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TRANSFER OF TECHNOLOGY*

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EXECUTIVE SUMMARY

1. At the thirteenth session of the Standing Committee on the Law of Patents (SCP), held from March 23 to 27, 2009, in Geneva, the SCP asked the WIPO Secretariat to establish, for the next session of the SCP, preliminary studies on two additional issues, namely, the transfer of technology and opposition systems. The present document primarily addresses those issues of technology transfer that have a link to a patent system. It contextualizes various issues relating to the transfer of technology in a holistic manner, and contains no conclusions.
2. Following a general introduction, Chapter II provides an overview regarding the transfer of technology in general. It describes the transfer of technology in the context of innovation, and in particular, different mechanisms, channels and processes relating to technology transfer are explained. It also touches upon different types of parties from and to whom technologies may be transferred.
3. Chapter III sets the scene for the international transfer of technology, which is a recurring topic on the international agenda. It briefly refers to the discussions in the 1970s and 1980s, and reflects upon the current international environment.
4. Chapter IV describes some policy challenges relating to the further enhancement of the transfer of technology. Difficulty in objectively measuring the quantity of the transferred knowledge, complexity of the process of technology transfer and multifaceted factors relating to such a process are some of the major aspects that challenge policy makers. While no one policy may fit all countries, the paper explores some common questions and challenges surrounding the transfer of technology.
5. Chapter V looks specifically into the transfer of technology and the patent system. It describes how the patent system could make positive contributions to an efficient transfer of technology if the system functions in the way for which it is intended. Various possibilities for exploiting patent rights are also described so as to indicate the role of patents in the context of the transfer of technology. Although it appears that no conclusive evidence can be found with respect to the relationship between patent protection and the transfer of technology, the paper introduces some findings from economic studies that look at the effects of intellectual property rights (IPRs), in particular as regards patents, trade, foreign direct investment (FDI) and licensing. There are differences in the use of intellectual property and in other appropriability mechanisms at company, sectoral and country level. While no single IPR policy may provide a solution for all countries, some common questions and challenges are explored in the paper.
6. Chapter VI describes the relevant international agreements, such as the TRIPS Agreement and multilateral environment agreements, under which the role of IPRs in the transfer of technology has been discussed.
7. Turning to Chapter VII, this takes a more in-depth look at different aspects of the patent system, and explores how they can interact with the process of technology transfer. Patents define the scope and ownership of the technology concerned and disclose that technology fully. They have direct relevance to the tacit transfer of technology and the transfer of technology through licensing agreements and the transfer of rights. At the same time, where exclusive patent rights are abused or misused, there could be a negative impact to transfer of technology. Therefore, there are a number of mechanisms that are intended to strike the right balance between the technology producers and technology users, and to prevent abuse or misuse of exclusive rights. Such mechanisms are found in both the patent system

(e.g., exceptions and limitations to the rights) and outside the patent system (e.g. competition law). In addition, IP experts also play an important role in the effective transfer of technology.

8. Chapter VIII constitutes a separate chapter on public-private partnerships, since the role of intellectual property in knowledge transfer between universities and public research institutions on the one hand and the private sector on the other has attracted wider attention at the international level in the recent past.

9. Chapter IX highlights examples of technical tools and institutional frameworks that support the effective use of patent information in the context of the transfer of technology.

10. Finally, in Chapter X, the importance of technology transfer in responding to a global challenge, namely development, is described. In that context, the paper briefly illustrates recommendations under the WIPO Development Agenda.

I. INTRODUCTION

11. At the thirteenth session of the Standing Committee on the Law of Patents (SCP), held from March 23 to 27, 2009, in Geneva, the SCP asked the WIPO Secretariat to establish, for the next session of the SCP, preliminary studies on two additional issues, namely, the transfer of technology and opposition systems.

12. It is understood by the Committee that these issues are not to be considered prioritized over other issues contained on the list which was drawn up during the twelfth and thirteenth sessions of the SCP and is contained in the Annex to document SCP/13/7 (see paragraph 8(c) of document SCP/12/4 Rev.).

13. Accordingly, this document has been prepared by the Secretariat as a preliminary study on the issue of technology transfer for the fourteenth session of the SCP, to be held from January 25 to 29, 2010.

14. The present document primarily addresses the issues of technology transfer with linkage to the patent system. A general description of the transfer of technology, including the transfer of skills, know-how and trade secrets are dealt with in the first part of this document in order to highlight the role of a patent system in transferring technologies. It should be noted that the issues relating to the stimulation and promotion of innovation are not dealt with in this document, although there is an inherent link between the promotion of innovation and the transfer of technology. In the first place, innovation takes place before any transfer of technology. Furthermore, it could be considered that the transfer of technology can be concluded only where a transferee has absorptive capacity to develop further the acquired technology.

15. At the twelfth session of the SCP, it was clarified that the *modus operandi* of the Committee, namely, to move forward along a number of channels, including the preparation of preliminary studies, was agreed upon for the purpose of developing the work program of the SCP (see paragraph 123 of document SCP/12/5 Prov.). With a view to this specific background, this preliminary study contextualizes various issues under a patent system relating to the transfer of technology in a holistic manner, and contains no conclusions.

II. TRANSFER OF TECHNOLOGY: OVERVIEW

16. The term “transfer of technology” may be understood in a narrow or broad sense when used in the context of intellectual property, in particular, patents. Broadly stated, the transfer of technology is a series of processes for sharing ideas, knowledge, technology and skills with another individual or institution (e.g., a company, a university or a governmental body) and of acquisition by the other of such ideas, knowledge, technologies and skills. In the context of transferring technologies from the public sector and universities to the private sector, the term “transfer of technology” is sometimes used in a narrower sense: as a synonym to “technology commercialization” whereby basic scientific research outcomes from universities and public research institutions are applied to practical, commercial products for the market by private companies.

17. Technology transfer increases the stock of knowledge of the transferee, which forms the basis for further development and exploitation of technology into new products, processes or applications. For the transferee, the absorption of a new technology is one of the vital factors which improve competitiveness in the market. In reality, technical superiority may not

necessarily ensure market success and extraordinary profits (it is just one of the factors that determine ultimate market success). A marketing network, branding strategies, business and commercial know-how, such as information regarding consumers' preferences, market trends and customers' details, are all relevant to commercial success. Nevertheless, the importance of technology in adding value to goods and services in the market economy cannot be denied. It contributes to adding value in a commercial chain, enhances competitiveness in the market and fosters a better quality of life. Consequently, in general, technology transfer promotes the dissemination and further creation of knowledge and technology in society at large. The technology recipient may be able to obtain existing public domain technology from the bigger pool of knowledge and adapt such technology to his or her own needs. Where a technology is transferred through a voluntary agreement between the technology holder and the technology recipient, it also enhances cooperation and collaboration between two parties.

18. Indirectly, at the macro level, the transfer of technology enriches the technological basis of a given society or country, widely believed to act as a catalyst for national economic growth. It may contribute to building technical expertise and know-how in the country concerned, encouraging the creation of local industries and increasing competitiveness in global trade.

19. With a view to a shift towards the knowledge-based economy, the assimilation of knowledge and the creation of new technology have become essential elements for companies to survive and grow in the market environment where competition has been increasing domestically as well as internationally. Consequently, many countries have been investing in knowledge creation as a priority under national economic, technological and development policy and strategy. Simply stated, in order to acquire a new technology, there are two ways to do so: either to create such technology by oneself or to acquire it from others. Creating the technology by oneself may have the advantage of having the possibility better to control, in terms of the duration, geographical coverage and scope, the developed technology through intellectual property protection, including trade secrets. It also avoids being dependent on technologies which have been created and owned by others. On the other hand, investment in research and development can be expensive. There is no guarantee that such investment would bring any fruitful results. In addition, if a company has no expertise in the field of technology under research, it may take a long time to develop such expertise. Sometimes, that is not a viable option because competitors' technical capability and the market may develop much faster than the speed of their own research.

20. Another path, that is, to acquire technology from others, is indeed an option if the required technology is available and accessible in a less risky, more efficient and more economic manner. While the importance of self-developed technology for maintaining a competitive edge cannot be denied, the importance of the transfer of technology in the innovation system has been widely recognized partly because of changes in technological and economic environments. Firstly, the technology becomes more complex and develops in a cross-cutting area which goes beyond the traditional fields of technology. The complexity of technology used in a product requires a company to cooperate with others which have expertise in other technical fields. Secondly, the ongoing integration of domestic and international markets through continuing liberalization and de-regulation of markets enhanced competition at the national and international levels. In certain fields of technology, competition within the sector is so strong that new products with new functions and designs appear in the market regularly in a short cycle. To keep up with the speed of technological development and global competition, acquiring new technology from others may allow companies to go beyond their own R&D to find the best technologies, and integrate them into the company's own settings. Consequently, while many companies have been integrating

both mechanisms into their innovation processes, namely, in-house innovation and technology acquisition from others, the latter is used more and more strategically with a view to the company's overall business model. Open and collaborative innovation mechanisms have been explored by many private companies. The strategic cooperation between the transferor and the transferee of the technology may bring mutual benefits to both parties by utilizing the expertise of the other.

21. The process of technology transfer is fundamentally the flow of human knowledge from one human being to another, whether a transferor or a transferee is an individual, an enterprise, small or large, a university, a research institution or any other party.¹ Such a flow of knowledge may occur through various channels as described below. They are neither exhaustive nor mutually exclusive, since various channels may be exploited simultaneously.

22. Through the public domain: Anyone can use and build upon ideas and innovations over which no person has any property rights. In relation to a patent granted in one country, after the expiration or abandonment of the patent in a given country, or in any other country in which a patent has not been granted or has no legal effect, third parties are not required to obtain the consent of the patent holder for the exploitation of the patented invention. However, it should be noted that if the exploitation of the patented invention infringes another valid patent that claims a broader scope of technology covering the said invention, the consent by the owner of such broader patent is required in order to exploit the off-patent invention. Public domain technologies may be transferred through technical publications and literatures or through products that exhibit their embedded technologies. For example, technology may be transferred by studying and examining technologies used in the acquired product (so-called reverse engineering). Such a form of transfer, however, requires an absorptive capacity on the part of the transferee to explore, understand and imitate the embedded technologies. There is usually a learning curve that increases the absorptive capacity by means of repeated "trials and errors".

23. Through tangible and intangible property: Transfer and acquisition of technology can take place with the transfer of ownership of properties, such as a purchase of production lines, an acquisition of a factory or a merger and acquisition (M&A) of a whole company. In many instances, those tangible assets inherently involve both implicit and explicit technological knowledge. In the case of M&A, transfer of intangible property, such as patents, would normally occur together with the transfer of tangible property. This would allow the new patent owner to obtain exclusive rights to prevent others from using, making etc. the patented invention without the new owner's consent. The mere acquisition of a patent *per se*, however, may not play much of a role in transferring new technological knowledge to the new patent owner, since the technological information relating to that patent has already been published by the patent office concerned. On the other hand, actual "use" of the patented technology by the new owner may lead to him or her understanding the relevant technology better and gaining technical know-how related to such technology.²

¹ John Barton, "New Trends in Technology Transfer – Implication of National and International Policy", ICTSD Issue Paper No. 18, 1.4.

² In countries where a broad research exception to patent rights exists, those advantages through the acquisition of a patent may be less relevant. However, there could be certain know-how that can be gained only through the use of the technology at the commercial level, which is not possible under the research exception.

24. Through technology licensing: Technology licenses mainly involve patents, trade secrets and know-how. Simply stated, in the intellectual property context, a license constitutes permission by the IP owner (e.g. of a patent) to another party to conduct one or more activities covered by the exclusive rights under the agreed terms and conditions, such as the amount of royalty payment, the duration of the license, geographical coverage, the scope of use, etc. A patent license *per se* only constitutes permission to use the patented technology in a specific way. However, as previously stated, the actual use of the patented technology by the licensee may facilitate better understanding of the relevant technology and increase the capacity of the licensee to absorb new technology.

25. In general, a licensor is interested in the commercial gain from a royalty payment from a licensee. Therefore, it is in the interest of the licensor to make sure that the licensee can properly exploit the technology and obtain economic benefits. In other words, it is in the interest of the patent licensor that the licensee acquires all knowledge, including tacit knowledge that may not be obvious from the patent document, to utilize successfully the patented technology on a commercial scale and in a profitable manner. Therefore, trade secrets and know-how contracts often go hand-in-hand with a patent license.

26. Technology licenses play a crucial role in joint venture agreements and collaborative research agreements, which are also important ways to transfer technology in a win-win environment. In an increasingly complex world, innovation and rapid market responsiveness are regarded as keys to global competitiveness. These factors have contributed to the development of various initiatives to address research in a more collective way at different levels, with the objective of establishing excellence in research projects and networks that would attract researchers and investments. Joint ventures and collaborative research support the exchange of knowledge, know-how and expertise of researchers participating in the collaboration, and stimulate the creation of new ideas through such exchange of knowledge.

27. Through technology services: One way of obtaining technology and expertise which does not exist in-house is to purchase such technology or expertise from experts via contracts. An individual expert or a consultant firm may render services that support the planning and acquisition of technology. Similarly, a research service agreement may be concluded with a specialized research-based firm from which a company may purchase research results. If both parties agree, it is possible to conclude an agreement that allows a technology purchaser to acquire the ownership of the contracted technology.

