Activities supporting technology transfer under the Convention on Biological Diversity

Gap Analysis

This analysis is based on information compiled pursuant to a request of the tenth meeting of the Conference of the Parties (decision X/16). The compilation is provided in a separate document.

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1 Introduction

1. In paragraph 2 (a) of decision X/16, on technology transfer and cooperation, the Conference of the Parties at its tenth meeting invited Parties, other governments, relevant international organizations and initiatives, research institutions and the business sector, to submit to the Executive Secretary information on activities currently being undertaken by international, regional or national organizations and initiatives, including sectoral organizations and initiatives, which support, facilitate, regulate or promote technology transfer and scientific and technological cooperation of relevance to the Convention, such as on:

i. Support for technology needs assessments and regulations, including capacity-building for technology assessments;

ii. Pertinent capacity-building and training courses;

iii. Pertinent seminars and symposia;

iv. Information dissemination;

v. Other implementation activities including match-making and catalysing or facilitating the establishment of research-centre networks, alliances or consortia, joint ventures, twinning arrangements, or other proven mechanisms, on technologies of relevance to the Convention.

2. Paragraph 2 (b) of the decision above requested the Executive Secretary to analyse this information, and to identify gaps in existing work as well as opportunities to fill these gaps and/or promote synergies. The present note responds to this request.

3. The invitation to submit pertinent information as outlined above was communicated to Parties, other governments, relevant international organizations and initiatives, research institutions and the business sector by notifications 2010/207, 2011/077, and 2011/094, and submissions received were made available through the clearing-house mechanism of the Convention.

4. Conducting a gap analysis requires a reasonable degree of comprehensiveness of the underlying information set. In light of the limited number of submissions received, additional web-based research was therefore undertaken and consultations conducted in order to amend the information received. As requested by the decision, the compilation result is made available through the clearing house mechanism of the Convention, in form of a searchable online database as well as an offline compilation document. [1] A total of 127 programmes and initiatives were identified as being relevant for this analysis and included in the database.

2 Scope and Methodology

5. **Scope of research.** This study has reviewed information from the submissions received in response to the aforementioned notifications, as well as the on-going activities undertaken by the Convention Secretariat and its more than 200 cooperation partners under the Convention's thematic programmes of work and programmes of work on cross-cutting issues. An additional 71 international organizations and programmes, 32 regional organizations and agencies, as well as 45 development cooperation agencies of OECD countries and technology-related research centers from developing countries were retrieved by web-based research. The study also investigated relevant activities and mechanisms of major biotechnology business associations which are actively engaged in technology transfer at international and regional levels. The sample also includes a number of joint research and exchange programmes operated by universities that contribute to the transfer of relevant technologies.

6. **The criteria for data selection.** Activities were considered relevant and selected if they were: (a) relevant to the list provided in decision X/16 (see above); (b) relevant to the Convention's objectives and in particular to the implementation of Article 16 of the Convention; (c) currently active, with long-term business plans and operational mechanisms; and (d) international (trans-border) technology transfer and cooperation, leading towards exchanges between countries.

7. **Definition of "gap".** "Gaps" were sought to be identified and analyzed against the following references:

[1] http://www.cbd.int/tech-transfer/gapanalysis.shtml

(a) the Programme of Work on Technology Transfer and Scientific and Technological Cooperation[2] adopted the Conference of the Parties at its seventh meeting, in 2004 (hereafter referred as "PoW-TT");

(b) the report of the meeting of the Ad Hoc Technical Expert Group on Technology Transfer and Cooperation, held in 2007 (hereafter referred as "AHTEG-TT ");

(c) the Strategy for Practical Implementation of the Programme of Work on Technology Transfer and Scientific and Technological Cooperation, developed by the AHTEG above for consideration by the Conference of the Parties at its ninth meeting, in 2008, and annexed to decision IX/14 (hereafter referred as "Implementation Strategy").

3 Gap analysis of supporting activities

3.1 General observations and key findings

8. **Most of the existing relevant activities supporting technology transfer under the Convention are not formally linked to the CBD.** Among the total 127 programmes and initiatives identified as relevant to this study, only 14% are directly related or linked to the CBD's process (see Fig. 1). This low level of institutional link implies that most of the support provided, although at least somewhat relevant, does not necessarily reflect or respond to the needs of Parties and the guidance developed thereon under the Convention. In addition, this may imply a knowledge gap: due to the lack of reporting or information sharing arrangements, many supportive activities may simply not be known to the biodiversity community.

