B and Flow C.

The depth of knowledge and information about the technology in Flow C would be greater than that required for routine operation and maintenance. The other (and crucial) component is the expertise required to undertake various engineering design studies, or the evaluation of alternative plans and designs, or the incorporation of technology in improved production systems. Through this flow, continuous technical change could be realized in existing production facilities.

The transfer of technology can occur from a supplier to a recipient by various mechanisms. The modes of technology transfer may be classified as commercial or non-commercial. Commercial transfers are contracted primarily through markets, and non commercial transfers occur primarily through non-market institutions.

The principal commercial methods of transfer are:

(1) Direct foreign investment in a host country subsidiary or a joint venture.
(2) Licensing of intellectual property rights, usually on royalty payments.
(3) Technical assistance.
(4) Sale, importation, installation, and servicing of machinery and other capital goods; and
(5) Franchising of consumer goods and services.

Some of the non-commercial methods of technology transfer are:
(1) Advisory groups.
(2) Personnel Exchanges.
(3) Information Dissemination; and
(4) Education.

It must be noted though that successful transfers are usually a combination of several (all) of these mechanisms. The effectiveness of transfer is a function of the stage of technological development, characteristics of end users, its potential for absorption within the recipient country, besides other factors. Two principal commercial modes of technology transfer are discussed below in more detail:

5.1 **Direct Foreign Investment:** Technology transfer is often a component of foreign direct investment, although each may also stand alone. The flow of technology to developing countries has frequently constituted a part of foreign direct investment, typically by large transnational corporations (TNCs).

Technology transfers between affiliates constitute a significant share of such transactions. Transfers involving the parent firm and their branches, or
wholly (or majority) owned subsidiaries are usually done informally, and do not include formal agreement(s). In contrast, when the foreign investment is a joint venture where the local partner is a majority owner, then a formal agreement/license is typically negotiated between the technology supplier and the recipient.

The mechanism of transfer through direct foreign investment may appeal to the supplier because he retains control and earns dividends rather than royalties. Control of the local enterprise is often comprehensive: management, operation and marketing, quality control of products. This facilitates control of the technology itself as a trade secret rather than submitting to the disclosure required by patents. From the viewpoint of the recipient, foreign investment brings in capital in the form of foreign exchange, and the security of the foreign partner's long-term commitment. However, local innovative improvement of the imported technology may be thwarted by the supplier quite deliberately.

5.2 Licensing of Intellectual Property Rights: Technology transfer can occur independently of direct foreign investment by means such as intellectual property licenses.

A patent license transfers to the licensee several of the exclusive rights of the patent. The license is usually obtained by the payment of lump-sum fees or royalty, although other commercial arrangements are also possible.

Such an agreement enables a foreign licensor, unwilling to risk his capital in a developing country, or uncertain of a project's profitability, or unable to invest in unfamiliar conditions, to benefit from his intellectual property holding.
In countries where foreign investment is regulated and local entrepreneurship is strong, technology licensing is increasingly used. Similarly where host country foreign investment laws are restrictive, either in the form of prohibition of foreign equity participation in certain sectors of the economy, or legislation requiring a phased 'fade-out' of foreign ownership in local subsidiaries/joint ventures, it encourages TNCs interested in penetrating these markets to opt for licensing agreements in place of foreign investment. This has been the typical experience in India till recently.

Licensing is also convenient in that it is for a finite duration. From the recipient's point of view, licensing leaves him free of control and interference. The recipient may also benefit from interaction with his own government in ensuring that the agreement is equitable. However, government interference may also result in restrictive licensing arrangements.

Role of Government in Technology Transfer: The role of the government in facilitating transfers of technology should not be underestimated. It is responsible for the economic framework of the recipient country, a factor which would influence investment decisions of TNCs. The signals government gives to industry may discourage or encourage R&D as well as influence modes and depth of technology transfer. Governments are also heavily involved in funding or organizing R&D. In India 80 per cent of scientific R&D is in the public sector, a situation similar to that in France. In the US, Government funding accounts for 50 per cent of the total R&D investments. Further, governments are heavily
involved in setting up the IPRs framework, as well as in negotiating the international IPRs regimes.

India had earlier followed a development path of import substitution, and in an effort to substitute imported technologies, indigenous technological capacity was encouraged by a restrictive regime of technology imports. No significant relationship between protection and degree of innovation has however been observed (Sengupta 1991). Recent policy changes have significantly liberalized technology imports.

IPRs regimes may impact the BOP situations of countries in several ways. First, a strengthening of IPRs may mean that transferees would have to pay increased royalties in foreign exchange. On the other hand a loss of IPRs earnings due to weak IPRs protection in transferees' countries could worsen a trade deficit. For example, it is claimed that the US loses 60 billion dollars a year due to IPRs "violations". Government policy also affects technology transfer through regulation of foreign direct investment, in terms of restriction on import of capital goods, and control of technology licensing. For example, India had earlier insisted on a majority domestic equity share of at least 51 per cent. If however, the transferred technology was closely held, or if the industry was a designated priority industry, or if the industry had a dominant export commitment, the foreign share could go upto 74 per cent.

7. **Appropriate technology**: The technologies under consideration for transfer should be 'appropriate' from the viewpoint of the recipient country. Some of the considerations determining whether a technology is appropriate are first, that it
conforms to the development goals of the recipient country, second it harmonizes with its resource endowments, and third that the conditions under which the transfer occurs relate to its circumstances.