28. Through unilateral investment: There are some transfers of technology effects where a unilateral investment is made by a technology holder. For example, foreign direct investment (FDI), such as a company establishing an R&D laboratory in another country, may have an effect of technology spillover to researchers and engineers in the other country. For a firm considering investing in another country, FDI has the advantage of keeping the technology within the affiliated firm. However, permanent or temporary migration of researchers and engineers (technology holders) to the other country and spillover effects to the domestic firms should not be underestimated in terms of a possible knowledge transfer through a tacit channel (see below). In the national context, the establishment of an R&D center in one locality may have a spillover effect for researchers and engineers in that region (e.g., researchers from a technical university in that region).

29. Through tacit channels: Knowledge and know-how may be transferred through observing what others do (such as apprentices learning techniques by observing a master). In the context of international technology transfer, one research paper suggests that learning by doing and subsequent labor turnover is an important channel of international technology

transfer.³ It considers that the international movement of people has a potentially much larger role to play in fostering international technology transfer.⁴

30. Whichever form of knowledge transfer is exploited, knowledge transfer requires an absorptive capacity on the part of the transferee to understand and adapt the technology for his or her own purpose, often in the specific setting of the transferee. Therefore, in the context of successful technology transfer, a number of reports stress the crucial importance of the development of the transferee's capacity through education and R&D and the development of appropriate institutions.⁵

31. Strategies, mechanisms and forms of technology transfer may be different depending on the type of technology to be transferred. For example:

- whether the technology is a proprietary technology (e.g., under patent or trade secret protection) or a non-proprietary technology (e.g., in the public domain, or off-patented technology);
- whether the technology is a mature technology that can be relatively easy to absorb or a cutting-edge technology that involves extensive know-how and tacit skills;
- whether the technology to be transferred is an existing technology or a technology to be developed in the future through, e.g., collaborative research;
- whether a cost-effective alternative technology is available.

32. The transfer of technology may occur between different types of parties. It may be transferred between parties in the public sector, between a party in the public sector and a party in the private sector, and between parties in the private sector. At the outset, whether a party comes from the private sector or the public sector, the transfer of technology occurs where the "needs" of the transferor and the transferee meet. In the private sector, such "needs" might be generated through a market mechanism and competition in the market. Competition in the market, however, may not be an appropriate stimulus for technology holders in the public sector to trade their technical expertise. Many public sector research institutes and universities engage in basic research but not in the commercialization of such basic research results. In the recent past, efforts have been made to explore the potential of transferring basic research results developed by the public sector to the private sector which would apply them to practical commercial products.

³ Bernard Hoekman, Keith Maskus, Kamal Saggi "Transfer of technology to developing countries: unilateral and multilateral policy options", World Bank Policy Research Working Paper 3332, June 2004.

⁴ To avoid brain-drain, the authors suggest encouraging the temporary movement of peoples across borders, with an appropriate environment for the returnees to be able to apply their skills, which in turn depends on the investment climate.

⁵ Commission on Intellectual Property Rights "Integrating Intellectual Property Rights and Development Policy". Evidence suggests that the ability of domestic firms to absorb foreign technology depends on the existence of the in-house R&D capacity (Rod Falvey and Neil Foster, "The role of intellectual property rights in technology transfer and economic growth: theory and evidence", UNIDO Working Papers, 2006).

III. INTERNATIONAL TECHNOLOGY TRANSFER

33. The transfer of technology may occur within national borders or internationally. Since, in general, a bigger pool of technology is available internationally than nationally, international procurement of technology is a natural solution to obtain new technology and to foster new innovation based on the acquired technology, particularly with a view to increasing competition at the global level. Due to a disparity in technological capacity among countries, at the macro level, technological knowledge generally flows from a higher technological capacity country to a lower technology capacity country, i.e., in a simplistic manner, from a party in a developed country to a party in a developing country. Such a description, however, may be too simplistic and static. Hoekman *et. al.* gathered data on the flow of technology trade among high income OECD countries and between high income OECD countries and (i) upper-middle income countries; (ii) lower-middle income countries; (iii) low income countries; and (iv) sub-Saharan states, respectively, and compared the data between 1971 and 2001.⁶ They found that upper-middle income countries constituted the fastest-growing market for technology-intensive exports from OECD countries and, at the same time, they had become suppliers of technology intensive products together with lower-middle income countries. While middle income countries collected royalty income of \$12.7 billion from OECD countries in 2001, the amount collected by low income countries was \$2 billion. Another researcher reported some specific cases where a technology holder in a developing country transferred his technology to a party in a developed country.⁷

34. It is generally agreed that access to technologies required for development is crucial to developing countries.⁸ A number of international agreements contain provisions that express commitments by developed countries to incentivize companies and institutions in their territories to transfer technologies to developing countries. International technology transfer has been a recurring topic on the international agenda. In particular, from the 1970s to the 1980s, the issues relating to the transfer of technology were debated through negotiations concerning a Draft Code of Conduct at the United Nations Conference on Trade and Development (UNCTAD) and a revision of the Paris Convention at WIPO, both of which were unsuccessful. While many would agree that the transfer of technology is a cornerstone for the stimulation of innovation and development, less agreement is found with respect to how that can be achieved. Some scholars note that the transfer of technology landscape has greatly changed,⁹ and that understanding the process of technology transfer has undergone significant changes during the past three decades.¹⁰

⁶ Bernard Hoekman, Keith Maskus, Kamal Saggi “Transfer of technology to developing countries: unilateral and multilateral policy options”, World Bank Policy Research Working Paper 3332, June 2004.

⁷ Some examples are found in Manthan Janodia, D Sreedhar, Virendra Ligade, Ajay Pise, Udupa N., “Facets of technology transfer: a perspective of pharmaceutical industry”, *Journal of Intellectual Property Rights*, Vol. 13, January 2008, pp.28-34.

⁸ For example, Commission on Intellectual Property Rights (CIPR), “Integrating Intellectual Property Rights and Development Policy”; WIPO Development Agenda contains a number of recommendations promoting transfer and dissemination of technology to developing countries.

⁹ John Barton, *New trends in technology transfer*, Issue Paper No. 18, ICTSD Intellectual Property and Sustainable Development Series.

¹⁰ Pedro Roffe, “Comment: Technology transfer on the international agenda” in *Keith Maskus and Jerome Reichman (ed.), International Public Goods and Transfer of Technology Under a Globalized Intellectual Property Regime*.

35. In the 1970s and 1980s, the debate on technology transfer mainly focused on the mechanisms of, and conditions for, technology transactions and on the imperfections of technology transfer processes. Consequently, questions were raised on how to remove obstacles and reduce costs resulting from using market power.

36. In the meantime, globalization and the movement towards free trade have progressed at an unprecedented speed. In many industries, production chains are spread over more than one country. In the international regulatory framework favoring such globalization and free trade, companies in any country have been facing stronger international competition in addition to local and national competition.

37. As the above OECD study referred to in paragraph 33 suggests, some developing countries have acquired a good scientific and technology base, and have become producers of technology. In the analysis of countries that have successfully developed their technological capacity during recent decades, greater attention has been paid to the processes of technological adaptation in the transferred country and domestic technological expertise than to the static mechanism of technology transfer.¹⁰ At the policy level, in the past, emphasis was placed on defensive measures to remedy defects in the international market. However, more recently, market imperfections have been addressed by improving competitiveness and the contestability of the markets rather than by directly intervening in the conditions for technology transactions.¹⁰ There is a general understanding that the determining factors of international technology transfer are complex, and that the dynamic interactions of various national factors, innovation system, market, human resources, etc. need to be taken into account as a whole.

38. Furthermore, there appears to be growing consciousness of the information asymmetry among various stakeholders involved in the process of technology transfer. A technology holder may not be able to determine easily whether any third party is interested in using his or her technology. A potential technology recipient may not be able to find out easily about available existing technologies. For a potential technology recipient, it is difficult to analyze correctly the “value” of the technology before the technology is actually transferred. With the right tool to bridge the needs of potential technology transferor and transferee, globalization could in fact be an opportunity, rather than an impediment for such a transfer to take place.

IV. POLICY CHALLENGES

39. With a view to promoting innovation and technological development, policy makers in all countries have been constantly seeking how to encourage sharing of technological knowledge with others and how to acquire such knowledge from others.

40. One of the difficulties for policy makers in identifying an optimal policy for the transfer of technology in an objective manner is that it is hard to quantify the flow of technology transfer, either within the territory or beyond it. This is because many forms of technology transfer, e.g., spill-over of knowledge or knowledge acquisition through imitation, are simply not measurable. While it is possible to measure the amount of foreign direct investment, there is no guarantee that the quantity of foreign direct investment is in proportion to the amount of knowledge acquired by the recipient country. Similarly, although a patent could be considered a concrete output of the technological innovation, a simple count of granted patents could be seriously misleading if the scope of the claims, different national patent laws and actual exploitation of such patents in the territory are not taken into account.

41. Another significant challenge relating to the transfer of technology is that technology is not like any other commodity that can be bought and sold in the market without consideration of the need for capacity building on the recipient side and the tacit elements required for effective transactions.¹⁰ Technology is neither mere blueprints and formulas nor new and advanced equipment which is easy to move from place to place. Mere blueprints and even machinery have proven inadequate to replicate the miracle of sustained economic growth, driven by advances in knowledge and its application to economic ends.¹¹ The process of transferring technology, which may involve the commercial transaction of blueprints and machines, transfer of both codified and non-codified knowledge, and adaptation and application of acquired knowledge for the purpose of innovation, is a complex one.

42. Many scholars point out the importance of the absorptive capacity of the recipient of the technology, that is, the ability of the recipient to evaluate and use the technology effectively. As an example, even if the technology is within the public domain which can be “accessed” by any party, the capacity to acknowledge, analyze and apply public domain technology is necessary in order to solve concrete problems encountered by the recipient party. The absorptive capacity may include the ability of the recipient party to conduct an effective negotiation with a technology holder, based on the clear understanding of the technology concerned and of legal terms and practical negotiation skills. This suggests that it is not only higher education in the scientific and technology fields that is important to the recipient country, but also skilled lawyers and intellectual property experts, who can play a significant role in the successful transfer of technology.

43. While some technologies are owned by the public sector, many technologies are owned by the private sector. Consequently, it appears that an efficient and sustainable technology transfer policy requires understanding business behaviors. In this context, one of the challenges is to find a synergy between political considerations and business behaviors. Since, in many cases, the transfer of technology depends on a conscious decision taken by a private technology holder, a wide variety of factors are relevant to such a decision-making process. They include, for instance, the size of the market, anticipated growth of the relevant market, geographical location of the market (such as proximity to a large market), competition in the market, available labor skills and costs, physical and telecommunication infrastructure, availability of financial services, political and economic stability and transparent governance structure.¹²

44. The complexity of the process of technology transfer and multifaceted factors that are related to such a process indicate that there is no one single technology transfer policy that is valid in all countries. It appears that there is no single answer to complex questions such as how to facilitate voluntary agreements between a technology transferor and a technology transferee, how to promote and strengthen the value adding chain from research to commercialization, and how to tap into a greater pool of available technology for development. Even if optimal answers for each country may vary, these common questions are of widespread concern.

¹¹ Ashish Arora, “Intellectual Property rights and the international transfer of technology: setting out an agenda for empirical research in developing countries” in the *Economics of Intellectual Property*, WIPO Publication No. 1012.

¹² Keith Maskus, Kamal Saggi, Thitima Puttitanun “Patent rights and international technology transfer through direct investment and licensing” in *Keith Maskus and Jerome Reichman (ed.), International Public Goods and Transfer of Technology Under a Globalized Intellectual Property Regime*.

45. The first question relates to bridging the needs of technology holders and technology recipients. It basically addresses the asymmetry of information held by various stakeholders involved in the process of technology transfer. Hence the question on narrowing the information gap between the parties and facilitating the flow of information among them.¹³

46. The second question relates to organizational measures that facilitate agreement among stakeholders involved in the transfer of technology. Reducing the costs of transferring and acquiring technology is a major challenge. Issues such as promoting licensing, facilitating investments and funding, improving the attractiveness of the market and facilitating the participation of publicly funded research institutions, universities, small and medium-sized enterprises (SMEs) and traditional knowledge holders¹⁴ in knowledge transactions are all relevant to the effective transfer of technology.

47. Another issue that raises a number of questions is the absorption and adaptation of new knowledge and the application of such knowledge to further innovation after the knowledge has been accessed by a recipient. This question touches upon basic preconditions such as education, professional training and capacity building, and incentives for further innovation.

V. THE ROLE OF THE PATENT SYSTEM

(a) General Description

48. One of the characteristics of “knowledge”, including technological knowledge, is that it is a public good that is “non-excludable” (people cannot be excluded from freely using a public good) and “non-rival” (it can be used simultaneously by many people). The nature of knowledge as a public good means that, once an invention has been created, it can be freely used by others at no additional cost. This results in situations where an inventor, who must invest to create a new invention, cannot capture the full benefits of the invention through its exploitation (e.g., selling in the market). Free riders can copy or imitate the invention and sell the copied products much more cheaply than the original inventor, because they do not bear the cost of R&D. This would reduce the expected returns of the original inventor, and would result, in theory, in an under-provision of new inventions.

49. The patent system is intended to correct such innovation under-provision by providing innovators with limited exclusive rights to prevent others from exploiting their invention and thereby enabling the innovators to appropriate the returns on their investment. At the same time, the patent system requires innovators to disclose fully their inventions to the public. These fundamental elements of the patent system play an important role in the dissemination of knowledge and the transfer of technology.