[2] http://www.cbd.int/doc/publications/ttc-brochure-01-en.pdf

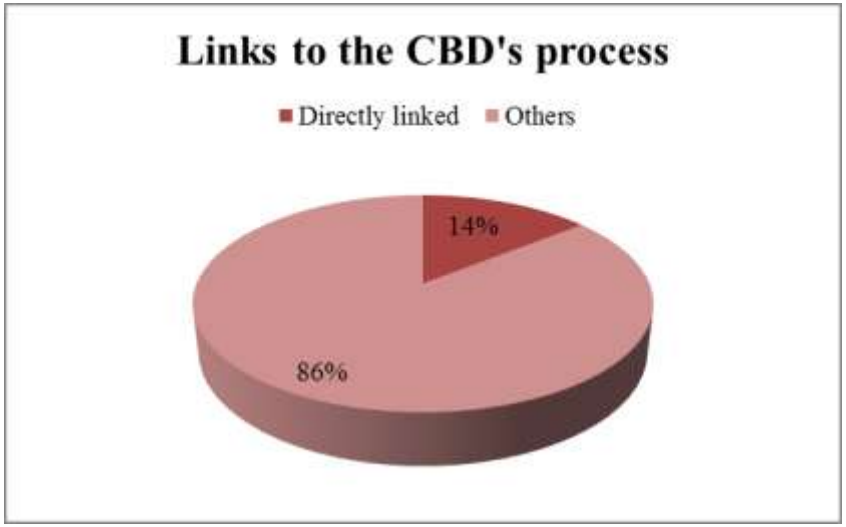

Figure 1 Support linked to the CBD

9. The majority of programmes and initiatives researched provide more than one type of support. Among all the five types of support, **information dissemination** leads with the largest number of activities, followed by **capacity building** and **match-making.** Most **seminars and symposia** are not formally related to the CBD-specific technology transfer. Finally, support to biodiversity **technology needs assessments** appears to be a gap area where very limited support is available (see Fig. 2).

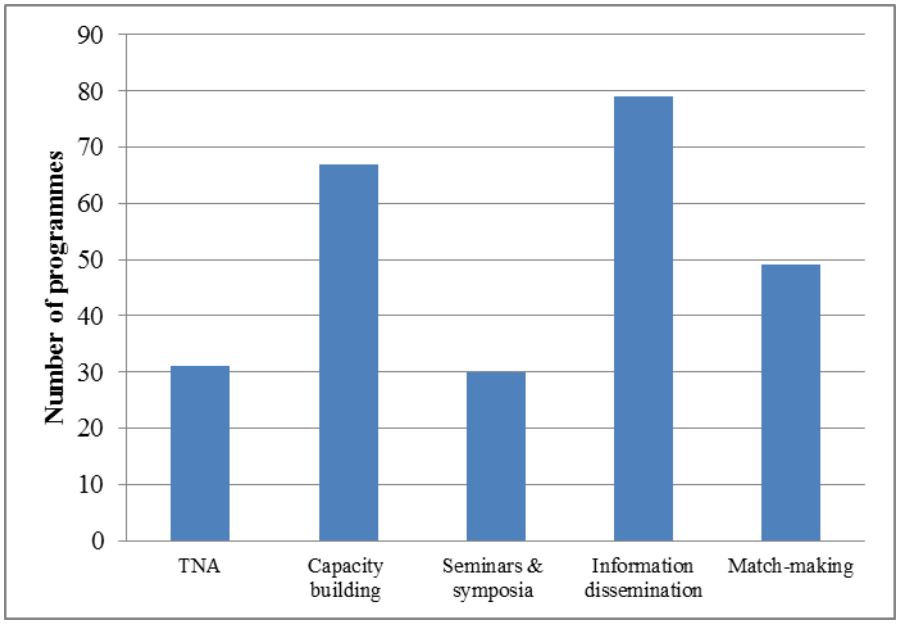

Figure 2 Types of support to technology transfer

3.2 Support to Technology Needs Assessment

3.2.1.1 Requirements and needs

10. According to the **PoW-TT**, biodiversity technology needs assessments (TNA) should be a "set of country-driven activities which involve relevant stakeholders in a consultative process to identify and determine the needs of Parties in response to national priorities and policies as set, inter alia, in the national biodiversity strategy and action plan, in accordance with the activities foreseen in the thematic programmes of work and cross-cutting issues under the Convention". Particularly, such assessments are expected to address:

(a) Technology needs, opportunities and barriers in relevant sectors;
(b) Related needs in the building of capacity.