Developmental goals may relate to promotion of self reliance, removal of inequalities in income, increasing employment opportunities etc. Resource endowments relate to availability of natural resources, manpower, managerial skills etc. The prevailing conditions include the existing infrastructure, markets, and other institutional structures.

Accordingly, for example, capital intensive technologies originating in some developed countries are not considered appropriate to India's labour rich economy. Appropriate technologies in this context would include those that are labour intensive, use local materials, are not capital intensive and could be operated on a small scale.

8. **Context of Global Environmental Agreements:** The two global environmental agreements which have important technology transfer implications are the Climate Change and Biodiversity Conventions, both of which were adopted at Rio in June 1992.

   The Climate Change Convention commits DCs to three specific actions:
   
   (a) To prepare national inventories of GHGs emissions and sinks.
   
   (b) To formulate and implement publicly notified plans for abatement and adaptation, and
   
   (c) To minimize any adverse effects of abatement or adaptation measures on the economy, public health and the environment.
Additionally, DCs may submit specific abatement (reduction of GHGs), projects for funding inclusive of technology transfer. In these the DCs are entitled to financial resources, outside of normal developmental assistance, including for transfer of technology. The quantum of assistance is described as the "agreed full incremental costs". If such assistance is not forthcoming, DCs have no commitments.

Technology transfer is thus visualized in respect of both abatement and adaptation measures, and to ensure that any harmful impacts of the measures themselves are minimized. No concessional or non-commercial terms of technology transfer are envisaged; only that the financial component (in the terminology employed) shall qualify as grant. Further, no attenuation of IPRs protection of the technologies are contemplated.

We have noted above that commercial technology transfers may occur in a dense set of modes and their combinations, from direct foreign investment protected by trade secrets, to transfer of in-depth R&D capability ("Flow C") under patent licenses on the other. What exactly constitute "full incremental costs" will clearly depend on the depth of technology transfer agreed to between the parties. On the other hand, in respect of Climate Change concerns, the duration of the technology transfer (in the case of patent licenses), or the geographical limits in which the transferred intellectual property right may be exercised, are relatively uncontroversial. The former must extend to whatever limits apply to the IPR protection itself, because Climate Change is a continuing, long-term concern. The latter must extend to (at least) the boundaries and
national jurisdictions of the transferee, i.e., the limits over which it has abatement or adaptation commitments.

An important issue for future negotiations is clearly the elaboration of "agreed full incremental costs". Negotiations may proceed either multilaterally, involving all ICs and DCs parties, or they may be bilateral, i.e., between particular DCs and the agencies entrusted with administering funding.

On the question of technology transfer, one may expect differences in perception among DCs. Any multilateral approach to the problem may involve various compromises or tradeoffs within the set of DCs (G-77), possibly with linkages to other issues. On the other hand, such cross linkages would be more difficult to establish in direct negotiations, in the case of individual projects between DCs and the administering agencies. In such cases, the strongest (most liberal) interpretation of the scope of such financial transfers would tend to be valued as precedents. Accordingly, before including interpretations of "agreed full incremental costs" on the multilateral negotiating agenda, it would be appropriate to study the strategic bargaining aspects on depth.

Technology transfer issues are also at the heart of the biodiversity convention. At its core, this convention attempts to set up a framework by which access to genetic resources are granted (typically by DCs to ICs) in exchange for transfer of the technology embodying the genetic resource. Because it is physically impossible to deny access to the genetic pool conserved in-situ, the framework stipulates (in the official Indian interpretation) that non-disclosure of the fact of use of particular genetic resources shall constitute a legal wrong. The parties shall
conduct the exchange on "mutually agreed terms", meaning commercial contractual agreements involving royalty payments.

In this case, since what exactly comprises "technology transfer" remains undefined, ICs may endeavour to place the least restrictive interpretation of the term. Apart from depth of transfer, since sharing of IPRs rent are envisaged, questions about duration of transfer and geographical limits over which the licensed (transferred) rights may be exercised are important. Further, because of the contractual nature of the arrangements visualized, little multilateral clarification of the terms of technology transfer are feasible.

It seems that the stipulation of mandatory technology transfer in the framework for contracts confers little advantage to DCs. Apart from the wide room for manoeuvre by ICs that exists in interpreting "technology transfer", we need to note that IPRs rents can be captured equally by licensing IPRs (i.e., by royalties) or by sale of products embodying the technology, (i.e., by dividends). The economics literature would not support a view that IPRs rents visualized in the former case would be substantially lower. On the other hand, if the IPR in question involved a category of trade secrets, any perceived risks of unauthorised disclosure of the technology would lead to a risk premium being added on top of the IPR royalty.

Serious legal issues are raised by the apparent requirement of compulsory disclosure of the source of genetic resources employed, and transferring the "make or license" discretion from the IPR holder to the gene supplier. For one, trade secrets protection may no longer be available. For another, patent protection may significantly lose its exclusionary power. Further, the effectiveness of the new
regime hinges critically on exactly what penalties follow in the event of non-disclosure. If the penalties are not severe, the regime would be ineffective.

A great deal of further analysis would be advisable on the specific legal and economic implications of the biodiversity convention. The document itself is complex, and ambitious. Besides, the question of the framework for contracts, other provisions of the convention are also subject to varying interpretations. The term "agreed full incremental costs" has again been employed in the context of commitments outside the contracts. In particular, in respect of conservation measures, DCs need to ensure that the transfer of funds at least equal their opportunity costs from alternative uses of the biosphere protected.