¹³ At the High-Level Forum on Intellectual Property for the Least Developed Countries, held on July 23 and 24, 2009, at WIPO, Minister Ahmadou Abdoulaye Diallo from Mali stated that although much talent could be found at invention and technology fairs, once the awards had been handed out, inventors were in the dark on how to implement the inventions (from “Intellectual Property Watch”, dated July 27, 2009).

¹⁴ For example, the “Farmer to Pharma” initiative in South Africa integrates traditional medical knowledge holders into modern pharmaceutical R&D.

50. By granting limited exclusive rights, the patent system, in effect, creates property rights in the knowledge embedded in patented inventions. The patent system has transformed public goods knowledge into a tradable property with defined ownership and boundary of rights. The exclusive right conferred by a patent can be used by a patentee to prevent others from using the patented invention. However, the same exclusive right can be used as a currency to promote an exchange of knowledge and collaboration by researchers through licensing agreements and assignment of rights. The patent system aims to improve the efficiency of the flow of knowledge and to facilitate the transfer of technology by setting up a legal framework that allows technology holders to disclose their inventions, license their patents or sell their patents without fear of free-riding. The possibility of defining ownership and a clear boundary of rights also facilitates packaging and trading technology under a “patent”.

51. Another element of the patent system, the public disclosure of inventions, also plays an important role in the effective transfer of technology. Published patent applications and patents are an enormous source of technological knowledge. In addition to the detailed description of inventions, such publication also contains claims which define the scope of patent protection and bibliographical data relating to inventors, patent applicants and patentees. Therefore, patent information not only makes detailed technological knowledge available to others but also informs the public of the owner, extent and scope of patent (property) rights. At the same time, patent information indicates the extent to which third parties may exploit the technical knowledge contained in the patent document without infringing the patent. After the expiration or abandonment of the patent in a given country, or in any other country in which a patent with respect to the same invention has not been granted or has no legal effect, third parties are not required to obtain the consent of the patent holder for the exploitation of the patented invention. In short, patent information provides an important infrastructure that facilitates knowledge sharing.

52. Without doubt, a patent system could make the above positive contributions to the efficient transfer of technology only where the system functions in a way for which it is intended. Albeit a negative right (a patent does not grant a patent owner the right to exploit the patented invention, it only entitles the patent owner to prevent others from exploiting the patented invention without his or her consent), a patent may confer a strong exclusive right on a patentee. Therefore, the scope of enforceable exclusive rights under national patent laws is carefully defined, taking into account the interests of other parties. To that end, various mechanisms are built into the patent system to prevent abuse and misuse of such exclusive rights.

53. The simple existence of a patent for a particular technology is not a barrier in itself to the transfer of technology nor does it guarantee that the technology will be fully exploited by the patentee in all possibly beneficial ways. Much depends on how the exclusive patent rights are designed under the respective national law, how they are deployed and used as a vehicle for technology transfer to the benefit of both a transferor and a transferee. Conversely, the absence of an enforceable patent right does not in itself provide any guarantee of technology transfer. The prospect of using the technology disclosed in the published patent applications and patents is open. However, the transfer of valuable know-how and other background technology that may be useful for the effective commercial exploitation of the technology may only be achieved with the partnership or involvement of the technology originator. As described earlier, the capacity to absorb and apply the technology on the recipient’s part is fundamental to the successful completion of the transfer of technology.

54. The term “patent” is often conceived as a synonym of “monopoly” in the market. However, the right conferred by a patent is defined in a manner that allows a patentee to exploit his or her patent in a manner other than preventing third parties from using the patented invention. While a patent can be used to exclude others in the market, it can also be exploited in a way that allows other parties to use the patented invention. Patents are more and more seen as one of the strategic business tools to achieve the firm’s business goal. The motives for obtaining a patent may be for a cross-licensing deal, or a patent may be licensed-out for royalty income. What is common in all business models that support access to patented technologies is that there is a transfer of knowledge from one party who wants to leverage the technology to another party wishing to procure external technology.

55. To meet the challenges such as intensified global competition, shorter life-cycle of products and more complexity in technology, in addition to the traditional vertical integration of the value chain, open innovation models have been widely introduced in the business sector. R&D collaboration among different parties can be carried out under different types of agreements, such as joint development agreements, public-private partnership agreements, or joint ventures. In all cases, intellectual property which relates to inputs to the R&D collaboration (background IP) and of intellectual property which will be generated as outputs from the R&D collaboration (foreground IP) constitute important elements in such collaboration. In the context of R&D collaboration, a patent system provides a legal mechanism that supports the collaborating parties to define clearly the boundary and ownership of the technologies contributed by the collaborating parties and to agree on the extent to which those parties and others are authorized to use such technologies.

56. Whether or not the patent system inhibits, rather than promotes, transfer of and access to technology is a recurring question. Most recently, in the context of the climate change debate, it has been argued that patents on carbon abatement technology, mainly owned by patentees in developed countries, constitute a major barrier to developing countries’ efforts to reduce greenhouse gases. One study that examined valid patents on seven emission-reducing energy technologies concluded that patent rights cannot possibly be an obstacle for the transfer of climate change technologies to the vast majority of developing countries, as there are hardly any patents on these technologies registered in these countries, and that relaxing patent protection in these countries would not improve technology transfer to them.¹⁵ Nevertheless, it is a fact that there exists a vast disparity in technological capacity among countries, not only between developing and developed countries but among developing countries. Even if patent protection is not an obstacle to the transfer of technology, this does not necessarily mean that the current patent system fully contributes to the promotion of technology transfer. How the patent system could better contribute to promoting technology transfer and narrowing the technological capacity gap among countries is a challenge that involves all stakeholders, including policy makers, technology holders and technology users from both developed and developing countries.

¹⁵ Copenhagen Economics, “Are IPRs a barrier to the transfer of climate change technology?”, January 19, 2009. In 2008, 1 in 5 patents for the relevant technologies was protected in a developing country. Among sampled developing countries, nearly all patents (99.4%) are found in a small group of emerging market economies, and there is a large group of low-income developing countries that protect very few patents (0.6%).

(b) Economic Perspectives

57. While a number of economic studies have been conducted with respect to patents and the transfer of technology, it appears that there is no conclusive evidence that demonstrates either a positive or negative impact of patent protection on technology transfer. This may be partly due to the difficulty of measuring technology transfer quantitatively and to the fact that patent protection is only one among many factors influencing such a transfer. The lack of conclusive evidence, however, does not diminish the important contributions that economic studies have made to the better understanding of the subject.

Effects of IPRs on trade

58. International trade is one of the various channels through which technologies are disseminated internationally. There are a number of economic studies that have looked into the impact of IPR protection on trade. Maskus and Penubarti (1997) analyzed exports from 22 OECD countries to a sample of 25 developing countries, and concluded that stronger patent laws in developing countries have a positive impact on bilateral imports into both small and large developing countries.¹⁶ On the one hand, strong IPR protection in the importing country may encourage foreign firms to export patented goods, while it may reduce the possibility of domestic firms imitating the patented technology and strengthen the market power of foreign firms. One study suggests that the enhanced market power for foreign firms created by stronger patents would dominate in smaller countries with weak imitation capacity, but the larger market size generated by the reduced abilities of local firms to imitate would dominate in larger countries with strong imitation capacity.¹⁷

59. One research paper suggests that stronger IPR protection has significantly positive effects on total trade, but the IPRs' strength is irrelevant to trade in high-technology products.¹⁸ Another found that the strength of IPR protection had no effect on the volume of exports from the United States of America to those countries where a technology holder faces no threat of imitation. However, a positive relationship between IPR protection and trade was found in those countries where a stronger threat of imitation existed.¹⁹ The results of those studies may suggest that the level of IPR protection may have an impact on trade flows between countries in general, but it may also depend on the level of development, the market structure and the imitation capability.

Effects of IPRs on FDI

60. As described earlier, foreign direct investment (FDI) is one of the channels for transferring technologies from one party to another. There is less conclusive evidence regarding the impact of patent protection on the level of FDI. Some studies found no effect of

¹⁶ Keith Maskus and Mohan Penubarti "Patents and international trade: an empirical study" in *Keith Maskus et. al.(ed.), Quiet Pioneering: the international economic legacy of Robert Stern, 1997.*

¹⁷ Keith Maskus and Mohan Penubarti "How trade-related are intellectual property rights?", *Journal of International Economics*, vol. 39, 1995.

¹⁸ Carsten Fink and Carlos Primo Braga "How stronger protection of intellectual property rights affects international trade flows" in *Carsten Fink and Keith Maskus (ed.), Intellectual Property and Development.*

¹⁹ Pamela J. Smith, "Are weak patent rights a barrier to U.S. Exports?", *Journal of International Economics*, 48, vol. 20, 1999.

IPRs on FDI,²⁰ while others suggest a positive relationship between IPRs and flows of FDI.²¹ However, even for those who take the latter position, IPRs are considered as one among many variables that determine the attractiveness of an FDI location. One researcher states that emerging economies should recognize the strong complementarities among IPRs, market liberalization and deregulation, technology development policies and competition regime.²²

61. Some researchers examined whether technology transfer behavior of US multinational firms changes in response to legal reforms that had strengthened IPR protection, and found that changes in the IPR regime abroad led to an increase in technology transfer by US multinationals to IPR-reforming countries.²³ In a firm-level study, another researcher studied data on multinational companies investing in Eastern Europe and the former Soviet Union, and found that investors in sectors relying heavily on IP protection were deterred by a weak IP regime.²⁴ It was concluded that the lack of IP protection deterred investors from undertaking local production and encouraged them to focus on distribution of imported products.

62. Lee and Mansfield (1996) examined the strength of IPR protection in a host country and the volume and composition of FDI from US firms. They found that the total volume of the FDI as well as the percentage of the FDI that was devoted to final production and to R&D facilities was lower in the host countries with weaker IPR protection.²⁵ Kumar (2002), however, found no relationship between the strength of IPR protection in the host country and the overseas R&D activities of transnational companies.²⁶

²⁰ Michael J. Ferrantino, “the effect of intellectual property rights on international trade and investment”, *Weltwirtschaftliches Archiv*, vol. 129, 1993; Edwin Mansfield, “Unauthorized use of intellectual property: effects on investment, technology transfer and innovation” in *M. B. Wallerstein, M. E. Mogee and R. A. Schoen (ed), Global Dimensions of Intellectual Property Rights in Science and Technology*, 1993; Keith Maskus and Denise Eby-Konan, “Trade related intellectual property rights: issues and exploratory results” in *A. Deardoff and R. M. Stern (ed), Analytical and negotiating issues in the Global Trading System*, 1994.

²¹ An OECD study concluded that the index for patent rights tends to be positively associated with inward FDI, holding other factors constant. Such a relationship holds for developed, developing and least-developed countries though quantitatively the association is strongest in developed countries (Walter Park and Douglas Lippoldt “Technology transfer and the economic implication of the strengthening of intellectual property rights in developing countries” OECD Trade Policy Working Paper No. 62, TAD/TC/WP(2007)19/FINAL).

²² Keith Maskus, “The role of intellectual property rights in encouraging foreign direct investment and technology transfer”, in *Carsten Fink and Keith Maskus (ed.), Intellectual Property and Development*.

²³ Lee G. Branstetter, Raymond Fisman and C. Fritz Foley, “Do stronger intellectual property rights increase international technology transfer? Empirical evidence from US firm-level panel data”, World Bank Policy Research Working Paper No. 3305, 2004.

²⁴ Beata Smarzynska Javorcik, “The composition of foreign direct investment and protection of intellectual property rights: evidence from transition economies” in *Carsten Fink and Keith Maskus (ed.), Intellectual Property and Development*.

²⁵ Jeongyong Lee and Edwin Mansfield, “Intellectual property protection and US foreign direct investment”, the *Review of Economics and Statistics*, vol. 78, 1996.

²⁶ Nagesh Kumar, “Determinants of location of overseas R&D activity of multinational enterprises: the case of US and Japanese Corporations”, *Research Policy*, vol. 30, 2001.

Effects of IPRs on licensing

63. In many cases of technology transfer, patent licensing agreements play an important role, as they allow access to the technology in question. The relationship between licensing, technology transfer and the strength of IPR protection can be highly complex due to the fact that technology licenses vary significantly from one agreement to the next.

64. Some researchers investigated how the strength of patent protection affects flows in international technology trade through licensing volumes, using data on US receipts for intellectual property from foreign unaffiliated firms and US affiliates overseas, and found the following: US receipts of unaffiliated royalties and license fees rise with stronger patent protection in the technology recipient country when the degree of initial patent protection was higher than a critical value; the ratio of US receipts of unaffiliated royalties and license fees to US exports is also higher with stronger patent protection; the US receipts of both affiliated and non-affiliated royalties and license fees are higher if the technology recipient country has a higher per capita GDP level and has a greater labor endowment; and there is weak evidence suggesting that openness to trade encourages export trade in relation to licensing.²⁷

65. Using a theoretical model, the same researchers found that stronger IPR protection in developing countries would increase the rate of innovation and the extent of high-quality licensing from developed countries to developing countries under particular conditions. Specifically, such an outcome requires that the labor force used in innovation, compared to that used in the production of goods anywhere in the world, is sufficiently small and that there remains a relatively large advantage of lower labor costs in developing countries.²⁸

66. Another researcher examined the effect of patent protection on technology transfer (e.g., marketing products, licensing arrangement, partnership, joint venture etc.) in the field of biotechnology, based on a survey of US and European firms. He found that enforcement concerns were paramount in limiting the willingness of the firms to transfer sensitive and valuable technology to specific countries.²⁹

(c) Challenges

67. While a number of economic researchers have examined the strength of IPR protection and its effect on trade or foreign investment, as suggested by the CIPR Report, the crucial point in respect of IPRs, and in particular patents, is not whether they promote trade or foreign investment, but how they help or hinder access to the required technology by those who are in need of such technology.³⁰ For example, the CIPR Report states that, if a foreign technology company licenses production to a domestic firm, rather than establishing manufacturing locally, less foreign investment will have been attracted. However, the overall result may be more beneficial to the domestic economy because of the indirect contribution to domestic

²⁷ Guifang (Lynn) Yang and Keith Maskus, "Intellectual property rights and licensing: an econometric investigation" in *Carsten Fink and Keith Maskus (ed.), Intellectual Property and Development*.