11. In the **Implementation Strategy**, TNA is considered as a component of the "enabling environment" to be undertaken primarily by the "receiving end" (technology recipient Party). Based on knowledge of the range of available technologies, recipient Parties should "**assess priority technology needs** through consultative multi-stakeholder processes on the local, national or regional level, possibly in collaboration with regional or international organizations."

12. The **AHTEG-TT** also pointed to the importance of promoting **demand-driven technology needs assessments involving consultations with a wide range of stakeholders**. Experts reviewed existing tools and projects focused on identifying technology needs, such as the TNA undertaken under the UNFCCC with support by GEF, as well as the UNDP/GEF guidebook on the preparation of needs assessments for climate change mitigation and adaptation technologies. It was noted that **training is essential given that "there is currently a lack of capacity to undertake assessments".**

3.2.1.2 Existing activities: the compilation result

13. As a total result, 31 programmes and initiatives have been identified as relevant support to TNA, of which, however, nearly 90% (28) do not directly address the technology needs arising from implementing the Convention. These activities, although supporting the identification of some aspects of technology needs which could be of relevance to biodiversity, such as those related to climate change and agriculture, would need to be adapted for effectively and comprehensively identifying the needs aringi under the Convention.

(a) From the submissions to the Notification: Support to TNA appears to be limited. No significant activities have been found in supporting comprehensive technology needs assessments across biodiversity thematic areas, biomes or sectors as required in the Programme of Work. However, some sectoral programmes are assessing specific needs. For instance, **Bioversity International** reported its support to the needs assessment for incorporating agro-biodiversity content in higher education curricula in selected countries in Sub-Saharan Africa, Meso-America and Southeast and East Asia. TNAs on climate change technologies at national and regional levels continue to be supported under the **UNFCCC**, with capacity building and training supported by the GEF through UNDP, UNEP, and in collaboration with the Climate Technology Initiative (CTI)**.** Similar support does so far not exist for the thematic programmes and cross-cutting issues under the Convention.

(b) From recent activities of the CBD: Sampling of third national reports indicates no Party having conducted thorough technology needs assessments (see fig. 3). According to the synthesis of the thematic reports on Technology Transfer and Cooperation submitted in 2003[3], less than ten Parties indicated their needs for relevant technologies in a few sectors. The Conference of the Parties at its tenth meeting invited Parties to consider including the preparation of technology needs assessments in the revision and updating of national biodiversity strategies and action plans (decision X/16, paragraph 3 (a)). Accordingly, the revised CBD's training manual on the National Biodiversity Strategy and Action Plan (NBSAP) advises Parties to include TNA as a "clear plan" in the revised NBSAP. [4]

(c) From web-based research, including CBD's TT database: given the absence of direct support for TNAs under the Convention, the most relevant activities seem to be in the area of **climate change** in support of the implementation of the UNFCCC, in particular with regard to technologies for adaptation to climate change. So far, no comprehensive TNA methodology for the Convention has been produced. However, due

[3] UNEP/CBD/COP/7/INF/9

[4] See NBSAP Training Manual Version 2.1 available under http://www.cbd.int/nbsap/training/ .

to the differences between the two Conventions, the applicability of the TNA methodology under the UNFCCC in the context of the Convention, and any need for amendments, remains to be fully explored. [5]

Moreover, in the area of **agriculture**, comprehensive assessments on the development status of agricultural science and technology as well as their impacts in meeting development and sustainability goals have been conducted at global and regional level through the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD). On the issue of **biosafety**, UNIDO's Biosafety Information Network and Advisory Service (BINAS) assists countries on biotechnology safety assessments to ensure that national regulations and practices are consistent with relevant legally binding agreements, including the Cartagena Protocol on Biosafety under the Convention. These activities are relevant to the CBD but do address particular elements.