²⁸ Guifang Yang and Keith Maskus, "Intellectual property rights, licensing and innovation", World Bank Policy Research Paper No. 2973, 2003.

²⁹ William Lesser, "Role of IPR in Biotechnology Transfer - Corporate Views" [http://www.wipo.int/about-ip/en/studies/pdf/ssa_lesser_biotech.pdf].

³⁰ Commission on Intellectual Property Rights "Integrating Intellectual Property Rights and Development Policy".

technological capacities. Furthermore, from a policy perspective, such access to required technology should be sustainable, i.e., without disproportionately diminishing incentives for innovators to invest in “further” innovation.

68. Therefore, the relationship between competition patterns, production and innovation in one country is different from that of another country, and consequently, there are differences in the pattern of use of intellectual property rights and other appropriability mechanisms at firm and sectoral level.³¹ In a similar manner, differences in the use of various appropriability mechanisms should also be found when comparing countries which are at different stages of industrial and technological development.³⁰ Such a hypothesis suggests that the dynamics of technology transfer and its interaction with an intellectual property mechanism are different from one country to the next, meaning that there is no one single intellectual property law and policy that maximizes the transfer of technology in any given country.

69. Nevertheless, there may be a number of common questions and challenges shared by many countries. Firstly, according to property rights theory, unclearly defined and/or insecure property rights (i.e., weak appropriability) are the sources of imperfections in the market.³² In the context of patents, this means that clear rules are needed with respect to the ownership, including inventorship, of a patent and the boundary of protection, i.e., clear scope of claims. Where a patent is licensed, a licensing agreement should clearly determine the rights and obligations of parties concerned. Further, there should be an appropriate mechanism to enforce patents.

70. Secondly, information asymmetry between the patent holder and a prospective licensee (or patent purchaser) is another problem. Certainly, the publication of clear and complete disclosure of a patented invention narrows the information gap. However, the availability of technical information as well as legal information relating to patents in the Registry of a patent office does not necessarily mean that they are easily accessible to the public. In order to carry out a technology transaction, a potential buyer (a potential licensee and patent purchaser) and a potential seller (a patentee) of the given technology need to be identified. A qualified patent expert may be able to play an important role in narrowing the information gap by understanding the business needs of a party, analyzing a patent, in particular, patent claims, and negotiating with another party.

71. The third question relates to how to reduce transaction costs. Transparency of relevant information is of fundamental importance. Clear licensing rules with balanced rights and obligations for licensees and licensors increase legal certainty and reduce costs. In this context, an enabling environment that promotes licensing agreements supportive of competition in the market may play an important role. Further, the quality of granted patents may also be relevant to the effective transfer of technology, since proliferation of sub-standard patents would decrease legal certainty with respect to the validity of patents, and raise the transaction costs of knowledge transfer. Financial incentives, such as reduction of fees or taxes associated with the technology transaction, may be another option worthy of consideration.

³¹ Andres López, “Innovation and appropriability, empirical evidence and research agenda” in *The Economics of Intellectual Property*, WIPO Publication No. 1012.

³² Jongwook Kim and Joseph Mahoney, “Property rights theory, transaction costs theory, and agency theory: an organizational economics approach to strategic management”, *Managerial and Decision Economics*, vol. 26, pp. 223-242, 2005.

72. The fourth question relates to the right balance between the interests of the patent holder and third parties, and the prevention of abuse or misuse of patent rights or market power. In principle, the granting of exclusive patent rights is considered as an incentive for investment in innovation. To correct the potential inefficiencies of the market power created by such exclusive rights, a number of mechanisms are provided in the patent system, such as patentability requirements and disclosure requirements. Nevertheless, granting full exclusive rights in all circumstances may not always contribute to the promotion of innovation and to the transfer and dissemination of technology for the enhancement of public welfare and social benefits. Consequently, the scope of enforceable exclusive rights is carefully designed in order to strike the right balance with the interests of other parties, who may be prevented from using the patented invention for a limited period. Those measures can be established within the patent system, e.g., certain limitations to patent rights such as a research exemption and compulsory licenses, and outside the patent system, e.g., competition law and policy.

VI. THE INTERNATIONAL REGULATORY FRAMEWORK

73. With the increase of globalization and transnational trade flows, the link between patents, trade and the transfer of technology has been increasingly recognized at the international level, as can be seen, for example in Articles 7, 8 and 66.2 of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement). Article 7 of the TRIPS Agreement states that:

“The protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations.”

74. Further, Article 8 establishes principles that:

“1. Members may, in formulating or amending their laws and regulations, adopt measures necessary to protect public health and nutrition, and to promote the public interest in sectors of vital importance to their socio-economic development, provided that such measures are consistent with the provisions of this Agreement.”

“2. Appropriate measures, provided that they are consistent with the provision of the Agreement, may be needed to prevent the abuse of intellectual property rights by right holders or the resort to practices which unreasonably restrain trade or adversely affect the international transfer of technology.”

75. Article 66.2 of the TRIPS Agreement states:

“Developed country members shall provide incentives to enterprises and institutions for the purpose of promoting and encouraging technology transfer to least-developed country members in order to enable them to create a sound and vital technological base.”

76. With respect to the implementation of Article 66.2, the WTO Doha Decision on Implementation-Related Issues and Concerns, adopted by the WTO Ministerial Conference in November 2001, states that:

“11.2 Reaffirming that the provisions of Article 66.2 of the TRIPS Agreement are mandatory, it is agreed that the TRIPS Council shall put in place a mechanism for ensuring the monitoring and full implementation of the obligations in question. To this end, developed country members shall submit prior to the end of 2002 detailed reports on the functioning in practice of the incentives provided to their enterprises for the transfer of technology in pursuance of their commitments under Article 66.2. These submissions shall be subject to a review in the TRIPS Council and information shall be updated by Members annually.”³³

77. The Declaration on the TRIPS Agreement and Public Health also reaffirmed the commitment of developed country members to provide incentives to their enterprises and institutions to promote and encourage technology transfer to least-developed country Members pursuant to Article 66.2.³⁴ The TRIPS Council, in 2003, decided on the procedures for the submission and review of reports by developed country members and agreed on the list of issues to be reported.³⁵

78. While it is acknowledged that building up technological capacities in LDCs would take time, some studies have questioned the effectiveness of Article 66.2 for technology transfer to developing countries, since the provision is restricted to LDCs³⁶ and no assessment regarding the nature and magnitude of the incentives has been made.³⁷ One scholar analyzed the submissions relating to Article 66.2 by developed countries to the Council of TRIPS, and concluded that submissions were irregular, did not specifically target LDCs, and did not provide sufficiently detailed data to determine whether Article 66.2 led to any additional incentive beyond business as usual.³⁸

79. A provision that addresses the international transfer of relevant technologies is also found in many multilateral environment agreements (MEAs). The development, application and transfer of technology are core elements in the implementation of MEAs. Intellectual property rights, in particular, patents, in the context of transfer of environment-related technologies are covered in different ways in various MEAs.³⁹ Many agreements state that technology transfer should be provided to developing countries “in fair and most favorable conditions or terms” including “on concessional and preferential terms, as mutually agreed”. The Convention on Biological Diversity (CBD) and the Convention to Combat Desertification (CCD) are two conventions that refer to intellectual property rights explicitly in conjunction with the transfer of technology.

80. As regards the CBD, it recognizes that access to, and the transfer of, technology are

³³ WTO document WT/MIN(01)/17.

³⁴ WTO document WT/MIN(01)/DEC/2.

³⁵ WTO document IP/C/28.

³⁶ Commission on Intellectual Property Rights “Integrating Intellectual Property Rights and Development Policy”.

³⁷ Carlos Correa, “Can the TRIPS Agreement foster technology transfer to developing countries?” in *Keith Maskus and Jerome Reichman (ed.), International Public Goods and Transfer of Technology Under a Globalized Intellectual Property Regime*.

³⁸ Suerie Moon, “Does TRIPS Art. 66.2 encourage technology transfer to LDCs?”, ICTSD-UNCTAD, Policy Brief No. 2, December 2008.

³⁹ Presentation by Constanza Martinez, “The Use of IP Rights in the Transfer of Technology under Multilateral Environmental Agreements (MEAs)” at the WIPO Symposium on Patent Landscaping and Transfer of Technology under Multilateral Environmental Agreements, August 26, 2008, Geneva [http://www.wipo.int/meetings/en/2008/lifesciences/ip_iss2_ge/].

essential elements for the attainment of its objective, and the Convention requires Parties to provide and/or facilitate access for, and the transfer to, other Parties of technologies that are relevant to the conservation and sustainable use of biological diversity or make use of genetic resources (Article 16.1). The Convention also provides that access to, and the transfer of, technology to developing countries “shall be provided and/or facilitated under fair and most favorable terms, including on concessional and preferential terms where mutually agreed,” and in a way “consistent with the adequate and effective protection of intellectual property rights” if the technology is subject to patents and other intellectual property rights (Article 16.2). In relation to the transfer of technology, issues concerning capacity building, research and training, education and awareness raising, exchange of publicly available information and technical and scientific cooperation, are also covered by the Convention (Articles 12, 13, 17 and 18).

81. Under the program of work on technology transfer and technological and scientific cooperation adopted by the Conference of Parties (COP) in 2004, a technical study on the role of intellectual property rights in technology transfer in the context of the CBD was prepared jointly by the Secretariats of the CBD, UNCTAD and WIPO.⁴⁰

82. Technology lies at the center of the climate change debate as well. International legal instruments and global policy debates place high emphasis on the role of technology in addressing the challenge of climate change. For example, Article 4.1 of the United Nations Framework Convention on Climate Change (UNFCCC) states that all Parties to the Convention promote and cooperate in the development, application and diffusion, including transfer, of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases, and promote and cooperate in the full, open and prompt exchange of relevant scientific, technological, technical, socio-economic and legal information related to climate change. The UNFCCC includes a specific commitment by developed countries regarding provisions of financial resources and technology transfer in Articles 4.3 and 4.5, respectively. In particular, Article 4.5 states that:

“The developed country Parties and other developed Parties included in Annex II shall take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention. In this process, the developed country Parties shall support the development and enhancement of endogenous capacities and technologies of developing country Parties. Other Parties and organizations in a position to do so may also assist in facilitating the transfer of such technologies.”

83. Article 4.7 links the effective implementation of the Convention by developing countries to the implementation of the above commitments by developed countries as follows:

“The extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology and will take fully into account that economic and social development and poverty eradication are the first and overriding priorities of the developing country Parties.”

⁴⁰ UNEP/CBD/COP/9/INF/7.

84. While the text of the UNFCCC does not explicitly refer to intellectual property rights or patents, intellectual property issues have been raised in conjunction with the review of the implementation of commitments made by the Contracting Parties, in particular by developed country Parties, under Article 4. How intellectual property could be best addressed in the framework of the UNFCCC is part of the ongoing debate.⁴¹

85. One scholarly preliminary suggests that technologies relating to climate change should be less dependent on strong patent protection, and/or that patents are less likely to cause significant bottlenecks in the development and transfer of such technologies for developing countries in the context of climate change than for public health.⁴² An UNCTAD report⁴³ revealed that a broad range of environmentally sound technologies was available to meet the needs of developing countries.⁴⁴ It states that while public-funded R&D in the development of such technologies was significant, only a small proportion of public-funded technologies are patented, commercialized or transferred, due to, among other reasons, the costly and lengthy process of obtaining patent rights, the lack of knowledge about the business aspects of technology development, the absence of an incentive structure conducive to the commercialization of research results, and the fact that many R&D activities are still too upstream in many countries.⁴⁵ The recent study indicates that many challenges to the dissemination and transfer of innovation in general are found in the area of eco-innovation.⁴⁶ Absorption and adaptation of technologies to local needs, the existence of complementary factors other than patents that affect innovation and the effective transfer of technology, information asymmetries and uncertainty regarding the qualities of the innovation are some of the challenges identified by the authors.

86. A detailed patent-based analysis regarding alternative energy technologies⁴⁷ demonstrates the possibilities of patent information in identifying and analyzing existing and future technologies, and the usefulness of patent information in a wider policy discussion.

87. As described in Chapter VII, various aspects of the patent system may have

⁴¹ Background documents, working documents and reports concerning the UNFCCC are available at: <http://unfccc.int>. Recent negotiations are summarized in: “The technology transfer debate in the UNFCCC: politics, patents and confusion”, Intellectual Property Quarterly Update, Fourth Quarter 2008, South Center and CIEL, and presentations made by Jukka Uosukainen and Wanna Tanunchaiwatana at WIPO Conference on Intellectual Property and Public Policy Issues, July 13 and 14, 2009, Geneva [http://www.wipo.int/meetings/en/2009/ip_gc_ge/index.html].

⁴² Frederick Abbott, “Innovation and technology transfer to address climate change: lessons from the global debate on intellectual property and public health”, ICTSD Issue Paper 24, June 2009.
⁴³ “The Role of publicly funded research and publicly owned technologies in the transfer and diffusion of environmentally sound technologies”, UNCTAD/ITE/IIP/9, 2000.

⁴⁴ According to an industry representative, the private sector accounts for 60-80 per cent of all investment in clean technology R&D (presentation by Carl Horton at WIPO Conference on Intellectual Property and Public Policy Issues, July 13 and 14, 2009, Geneva [http://www.wipo.int/meetings/en/2009/ip_gc_ge/index.html]).

⁴⁵ One expert noted that economic, human and institutional factors explain the low level of technology transfer in environmentally sound technologies (presentation by Jukka Uosukainen at WIPO Conference on Intellectual Property and Public Policy Issues, July 13 and 14, 2009, Geneva [http://www.wipo.int/meetings/en/2009/ip_gc_ge/index.html]).

⁴⁶ Daniel Johnson and Kristina Lybecker, “Challenges to technology transfer: a literature review of the constraints on environmental technology dissemination”, Colorado College Working Paper No. 2009-07.

⁴⁷ “Patent-based technology analysis report – alternative energy technology” [http://www.wipo.int/patentscope/en/technology_focus/alternative_energy.html].

implications for the transfer of technology. In this respect, some provisions under the TRIPS Agreement which are not mentioned above may be also relevant to the effective transfer of technology. These include: Article 29.1 concerning the disclosure requirement, Articles 30 and 31 concerning exceptions and limitations to the right, and Article 40 with respect to control of anti-competitive practices in contractual licenses.

88. In addition, the Patent Law Treaty (PLT) provides provisions concerning procedural requirements regarding a request for recording a change of applicant or owner, a request for recording a change of name or address and a request for recording a license or a security interest, with a view to avoiding unreasonable complexities in national patent procedures. Those provisions aim at the timely and efficient recording of information relating to patent owners and related licenses, which would support disseminating accurate up-to-date information concerning the owner of the rights and their licensing status. Consequently, they may be indirectly relevant to the transfer of technology.

VII. DESIGNING PATENT LAWS: LEGAL FRAMEWORK AND FLEXIBILITIES

89. Although a linkage between the patent system and the dissemination of technologies lacks clear evidence and their relationship is not obvious, it may be possible to identify certain elements in the patent system that could have implications for the transfer of technology. Those elements, as described in detail below, are multifaceted.

90. The patent system is intended to correct the under-provision of technology and knowledge, which are classified as public goods, by providing innovators with the exclusive right to prevent others from exploiting the patented inventions without their consent. In other words, it packages the technology in a property with a defined ownership and technical scope, which can be transferred or licensed to others. The disclosure of patented inventions allows others to learn about the patented technology, which contributes not only to the tacit transfer of technology but also to the transfer of technology through licensing agreements and transfer of rights. On the other hand, too strong exclusive rights could hamper access to, and the transfer of, technology and could be abused or misused. In order to safeguard the interests of technology users, there are a number of measures taken in order to strike the right balance between the interests of patent holders and third parties. Such measures are found both within the patent system, e.g., the exceptions and limitations to the rights, and outside the patent system, e.g., the application of the competition law. In addition, a supportive environment plays an important role in the transfer of technology. The following paragraphs describe those elements and indicate how they could relate to various stages of technology transfer.

(a) Defining the Technology to be Transferred

91. The first area relates to elements that define the technology to be transferred. The patent system has transformed public good knowledge into a tradable property with defined ownership and limits of the right. Patent law requires clear indications of the owner of the right and the scope of the right which is defined by the claims. Ambiguity in the ownership or unclear limits to the scope of patent protection only creates uncertainty and potential disputes, and thus becomes a barrier to the effective transfer of technology.

(i) Ownership and inventorship

92. The ownership of patents is one of the fundamental issues that define property rights. Ambiguity of ownership, either in the legal system or in each individual case, only creates

uncertainty and potential disputes, which runs counter to the efficient transfer of technology. The transfer of patented technology presupposes the legal ownership of the technology concerned. Patent law defines the issues such as who has the right to a patent and what kind of property right the patent owner may enjoy.

93. Many national laws provide that, in principle, the right in a patent belongs to the inventor or his or her successor in title. In cases where there is more than one inventor, the right to a patent belongs to the inventors jointly. In many countries, national laws provide a special provision for employee's inventions where an invention is made in the performance of an employment contract, or an employee used materials or other resources of the employer. In essence, many national laws provide that the right in a patent belongs to an employer where its employee made an invention in the course of his or her normal professional duties, unless any contractual provisions to the contrary exist.

94. However, this is not the case in some other countries, e.g., in Germany and Japan. In Germany, in principle, an employee inventor has a right to patent. He or she, however, has a duty to notify an employee's invention to his or her employer without undue delay. The employer has the right to claim the employee's invention within four months from the notification, and to file a patent application in Germany without undue delay, unless the invention falls under trade secret. On the other hand, the employee has the right to remuneration. If the employer fails to claim his or her right in the invention within the above four-month period, the right remains with the inventor employee. If the employer abandons his or her right in a patent application, the employee can take over the right in the application. Guidelines on calculating the entitled remuneration are published by the authorities, and in the case of a dispute on the amount of remuneration, the patent office provides arbitration. In Japan, a right in a patent belongs to an employee inventor in cases of employees' inventions. The statutory right of an employer is an entitlement to a non-exclusive license for the patent obtained by the employee. In reality, a contractual agreement is concluded between the employer and the employee to the effect that the employee assigns his or her right in a patent to the employer. When he or she assigns his or her right to, or concludes an exclusive license with, the employer, the employee shall have the right to reasonable remuneration.

95. Ownership of patents as a result of public-funded research or created by public research institutions, including universities, is an area that has attracted significant attention in the recent past. In those countries where the right in a patent belongs to the employer in the cases of employees' inventions, the same analogy could be applied with respect to the inventions created by researchers during the course of their employment at a public research institute or a university. Another line of thinking could be that, if the inventive activities by researchers in the public sector are financed by public funds, the fruit of such research, i.e., inventions, shall belong to the State or to the local government. The recent trend, however, is to allow public research institutions and universities to claim ownership of inventions created by their researchers, with an appropriate mechanism to remunerate the inventor researchers and taking into account the public dimensions so that the public research results would best serve the public interests. For example, in Germany, in the past, professors had so-called "professor's privilege" under which he or she holds the rights in his or her inventions. Therefore, they are free to apply, or not to apply, for a patent application and are free to conclude any agreements with third parties with respect to his or her invention. However, since 2002, professors and university researchers have to notify the university of their inventions, and universities can claim the ownership of inventions created at universities. The underlying reason for such a change is that it would facilitate converting scientific knowledge into commercial innovations

with social and economic benefits.⁴⁸ The legal framework concerning the ownership of inventions created under public-funded research, however, varies in different countries. Issues concerning public-private partnerships are further dealt with in Chapter VIII.

96. Similarly, the right in a patent where a student created an invention during the course of activities at a university or school is not always clearly defined, since the legal provision concerning an employee researcher's invention is not applicable to a student's invention.

97. Where a patent is owned jointly, national laws relating to rights and obligations of joint owners vary. For example, in the United States of America, joint owners may license a co-owned patent without the other party's consent unless there is an agreement to the contrary. On the other hand, Japanese law requires consent of the other joint owner to license the co-owned patent. This means that in the case of joint R&D, parties need to consider carefully, in advance, their needs to license future intellectual property to third parties and how different national laws may affect such needs.

98. The question of entitlement may not be easy to answer, in particular, where an invention is created jointly. It is generally considered that negotiations on the terms and conditions of future intellectual property ownership derived from joint R&D can be extremely lengthy and costly.⁴⁹ However, it has also been observed that when positions over ownership of a potentially valuable right are entrenched due to a lack of clear agreement by the parties, the time for and cost of resolving those positions can be considerable.⁵⁰ In particular, where parties to a joint R&D are from different countries or they plan to exploit future intellectual property in a number of countries, they may need to take fully into account the differences concerning ownership of patents in different jurisdictions. In addition, where a private company and a university wish to engage in a collaborative research project, due to the different priorities of the parties, questions of ownership and the right to use future intellectual property could be complicated.

99. Further, since a patent may be assigned to another party, the patent owner may change over time. Recording such a change in a timely and accurate manner would allow third parties to trace the actual owner of patents, and consequently ensure access to the patent owner whose consent is essential to use the patented invention.

(ii) Claim drafting and interpretation

100. Ambiguity of the claims means ambiguity of the scope of patent protection. In connection with the transfer of technology, it would increase uncertainty regarding the value of the patented technology in question for both the patentee and the prospective licensee (or prospective buyer of the patent). Such uncertainty may increase transaction costs for the negotiation and potential costs for judicial procedures to clarify the scope of protection or to invalidate the patent. Similarly, ambiguous claims also increase uncertainty among third parties who wish to avoid infringement of a patent and to develop a technology that circumvents the patented claims.

⁴⁸ Third European Report on Science & Technology Indicators: Towards a Knowledge-Based Economy, European Commission, 2003.

⁴⁹ Lambert-Review of Business-University Collaboration, December 2003.

⁵⁰ John Hull, "Ownership of rights created in sponsored academic collaborations", E.I.P.R., Issue 1, 2007.

101. Many national patent laws provide a requirement that claims shall be clear and concise. Since the claims define the scope of protection, they should be drafted in a manner that third parties clearly understand the scope of patent protection. Unreasonably complicating claims by including a high number of claims or complicated multiple dependent claims could result in ambiguity in respect of the scope of protection. Since such ambiguity creates legal uncertainty to enforce patents, it benefits neither the patentee nor third parties. National or regional practices regarding the acceptable drafting of claims and interpretation of claims differ from one jurisdiction to another. Those differences could lead to uncertainty about the scope of patent protection in different jurisdictions, unless a party is fully informed of all such differences.

(b) Dissemination of Technology and Publication of Legal Status

102. The patent system provides, on the one hand, an exclusive right that prevents others from using a patented invention without the consent of a patentee. At the same time, the patentee is obliged to disclose the invention to the public in a clear and complete manner. In addition to the full description of the technology concerned, published patents and applications also disclose the scope of protection (boundary of the right), the owners of the right, information concerning any associated rights (e.g., licenses) and other information relating to the legal status of the patents and patent applications. Such a transparent mechanism embedded in the patent system facilitates the transfer of technology by, for example:

- supporting the assimilation of the existing technological knowledge described in patents and patent applications, and stimulating new ideas and inventions;
- assisting the development of inventions and the commercialization of products by finding potential partners;
- assisting the acquisition of technology through the transfer of patent rights, and mergers and acquisitions.

103. Combining the technical information and legal information disclosed in patents, third parties can identify the public domain technology which can be used freely by anyone. As an example, where an invention has been publicly disclosed in a patent application in country X and a patent has not been sought for the same invention in country Y, anyone can learn about the invention disclosed in the patent application and can freely use that invention in country Y.⁵¹

(i) Enabling disclosure requirement

104. The enabling disclosure requirement is fundamental to the effective dissemination of technological knowledge. Many technologies are cumulative. The state of art technology described in prior patent applications and patents provides a useful background for further improving existing technology. It can also provide clues on how to solve particular technical problems faced in different fields. In order for patent documents to be a useful source of technological information, at the outset, the technology should be described in such a manner

⁵¹ To reach this conclusion, there is an assumption that the exploitation of the invention concerned does not infringe another patent or any other rights in force in country Y, and that the prior publication of the invention in country X defeats the novelty of the same invention in country Y.

that at least a person skilled in the art could grasp a practical sense of what is contained in the patent document.

105. As a trade-off to exclusive patent rights, all patent law requires applicants to disclose the invention to the public. In many countries, in order to obtain a patent, an applicant has to disclose the invention in a manner sufficiently clear and complete for the invention to be carried out by a person skilled in the art. Since such a requirement is found in Article 29.1 of the TRIPS Agreement, the provisions in national patent laws regarding the enabling disclosure requirement are similar in many countries. The interpretation of the national provisions, however, is more nuanced. The term “a person skilled in the art” may be interpreted differently in different countries. Another difficult question is the extent of disclosure of the invention that can be considered “sufficient and complete” to “carry out the invention”. Further, since the technology evolves over time, there could be a case where the description of the invention was not “sufficient and complete” at the time of filing the application, but has become “sufficient and complete” at the time the patent is granted, due to the fact that, in the meantime, “a person skilled in the art” has a better understanding of the relevant technology. In such a case, could the enabling disclosure requirement be considered as having been met?

106. Article 29.1 of the TRIPS Agreement allows Members to require that the applicant indicate the best mode for carrying out the invention known to the inventor at the filing date, or where priority is claimed, at the priority date, of the application. Consequently, some countries provide such a requirement in their respective national laws. Others do not require an indication of the best mode, but require that any mode for carrying out the invention be described in the description.

107. In the field of biotechnological inventions, in many countries, where an application refers to biologically reproducible material which cannot be sufficiently disclosed in a written application, the enabling disclosure requirement is considered to be complied with by the deposit of such material, to the extent that the disclosure requirement cannot be complied with. Unlike other inventions whereby a person skilled in the art may be able to analyze the claimed invention based on the text of the description and the drawings contained in a patent application, certain biotechnological inventions require physical access to the biological material in order for a person skilled in the art to understand the invention to the extent that he or she could carry out the invention. Therefore, it is important to ensure the availability of such access for third parties. Differences, however, are found in the formal and substantive requirements regarding such a filing under national/regional patent laws.