Technology assessments as an extended service are also found as a type of support to some regional technology transfer mechanisms. For example, the European Parliamentary Technology Assessment Networks (EPTA) is a network-bounded regional mechanism assessing technologies applied in forestry, agriculture, plant and animal genetics and nanomedicine under the umbrella category of "bio-based economy". However, the purpose of these assessments is to identify the possible social, economic and environmental impact of new sciences and technologies, but not to identify the technology needs of Parties for implementation of the Convention.

3.2.1.3 Gap analysis

14. Two significant gaps have been identified: **i) methodologies for conducting TNA** and **ii) pertinent capacity building on TNA**. These gaps result in a limited implementation of Article 16 among the 193 CBD Parties. According to the third National Reports, only about 20% of the Parties were undertaking some "basic assessments" and some 18% Parties had indicated that they were only planning to conduct such assessments. The majority (62%) either reported "no assessments" or had provided no information. (see Figure 3). Comparing with the implementation progress of the UNFCCC, where 95 developing countries have conducted country-specific TNAs for identifying and prioritizing climate change mitigation and adaptation technologies following the same framework methodology, the support to CBD Parties to conduct TNAs needs to be strengthened.

[5] See the preliminary analysis provided in a note by the Executive Secretary for consideration by the Conference of the Parties at its eighth meeting, in 2006 (document UNEP/CBD/COP/8/19, paragraphs 25-30).

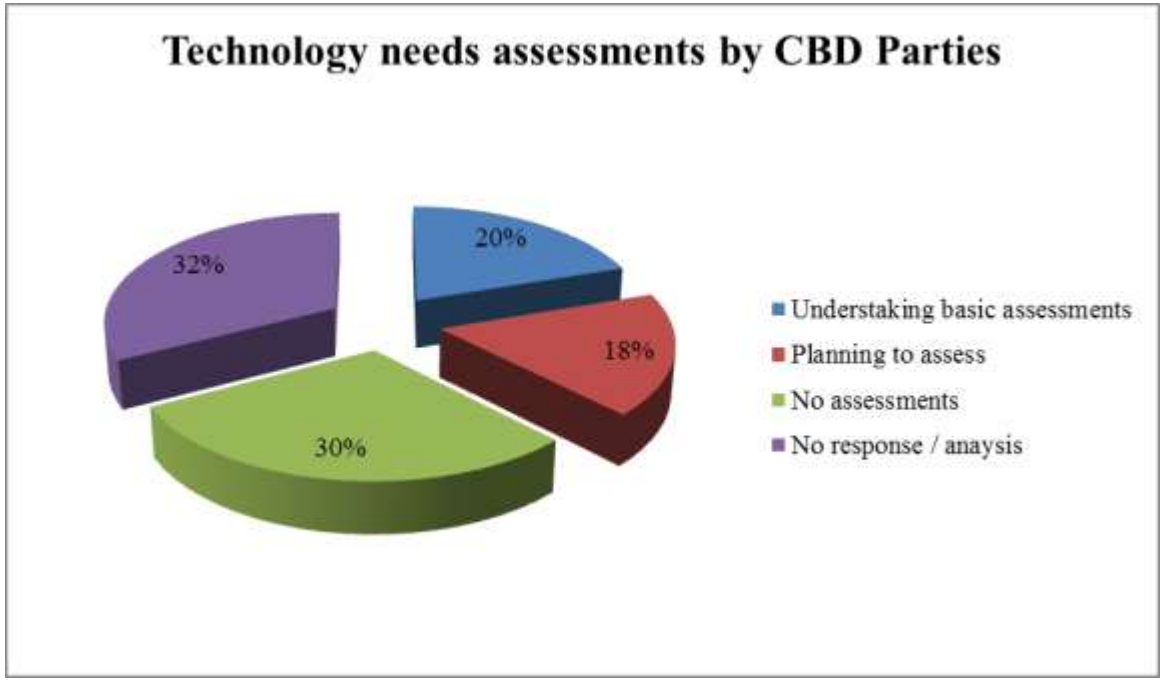

Figure 3 Biodiversity TNA gaps from the 3rd national reports (NR3) submitted by CBD Parties