(c) Licensing of Technology

108. The exclusive patent right allows a patentee to prevent others from using the patented invention without his or her consent. At the same time, the exclusive right is designed in such a way that a patentee can license the patented invention to others under conditions agreed to by both parties for their mutual benefit. As described earlier, patent licensing is one of the major channels for promoting technology transfer to, and the further development of technology by, licensees.

(i) Voluntary patent licenses

109. Patent licensing plays an important role in creating income for the patentee, promoting dissemination and further development of technologies by a wider group of licensees, and thereby facilitating the commercialization of innovative products. Since the business needs of

a licensor and a licensee may be different in each case, every patent licensing agreement is unique. Typically, a licensing agreement contains, among others, the subject matter of the licensing agreement, the extent of rights licensed, terms and conditions, obligations of the licensor and the licensee, representations and warranties and clauses concerning disputes, expiration and termination of the agreement and applicable law. A license may be an exclusive license, a sole license or a non-exclusive license. An exclusive license guarantees that the licensee will be the only party who exploits the patent under the terms and conditions stipulated in the agreement (even the licensor will not exploit the patent). A sole license guarantees the licensee that the licensor will not grant any license to other parties within the contractual territory. Under a non-exclusive license, the licensor retains the right to grant another non-exclusive license to other parties.

110. Some countries require registration of technology licensing contracts with the government in order to monitor such transactions and to facilitate the development of national technology transfer policy. One scholar, however, noted that there is little evidence that extensive government monitoring of technology licensing contracts, with associated requirements for the full disclosure of proprietary information to public agencies or other performance mandates, had positive impacts on the inward international transfer of technology or on productivity growth.⁵² He observed that such mandates were likely to deter foreign firms from transferring their newer technologies to all but the largest or higher-income economies, and suggested vigilant control of anti-competitive abuses of licensing agreements rather than restricting licensing terms *ex-ante*.

111. Another element concerning licensing agreements that touches upon the transfer of technology is statutory rights and the obligations of licensors and licensees, including the rights and obligations of co-licensors. Questions such as to what extent licensees are protected from a change in ownership of the patent (change in the person of licensor) or from insolvency of the licensor are some of the issues relevant to the certainty of licensing agreements and the need for such agreements to be executed in a reliable manner.

112. In connection with licensing agreements relating to R&D collaboration, it is essential to identify clearly the scope of the joint activities, for instance their field, duration, objectives, milestones and deliverables. In particular, intellectual property, predominantly patents, arising from joint R&D activities, should be clearly defined in terms of ownership of future intellectual property created by the joint R&D and exploitation of such future intellectual property rights. Since expectations and goals of joint R&D may not be the same among participating parties, which party or parties have the right to exploit the future intellectual property under which terms and conditions needs to be agreed upon among the parties in advance.

113. Further, it is often the case that participating parties bring their existing IP (background IP) and know-how to conduct the joint R&D. Clear demarcation of the background IP and any new IP created through the joint activities (foreground IP) needs to be made in order to avoid any future disputes over ownership of rights and extent of contribution to such rights. Similarly to any other contractual arrangements, some thought should be given to the ownership and exploitation of intellectual property in situations where joint R&D is terminated prematurely or the stated objectives or expected research goals are not fulfilled.

⁵² Keith Maskus, "Encouraging international technology transfer", UNCTAD-ICTSD, Issue Paper No. 7, May 2004.

114. Where a product involves a number of patents owned by a number of different patentees, the cost of evaluating those patents and negotiating licensing agreements separately with each patentee can become extremely high. In order to reduce such transaction costs, a patent pool mechanism is used, in particular, in information and communication technology.⁵³ This is one of the licensing arrangements that facilitate licensing agreements involving multiple parties. However, where a patent pool is formed among competitors in the market, competition concerns could be raised depending on the arrangement made.

(ii) License of rights

115. Many national patent laws provide a mechanism allowing a patentee voluntarily to file a statement with the patent Office that he or she is prepared to allow any person to use the invention as a non-exclusive licensee. Such a statement will be published in the official gazette, and the patentee typically enjoys a reduction of the maintenance fee (around 50 per cent, depending on the applicable national law). Adequate remuneration should be agreed upon between the patentee and a party seeking a non-exclusive license. In the absence of such an agreement, the patent office or a court, depending on the applicable national law, would establish the adequate terms and licensing conditions. The patentee may withdraw such a statement under certain circumstances. For example, according to the law of the United Kingdom, the withdrawal of the statement is possible if there is no licensee with respect to the patent in question or all licensees agree to such withdrawal, and the exempted maintenance fee is paid. Some Offices provide a database that allows third parties to search patents with respect to which license of rights statements have been filed.

116. This mechanism aims to encourage the use of patents by third parties through voluntary agreements by giving a financial incentive to patentees. Use of such a mechanism, however, is not high.⁵⁴ One of the reasons could be that, where the patent relates to the core business of the patentee, even if that patent has not been used by the patentee so far, limiting the patent right to monetary remuneration and giving away the possibility of injunctive relief could considerably weaken the position of the patentee vis-à-vis his or her competitors. For example, even if the patent in question has not been used by the patentee, that patent could be used for the negotiation and conclusion of a cross-licensing agreement with a third party. Where the third party is aware that the patent is subject to a license of rights, the negotiating position of the patentee would be considerably weakened.

117. On the one hand, for patentees who are primarily interested in royalty revenue, e.g., research institutions and universities, or who have clearly no intention of manufacturing the patented invention by themselves, a license of rights may be an attractive option to consider, since it would increase the visibility of their intentions to license, and at the same time, reduce the maintenance cost of patents.

(d) Safeguarding the Interests of Technology Users

118. In any patent system, with a view to contributing to the promotion of technological innovation and to the transfer and dissemination of technology, finding the right balance

⁵³ Patent pools in connection with technical standards are described in document SCP/13/2, pages 32 to 37. The description in that document, for example, on competition concerns, is also relevant in the general context.

⁵⁴ According to the Annual Review 2007, published by the United Kingdom Intellectual Property Office (UKIPO), 597 statements were filed with UKIPO in 2007.

between producers and users of technological knowledge is considered fundamental. Since patents confer exclusive rights on patentees, national patent laws carefully exclude certain subject matter from patent protection and set a limit to exclusive patent rights in certain cases which otherwise would be considered as infringing a patent. This allows technology users to use inventions that fall under certain subject matter, or to use patented inventions in a certain manner or for a specific purpose, without fear of infringing a patent. In addition, measures have been taken in national laws, both within and outside the patent system, to prevent the abuse or misuse of exclusive patent rights that would impede, rather than promote, the dissemination and transfer of technology. The need to embrace the mutual advantage of producers and users of technological knowledge in a manner beneficial to social and economic welfare and to take appropriate measures to prevent the abuse or practices that adversely affect the international transfer of technology is widely acknowledged at the international level.⁵⁵

(i) Exclusions from patentable subject matter⁵⁶

119. In general, fundamental principles, such as laws of nature, mathematical and scientific theories, and schemes and rules for performing pure mental acts, are regarded as not patentable. Granting the exclusive patent right to such fundamental knowledge is generally considered as not supporting the promotion of innovation and dissemination and the transfer of technology in society at large, since the detrimental effect of the exclusive rights that prevent others from using those fundamental principles is considered so critical.

120. The current international framework provides flexibilities as to the exclusion of certain technology from patentable subject matter. For example, many countries exclude plants, animals or computer programs from patentable subject matter. Different views have been expressed regarding the question as to whether patent protection is supportive of the transfer of certain technology. Therefore, it appears that no conclusion can be drawn with respect to the effect of excluding certain technology from patent protection to the transfer of such technology.

(ii) Exceptions and limitations⁵⁷

121. Certain exceptions and limitations to the rights seem to be more closely related to the issue of technology transfer. One of those exceptions is the so-called experimental use exception or research exemption. In general, the research exemption enables researchers to examine the stated effects of patented inventions and improve such patented inventions without fear of infringing the patent.⁵⁸ As described earlier, it is well known that the capacity to absorb and adapt technology is one of the cornerstones of the successful transfer of technology, and that such a capacity could be strengthened through “learning by doing”. The research exemption may provide a greater possibility of using the reservoir of existing knowledge without any fear of infringement of patents.

⁵⁵ In particular, Articles 7 and 8 of the TRIPS Agreement.

⁵⁶ Document SCP/13/3 provides general information regarding exclusions from patentable subject matter.

⁵⁷ Document SCP/13/3 provides general information regarding exceptions and limitations to the rights.

⁵⁸ Further information concerning the research exemption can be found in document SCP/13/3.

122. A large number of countries have, in their national legislation, provisions that allow the government and/or third parties, under certain circumstances and conditions, to use a patented invention without the authorization of the right holder. In general, those so-called compulsory license provisions are considered as an instrument to prevent abuses of the exclusivity inherent in the patent rights. They are also considered as tools to ensure that the patent system contributes to the promotion of innovation in a competitive environment and to the dissemination and transfer of technology, meeting the objectives of the system and responding to the public interest at large. Consequently, various conditions and grounds found in national laws aim to balance the interests of various stakeholders including the right holder, their competitors and the public at large.⁵⁹ International legal instruments, such as the Paris Convention, the TRIPS Agreement, the Doha Declaration on the TRIPS Agreement and Public Health and the Decision on Implementation of Paragraph 6 of the Doha Declaration on the TRIPS Agreement and Public Health, allow countries to issue compulsory licenses under certain conditions aimed at safeguarding the legitimate interests of the patent holder and third parties.

123. The effectiveness of compulsory licenses as a tool for the transfer of technology has been widely debated. Some note that, since the transfer of know-how not disclosed in a patent application can only be made by concluding voluntary licenses or through reverse engineering, compulsory licenses may be most effective when the technology is already known and only access to it is required.⁶⁰ One scholar notes that associated costs, political pressure and the non-exclusive nature of licenses are factors that may discourage the use of compulsory licenses as a means of acquiring technology.⁶¹ While the question as to whether compulsory licenses necessarily or automatically discourage any particular investment in R&D may require further investigation, presumably beneficial uses of compulsory licenses (such as selected uses of compulsory licenses to address emergencies or to remove specific technology supply bottlenecks) impose social costs of their own.⁶² In that light, some scholars suggest that compulsory licenses be viewed as one item of an arsenal of tools that may be used to promote coherent and effective national systems of innovation.⁵⁵

(iii) Parallel imports

124. Under the current legal framework, as stipulated in Article 6 of the TRIPS Agreement and the Doha Declaration on TRIPS and Public Health, countries are free to provide their own rules regarding the exhaustion of intellectual property rights. The exhaustion of patent rights occurs once a patentee, or any other person with the consent of the patentee, puts a product protected by a patent on the market. With respect to that product, the patentee, or any other person who put the product on the market with the patentee's consent, would no longer be able to enforce his or her patent rights. That is, the rights to prohibit others from using a patented product without the patentee's consent are "exhausted" when the patentee puts the product on the market for circulation or when it is put on the market with his or her permission. Depending on the territorial limitation on the market with respect to which the

⁵⁹ Further information concerning compulsory licenses can be found in document SCP/13/3.

⁶⁰ For example, Jayashree Watal, "Intellectual property rights in the WTO and developing countries", 2001.

⁶¹ Carlos Correa, "Can the TRIPS Agreement foster technology transfer to developing countries?" in *Keith Maskus and Jerome Reichman (ed.), International Public Goods and Transfer of Technology Under a Globalized Intellectual Property Regime*.

⁶² Jerome Reichman, Catherine Hasenzahl, "Non-voluntary licensing of patented inventions", UNCTAD-ICTSD, Issue paper No. 5, 2003.

exhaustion occurs, three types of exhaustion mechanisms exist, i.e., national exhaustion, regional exhaustion and international exhaustion. According to the principle of national exhaustion, the patent right is exhausted only where a patented product is put on the domestic market. In other words, if a patented product is put on the foreign market, the domestic patent right with respect to that product has not been exhausted, and therefore, the patentee may prevent the import of such a product put on the foreign market.

125. However, under regional or international exhaustion, the patent right is exhausted where a patented product is put on the regional market or put on any market internationally. In other words, if a patented product is put on that regional market or on any market in foreign countries, the domestic patent right with respect to that product is exhausted, and therefore, the patentee cannot prevent the import of such a product put on the regional or foreign market. Under such mechanisms, since the market price of the same product may be different from one country to the other, a third party may acquire a product from the foreign market at a lower price, and resell that product domestically outside the normal distribution channel of the patentee and the authorized importer/seller (parallel imports). A parallel importer usually exploits the difference in the purchasing price on the foreign market and the selling price on the domestic market.

126. On the one hand, the wide availability of parallel imported products in the domestic market, which are generally cheaper than products distributed through the normal distribution channel of the patentee and his or her authorized dealers, may increase the possibility for third parties to reverse engineer the technology. On the other hand, wide availability of parallel imported products may discourage foreign right holders from investing in the domestic market, since the parallel importer could free ride on the investments made by authorized distributors. The impact of parallel imports on innovation and investment is theoretically ambiguous, while some studies suggest that it may depend on the relevance of IPRs to the market power, size of the domestic market, the risk of re-export of parallel imported goods and the reasons for differential pricing.⁶³ In short, no clear evidence has been found with respect to parallel imports and the transfer of technology.

(iv) Competition law

127. Patent laws and competition laws are complementary in the sense that patent laws aim to prevent the copying or imitation of patented goods and contribute to fair market behavior, while competition laws may limit patent rights in that patent holders may be prevented from abusing their rights. A balance has thus to be found between competition policy and patent rights, and this balance must achieve the goal of preventing abuses of patent rights, without annulling the reward provided by the patent system when patent rights are used appropriately. Even if a patent allows a patentee to obtain a monopoly position, in principle, acquiring a monopoly position by lawful means does not constitute a violation of a competition law. However, if competition is distorted by the abusive behavior of a patentee dominating a market or by anti-competitive practices that tend to lead to such a dominant position, competition law would be applied to restore fair competition in the market.

128. Patent licensing agreements have competitive elements in the sense that they promote the efficient transfer of technology by integrating a licensed technology to the licensee's complementary assets. Under general principles applicable to contracts, parties are free to

⁶³ Rod Falvey and Neil Foster, "The role of intellectual property rights in technology transfer and economic growth: theory and evidence", UNIDO Working Papers, 2006.

determine the contents of contracts, and may derogate by mutual consent from the provisions relating to license contracts as long as they are not barred by law. Certain limitations in licensing agreements, such as territorial limitations or limitations as to the field of use, may be pro-competitive under certain circumstances, since such limitations may allow both the licensor and the licensee to exploit the patented technology as efficiently and effectively as possible. However, a competition law concern may arise if a licensing agreement contains restraints that adversely affect competition among entities that would have been competitors in the relevant market in the absence of the license. For example, if a licensing agreement that divides a market between competitors who would otherwise have competed with each other adversely affects competition, it may be contrary to competition law requirements.

129. As stated in Article 40.1 of the TRIPS Agreement, it is generally recognized that some licensing practices or conditions pertaining to intellectual property rights which restrain competition may have adverse effects on trade and may impede the transfer and dissemination of technology. Consequently, Article 40.2 allows WTO Members to specify, in their national legislation, licensing practices or conditions that may in specific cases constitute an abuse of intellectual property rights having an adverse effect on competition in the relevant market. Examples of such anti-competitive practices include: exclusive grant back conditions, preventing challenges to validity and coercive package licensing. Therefore, licensing clauses that oblige the licensee to transfer to the licensor any rights associated with the improvement of the licensed patent, oblige the licensee to purchase the licensor's other technologies that the licensee does not need or oblige the licensee to purchase materials only from the licensor or any particular source, may risk accusations of anti-competitive practices, which would be assessed on a case-by-case basis by a national authority.

(e) Supportive Environment in the Patent System

130. In order truly to empower the patent system as a tool for the efficient and effective transfer of technology, it has to be viewed in a broader context. While patent law provides the above various elements that together comprise the framework which supports the dissemination and transfer of technology, other features also support the patent system so that it works as intended. To name but a few, higher predictability in terms of the validity of the granted patents, high quality services offered by IP professionals and financial accessibility to the patent system all support the transfer of technology.

(i) Role of IP professionals and patent quality

131. The role of patent attorneys is, in general, to give advice and assist inventors and applicants in obtaining and maintaining patents, to give advice to third parties on the relevance of existing patents to their business activities and to assist third parties during opposition and invalidation proceedings. They should be able to provide a full range of possible protection or enforcement options available to the client and assist the client if a patent is erroneously granted or an abuse of right is found. Also, with a view to increasing integration of IP into the business model of firms, the role of patent attorneys in assisting in the IP management of his or her client appears to be increasingly important.

132. Qualified patent attorneys and patent agents are in a position to understand the technology concerned and to analyze the scope and value of the patented technology. Because of such capability, together with their understanding of IP law, patent attorneys can be an important interface between the transferor and transferee of the technology in the technology transfer process.

133. Although qualified patent attorneys would support patentees and third parties in finding mutually agreeable terms and conditions, at the outset, if the validity of granted patents is not credible, this would raise the costs for both patentees and third parties of concluding licensing agreements. Re-evaluation of the validity of a sub-standard patent (a patent for claimed inventions which do not meet patentability requirements), negotiations on such a sub-standard patent and taking any legal action, if necessary, to revoke totally or in part such a patent would require additional time, human and financial resources that could have been spent elsewhere.

VIII. PUBLIC-PRIVATE PARTNERSHIPS

134. Among the various partnerships and networks that we have witnessed in the past, a considerable part consists of inter-firm relationships, but collaborative innovation networks are gaining popularity among players from the private sector and government-funded agencies (so-called public-private partnerships). To a certain extent, almost all these collaboration models rely on patent strategies and contain provisions on the management and use of patent rights.

135. Simply stated, the process of creation and development of products involves three stages: (i) a research phase that forms the basis of the creation of the new product; (ii) a development phase that involves the transformation of research results into a concrete new product; and (iii) a marketing phase that involves all aspects relating to the distribution of the new product. Many private companies are successfully committed to the above three stages, i.e., from the R&D to the commercialization and dissemination of products. On the other hand, it has been widely recognized that, in many countries, a substantive amount of R&D, particularly basic research, is financed by the government and conducted by public research institutions including universities, while the commercialization of new products is essentially conducted by the private sector. Furthermore, as the technology becomes increasingly complex, the private sector is seeking collaboration with public sector research institutions that possess a high level of research expertise.

136. Generally speaking, there used to be a clear division between the activities of firms and those of the academic sector. The academic sector, including the public research institutions, previously concentrated more on the basic science. However, there has been an erosion of the division between basic science and applied science, in particular, in the field of biotechnology where basic science, such as genomics, is perceived as having potentially significant commercial value.⁶⁴ From the financial viewpoint of the public sector, at a time when public financial resources are scarce, collaboration with the private sector would ensure additional financial support for public research activities.

137. Despite the above collaboration needs, it was generally perceived that universities and public research institutions were not able sufficiently to convert the results of their research into viable products, mainly because of the absence of sufficient cooperation with the private sector. Consequently, policy makers have started to explore a better interface between the public sector and the private sector with a view to accelerating the innovation and commercialization of public-funded research results. The needs of bridging these two sectors may be higher in countries where advanced research capacities are concentrated in the public

⁶⁴ Commission on Intellectual Property Rights “Integrating Intellectual Property Rights and Development Policy”.

sector. According to a report issued by the European Commission, in Europe, universities and higher education establishments employ 34 per cent of the total number of researchers and are responsible for 80 per cent of the fundamental research carried out in that region.⁶⁵ Another source indicates that the government funds 67.5 per cent, 62.6 per cent and 38.2 per cent of the national research expenditure in Argentina, the Russian Federation and South Africa, respectively.⁶⁶

138. Without doubt, through their primary mission of delivering higher education and basic research, universities and public research institutions have been playing an important role in disseminating and transferring their research results through, e.g., publications, conferences and educating future researchers who would be employed by the private sector. However, in order to narrow the gap between the public research sector and the private sector, more direct dissemination and transfer of knowledge, such as collaborative research, licensing and creation of spin-off companies, has received wider attention. Consequently, the role of patents in accelerating the innovation and commercialization of public funded research results has been closely examined.

139. For a long time, as regards inventions created by public institutions, patent rights belonged to the State or professors themselves in many countries. Therefore, the public institutions could not take any decisions regarding the assignment or licensing of inventions created in the course of their research activities. Typically, State-owned patents, if any, were rarely exploited. As one of the intended functions of a patent system is to provide incentives for R&D, it was considered that allowing universities and public research institutions to claim ownership of intellectual property on their research results would offer more incentives for them to create new inventions. Further, it was also expected that any possibility of exploiting its intellectual property would motivate the public sector to seek licensees, possibly private companies, who may further develop its patented research results to a commercialized product. From the viewpoint of the private sector, it was argued that since public research activities were often basic research, private sector companies needed substantial investment, with a risk of failure, to develop further the early stage basic research into a new product and put it on the market. A possible motivation for the private sector to take such risks would be to ensure that a legal mechanism provides the possibilities for a company to have control over the developed technology, e.g., by way of an exclusive license or ownership of patents.

140. On the other hand, the mission of universities is widely considered as education, research and dissemination of research results for the benefit of humankind. To that end, freedom of research and publication are considered cornerstones of academic activities. There has been a fear that pursuing licensing activities with commercial partners might negatively affect the freedom of research and the fundamental mission of universities.

141. Taking into account the various interests involved, it appears that the policy choices of many governments are to allow universities and public research institutions to claim ownership of intellectual property based on public-funded research with the aim of maximizing the public benefits of such research. Consequently, universities and public research institutions can, to a large extent, set up IP and licensing policies, and decide on the

⁶⁵ The Role of the Universities in the Europe of Knowledge (COM(2003) 58 final). However, the total number of researchers employed in universities and higher education establishments varies significantly among EU Member States (26 per cent in Germany, 55 per cent in Spain and over 70 per cent in Greece).

⁶⁶ OECD Main Science and Technology Indicators (MSTI): 2009/1 edition.

distribution of royalty incomes among the stakeholders. One of the first countries that established a legal framework to implement such a policy was the United States of America: the so-called Bayh-Dole Act of 1980 allowed and encouraged research institutions in the United States of America to patent technology developed with federal funding, and to license that technology in return for royalties. In principle, non-profit organizations, including universities, and small businesses may retain the title to inventions made under the funding agreement with a federal agency, subject to the fulfillment of a number of obligations in order to meet the principal objective of promoting the utilization of inventions arising from federally-supported research.⁶⁷

142. The Bayh-Dole Act triggered a substantial increase in patenting activities in US universities and has been at the heart of the establishment of technology transfer offices in many US research institutions. This has resulted in a substantial growth in licensing revenues in those universities and research institutions and in the number of spin-off companies therefrom. However, it may also be important to note that the vast majority of institutions earn relatively little income from licensing fees, while a relatively small number of those institutions share the bigger part of total income. An extensive study examining university-industry technology transfer before and after the Bayh-Dole Act⁶⁸ found that the processes of knowledge exchange between a university and industry are multi-channeled and complex, and differ significantly among different fields of technology: US university patenting and licensing have been concentrated in the biomedical sciences. It concludes that the Act's emphasis on patenting and licensing as a critically important vehicle for the transfer to industry of academic inventions lacks a strong evidentiary foundation so far, and evidence on the role of patenting and licensing as indispensable components of technology transfer remains mixed. However, it also finds that the Bayh-Dole Act has simplified a complex administrative process to obtain intellectual property for inventions resulting from public-funded research, and has facilitated the entry into patenting of a number of institutions with little experience in managing patenting and licensing activities. It also suggests that patenting *per se* is less critical to an assessment of the Bayh-Dole Act's effects on public welfare than the types of licensing policies adopted by universities, although greater patenting of scientific, as opposed to technological, findings could be an issue of concern.

143. Following the enactment of the Bayh-Dole Act, many other countries have started to adopt policies and legal mechanisms for technology transfer from universities and public research institutions which are similar, although not identical, to the US policy and legislation. Not only developed countries, but also developing countries, have looked into areas such as the legal status of universities and public research institutions, simplifying administrative complexity to obtain intellectual property from those institutions, developing the intellectual property policy of those institutions, establishing technology transfer offices (TTOs) and reviewing funding and financial schemes for research activities carried out in those institutions.

144. The effects of such changes in other countries may require further evaluations due to the relatively recent introduction of those changes in those countries. It is well known that the cost of establishing and maintaining a TTO is not negligible. The experiences of China, India, Japan, the Philippines, the Republic of Korea, Singapore and Thailand are found in a number of studies that were commissioned in the framework of the WIPO project on

⁶⁷ 35 U.S.C., Chapter 18, §200-212.

⁶⁸ David C. Mowery et. al. "Ivory tower and industrial innovation: university-industry technology transfer before and after the Bayh-Dole Act in the United States", 2004.

“Development of University-Industry Partnerships for the Promotion of Innovation and Transfer of Technology”.⁶⁹ Focusing on the Japanese experience, one study finds that, in addition to bigger companies, small and young businesses have started to use university collaboration R&D in the recent past, and suggests that it could be an indication of a change in the innovation system in Japan from in-house innovation to network-based innovation.⁷⁰

145. A study examining university patenting in Germany before and after the legal reform of abolishing professors’ privilege shows a number of findings that are in common with the above US study.⁷¹ It finds no evidence of systematic increase in the numbers of university-invented patents after the legal reform, but the ownership of those patents has shifted from individuals (professors) and firms to universities. It also observed that the legal reform provided inexperienced researchers with institutional support for better access to an improved transfer infrastructure. From a technology transfer perspective, the probability of successful commercialization might be higher for university ownership due to more patenting experience, more diverse industry contacts and more time investment of TTO staff. Nevertheless, the study concludes that the hope for revenues from commercialization as a new source of funding for universities could be misguided.

146. In order to facilitate collaboration between the public sector and the private sector, some countries provide standard model agreements, such as model research collaboration agreements and consortium agreements, for a variety of circumstances.⁷² In addition, although legal frameworks and policies underlining public private partnerships vary among Member States, the European Commission established voluntary guidelines for universities and other research institutions to improve links with industry across Europe.⁷³ These aim to help research institutions develop more effective mechanisms and policies to promote both the dissemination and the use of public-funded R&D results and to facilitate the creation of a standard approach at European level. The complexity of different IP systems among countries in Europe was indeed recognized as a deterrent for cross-border collaboration between businesses and public research institutions by a European Expert Group.⁷⁴ The Group produced a Decision Guide and a Toolkit for private enterprises, public research institutions and intermediaries in order to support setting up cross-border collaboration.

147. It has been observed that the amount of knowledge and technology transferred from university to industry (and/or which is the result of collaboration between these two types of institutions) depends on: (i) the amount of knowledge generated within universities and public research institutions; (ii) the type of knowledge disclosure; (iii) the nature and type of their research; and (iv) the absorptive capacity and demand for new knowledge by

⁶⁹ <http://www.wipo.int/uipc/en/partnership>.

⁷⁰ Kazuyuki Motohashi, “Economic analysis of university-industry collaborations: the role of new technology based firms in Japanese national innovation reform”, RIETI Discussion Paper Series 04-E-001, January 2004.

⁷¹ Sidonia von Ledebur et. al. “University patenting in Germany before and after 2002: what role did the professors’ privilege play?”, Jena Economic Research Papers, #2009-068.

⁷² In the United Kingdom, a Lambert toolkit is available at: http://www.dius.gov.uk/innovation/business_support/lambert_agreements. In Germany, a variety of model agreements, such as the “Berlin Contract”, “Hamburg Contract” and “Munich Contract” exist.

⁷³ Voluntary guidelines for universities and other research institutions to improve the links with industry across Europe, COM(2007) 182 final, European Commission.

⁷⁴ Report of the CREST OMC Expert Group on Intellectual Property (2nd Cycle), 2006 http://ec.europa.eu/invest-in-research/coordination/coordination01_en.htm.

companies.⁷⁵ Since public-private partnerships are one form of technology transfer from one party to another, intellectual property rights are relevant, but represent just one element for successfully transferring knowledge from the public sector to the private sector. Needless to say, in addition to the legal and institutional framework of the knowledge production system, the capacity of the business sector to absorb the research results and other enabling environments are essential for effective public-private partnerships.

IX. TOOLS AND INSTITUTIONAL FRAMEWORK

148. In business circles, patent information is widely used in formulating a firm's IP strategy, as an input into research and development processes, to facilitate licensing and technology transactions, for technology transfer and for analysis of markets and competitors in order to support important business decisions. Further, the availability of information concerning ownership and rights and obligations associated with a patent (e.g., licensing agreements or security interest), which may be found in national patent registries, may support the transparency of the market and the legal certainty of transactions of so-called "intangible assets".

149. Although all information that is needed to analyze the technical contents of patents as well as the status of such patents (and patent applications) is held by patent offices, if such information is published on paper, in practical terms, it can be difficult to access, particularly from abroad. Digitization of national patent documents facilitates access to patent information as well as the statistical/analytical use of such information. Patent information is increasingly available via easily-accessible services that are delivered over the Internet. In addition, WIPO coordinates the Access to Research for Development and Innovation (aRD_i) program together with its partners in the publishing industry with the aim of increasing the availability of scientific and technical information in developing countries.⁷⁶

150. Various patent databases and the possibilities of patent landscaping are described in detail in document SCP/13/5, and therefore, are not repeated in this document. It may be sufficient to state simply that those digital tools play a significant role in the dissemination and transfer of technology. In some countries, with a view to disseminating information concerning the patents available for use without any need to obtain the consent of the patent holders, off-patent databases (databases of patents which have expired or withdrawn) are available on-line. An electronic registry which can be consulted on-line by third parties would serve the same purposes.

151. Further, in order to promote licensing deals, a number of countries have set up tools that facilitate bringing potential buyers and potential sellers of technology together. The United States Patent and Trademark Office, e.g., publishes information concerning patents available for license and sale in its Official Gazette⁷⁷ and the Intellectual Property Office of the United Kingdom provides a license of rights database. In addition, a number of national and regional authorities are active in promoting licensing by assisting market assessment and finding

⁷⁵ Fabio Montobbio, "Intellectual property rights and knowledge transfer from public research to industry in the US and Europe: Which lessons for innovation systems in developing countries?" in *The Economics of Intellectual Property*, WIPO Publication No. 1012.

⁷⁶ <http://www.wipo.int/ardi/en/>. Currently, 12 publishers provide access to over 50 journals for 107 developing countries through the aRD_i program.

⁷⁷ <http://www.uspto.gov/web/patents/patog/week50/OG/TOC.htm#ref11>.

business partners. They also provide a user friendly platform on the Internet where potential buyers and sellers can identify each other.⁷⁸ Generally speaking, such platforms provide a description of the technology offered/searched or a list of licensable patents and contact information. A number of commercial patent transaction businesses also exist, e.g., IP auction businesses.⁷⁹

152. The institutional framework is also important for the effective transfer of technology. Technology and Innovation Support Centers (TISC), proposed in the context of the WIPO Development Agenda, not only provide patent information services, but also a wide range of innovation support services, including strengthening the local technological base by building up local know-how, coordinating the transfer of technology and skills, and sharing of know-how by investigating the possibilities of licensing, joint ventures, etc. As regards the transfer of universities' research results to the commercial sector, TTOs in universities prosecute, license and manage intellectual property rights originating from universities. They often cover a wide range of tasks from evaluating invention disclosures and prosecuting patent applications to licensing the university's patents, assisting research collaborations with industry, assisting spin-outs and handling patent disputes, among others. They play a critical role in the commercialization of basic research results by bridging academic research and commercial applications of such research.

X. DEVELOPMENT AND TRANSFER OF TECHNOLOGY

153. Access to new technologies is considered crucial in effectively responding to global challenges, such as development, climate change, health and food security. Indeed, new technologies can be a solution to a number of, if not all, challenges prescribed in the United Nations Millennium Development Goals (MDGs). In particular, Goal 8 of the MDGs states that UN Member States are committed to developing a global partnership, and Target 8f indicates: "in cooperation with the private sector, make available the benefits of new technologies, especially information and communications".

154. As a specialized agency of the United Nations, the effective use of intellectual property for economic, social and cultural development has been a key concern of WIPO. In particular, the WIPO Development Agenda aims to ensure that development considerations form an integral part of WIPO's work. Forty-five recommendations adopted by the WIPO General Assembly in October 2007 contain a number of recommendations that relate to the transfer of technology. Specifically, Cluster C "Technology Transfer, Information and Communication Technologies and Access to Knowledge", as reproduced below, highlights the concerns of WIPO Member States and recommends actions in this area⁸⁰:

⁷⁸ For example, a patent licensing database by Japan's National Center for Industrial Property Information and Training (NCIPI) [<http://www.inpit.go.jp/english/index.html>], Innovation Relay Centres (IRCs) by the European Commission [<http://irc.cordis.lu>], the National Technology Transfer Center (NTTC) in the United States of America [<http://www.nttc.edu/default.asp>] and IP Market Place for Patents by the Danish Patent and Trademark Office [<http://www.dkpto.org/>].

⁷⁹ It was reported that a patent for a continuous play broadcast system was sold for US\$1.75 million at one of those auctions. [Managing Intellectual Property Weekly News, October 26, 2007].

⁸⁰ In addition, Recommendation 19 is also relevant to access to knowledge and technology for developing countries.

“Cluster C: Technology Transfer, Information and Communication Technologies (ICT) and Access to Knowledge

“24. To request WIPO, within its mandate, to expand the scope of its activities aimed at bridging the digital divide, in accordance with the outcomes of the World Summit on the Information Society (WSIS) also taking into account the significance of the Digital Solidarity Fund (DSF).

“25. To explore intellectual property-related policies and initiatives necessary to promote the transfer and dissemination of technology, to the benefit of developing countries and to take appropriate measures to enable developing countries to fully understand and benefit from different provisions, pertaining to flexibilities provided for in international agreements, as appropriate.

“26. To encourage Member States, especially developed countries, to urge their research and scientific institutions to enhance cooperation and exchange with research and development institutions in developing countries, especially LDCs.

“27. Facilitating intellectual property-related aspects of ICT for growth and development: Provide for, in an appropriate WIPO body, discussions focused on the importance of intellectual property-related aspects of ICT, and its role in economic and cultural development, with specific attention focused on assisting Member States to identify practical intellectual property-related strategies to use ICT for economic, social and cultural development.

“28. To explore supportive intellectual property-related policies and measures Member States, especially developed countries, could adopt for promoting transfer and dissemination of technology to developing countries.

“29. To include discussions on intellectual property-related technology transfer issues within the mandate of an appropriate WIPO body.

“30. WIPO should cooperate with other IGOs to provide to developing countries, including LDCs, upon request, advice on how to gain access to and make use of intellectual property-related information on technology, particularly in areas of special interest to the requesting parties.

“31. To undertake initiatives agreed by Member States, which contribute to transfer of technology to developing countries, such as requesting WIPO to facilitate better access to publicly available patent information.

“32. To have within WIPO opportunity for exchange of national and regional experiences and information on the links between IPRs and competition policies.”

155. Further, in relation to norm-setting, recommendations 22 and 23 read as follows:

“22. WIPO’s norm-setting activities should be supportive of the development goals agreed within the United Nations system, including those contained in the Millennium Declaration.

“The WIPO Secretariat, without prejudice to the outcome of Member States’ considerations, should address in its working documents for norm-setting activities, as

appropriate and as directed by Member States, issues such as: (a) safeguarding national implementation of intellectual property rules; (b) links between intellectual property and competition; (c) intellectual property-related transfer of technology; (d) potential flexibilities, exceptions and limitations for Member States; and (e) the possibility of additional special provisions for developing countries and LDCs.

“23. To consider how to better promote pro-competitive intellectual property licensing practices, particularly with a view to fostering creativity, innovation and the transfer and dissemination of technology to interested countries, in particular developing countries and LDCs.”

156. The Committee on Development and Intellectual Property (CDIP) was established by the WIPO General Assembly in 2007 to (i) develop a work program for implementation of the 45 adopted recommendations; (ii) to monitor, assess, discuss and report on the implementation of all recommendations adopted, and for that purpose it shall coordinate with relevant WIPO bodies; and (iii) discuss IP and development-related issues as agreed by the Committee, as well as those decided by the General Assembly. Consequently, implementation of the above recommendations has been monitored, assessed, discussed and reported at the CDIP.⁸¹ Two projects for the implementation of the WIPO Development Agenda are directly relevant to the transfer of technology. They are the “Project on Innovation and Technology Transfer Support Structure for National Institutions”⁸² and the “Project on Intellectual Property and Technology Transfer: Common Challenges – Building Solutions”⁸³.

157. As UNCTAD’s Innovation Capability Index suggests, there are large gaps among countries, not only between developed and developing countries but also among developing countries, in terms of technological activity and human capital.⁸⁴ How to design a patent system that functions in the way for which it is intended, i.e., to promote innovation, technological development, the diffusion and transfer of technology and private investment flows, in those very different countries is a real challenge. One scholar suggests that the need for patent protection on technology transfer and local innovation in developing countries varies with the level of development.⁸⁵ According to this researcher, econometric cross-section evidence suggests an inverted-U shaped relationship between the strength of patents and income levels, i.e., the intensity of patenting first falls with rising incomes, as countries slacken patents to build local capabilities by copying, then rises as they engage in more innovative effort. Another researcher who examined the experience of the Republic of Korea concluded that strong IPRs protection would hinder, rather than facilitate, technology transfer to indigenous learning activities in the early stage of industrialization when learning takes place through reverse engineering and duplicative imitation of mature foreign products.⁸⁶ He argued that it is only after countries have accumulated sufficient indigenous capabilities with extensive science and technology infrastructure to undertake creative imitation that IPR

⁸¹ Background documents, working documents and reports concerning the WIPO Development Agenda are available at: <http://www.wipo.int/ip-development/en/agenda/>.

⁸² See document CDIP/4/2

⁸³ See document CDIP/4/7

⁸⁴ UNCTAD, World Investment Report 2005.

⁸⁵ Sanjaya Lall, “Indicators of relative importance of IPRs in developing countries”, UNCTAD-ICTSD, Issue paper No. 3, June 2003.

⁸⁶ Linsu Kim, “technology transfer & intellectual property rights”, ICTSD-UNCTAD, Issue paper No. 2, June 2003

protection becomes an important element in technology transfer of industrial activities. On the other hand, as some economic studies referred to in Chapter V suggest, the interaction between IPR protection and the transfer of technology could be complex, and the level of development is one among many other factors that relate to the technology transfer processes which can again vary.

158. It appears that there is general agreement that national patent policy and laws should be adjusted to the needs of each country, taking into account its economic and social development.⁸⁷ While history offers us rich lessons from the past, it may be worth noting that the current economic and social environments are not exactly the same as in the past. In addition to intensified globalization, it is said that the world today is in a transition to a knowledge-based economy where knowledge would become a strong competitive advantage in the globalized market. In the past, the low labor wedge was one of the major reasons for FDI in developing countries. However, with the increasing importance of intangibles and knowledge, the low price of labor is not the only reason for many companies to set up R&D facilities in developing countries. They are attracted by the possibility of plugging into national clusters of excellence and obtaining local knowledge, which is required to respond to the specific needs of national and local markets.⁸⁸ Technological advancement, in particular, in the field of information and communication technology, has dramatically increased the possibilities of retrieving and exchanging information and knowledge. Compared with the pre-Internet age, accessibility to scientific and technological information, including patent information, has been considerably improved. With a view to the ever-increasing competition in the market, firms as well as policy makers have been searching for new innovation models, such as open innovation models, advantageous to cross-border collaboration and cooperation. With a view to designing a future patent policy aimed at effective technology transfer, both nationally and internationally, these new elements may also be taken into account.

[End of document]

⁸⁷ For instance, recommendations 15, 17 and 22 of the WIPO Development Agenda

⁸⁸ “The world is our oyster”, *The Economist*, October 7, 2006