i) Gap: TNA methodology

15. A methodology for conducting country-level TNAs has not been defined yet under the CBD. In the absence of a clear methodology, almost all the assessments undertaken by Parties in fact were following methodologies designed for other purposes. For example, some parties chose to use the GEF framework of National Capacity Self-Assessment for Global Environmental Management (NCSA), which aims at assessing the capacity constraints and potentials for implementing the three Rio Conventions (CBD, UNCCD and UNFCCC). Clearly, this framework has a broader scope and a different focus than biodiversity technology needs, which would require more detailed and specific assessments.

16. Relevant international organizations may wish to support the development of a TNA methodology for the CBD, drawing upon the experiences from similar processes:

(a) In terms of the methodology for TNA process design, which requires to be "country-driven" and "involving relevant stakeholders", the most relevant example is the TNA methodology developed under the UNFCCC's technology transfer framework, particularly, the UNDP/UNFCCC Handbook for Conducting Technology Needs Assessment for Climate Change (an updated version from the 2004 handbook), produced under the guidance of the Expert Group on Technology Transfer, with support and contribution from the GEF, the Climate

Technology Initiative (CTI) and numerous climate change technology transfer practitioners in developing countries. While the relevance of this handbook to the CBD needs to be fully examined, a number of areas would arguably require adjustments and different approaches to fit the distinctive focus and context of the CBD. A comparison table below highlights some of the areas.

"Technology needs" defined under the UNFCCC [1]	**"Technology needs" described under the CBD** [2]
The evolving need for new equipment, techniques, practical knowledge or skills to meet development priorities through **provision of low greenhouse gas services** or **reduction of the vulnerability of sectors** to promote sustainable livelihoods and minimize the extent and adverse impacts of climate change. Technology needs are further defined by both the context of national development priorities and the extent of international opportunities.	…(T)he needs of Parties in response to national priorities and policies, particularly developing countries, least developed countries and small island developing States, as well as countries with economies in transition, with regard to the cooperation and transfer of technology for **conservation and sustainable use of biodiversity**, or technology that **makes use of genetic resources and do not cause significant damage to the environment**, and with regard to building or enhancement of scientific, legal and administrative capacity, and training.
TNA for UNFCCC (examples)	**TNA for CBD- what needs to be adapted (examples)**
a. In order to provide a starting point in the identification of relevant stakeholders, Chapter 2 of the handbook includes an illustrative list of stakeholders and the organization of national team/ national stakeholder group.	a. This list would need to be amended or modified in order to reflect the interests of relevant stakeholders (including indigenous and local communities) for technology transfer under the Convention
b. Chapter 4 of the handbook, on the preparation of a preliminary overview of options and resources, provides a list of economic sectors affected by climate change adaptation and mitigation and are hence relevant for TNA.	b. This list would again need to be amended or modified in order to reflect sectors of relevance for technology transfer under the Convention.
c. Chapter 5 of the handbook provides criteria to identify, categorize and assess priority environmentally sound technologies for climate	c. This set of criteria would need to be amended or re-designed to be applicable to the three objectives of the Convention.

change mitigation and adaptation.	
d. Chapter 6 of the handbook addresses the identification of barriers and policy needs and provides an illustrative list of possible barriers.	d. This list could again be adapted and/or further specified to reflect the specific barriers and policy needs arising in the context of the CBD.
e. Chapter 6 also provides guidelines for mapping national market system and formation a network	e. These guidelines would need to be adapted and/or re-defined to address the technology market in the context of the Convention.
f. Chapter 6 also addresses technology R&D activities in supporting strategies for pre-commercial and long-term technology transfer.	f. This would need to be adapted to the Convention and the provisions under the Cartagena Protocol on Biosafety as well as the Nagoya Protocol on Access and Benefit-Sharing.

Table 1 UNFCCC TNA Handbook and its applicability to the CBD

Source: 1. Handbook for Conducting Technology Needs Assessment for Climate Change, UNFCCC/UNDP (2010);
2. Programme of Work on Technology Transfer and Scientific and Technological Cooperation, SCBD (2004)

(b) With regard to the technical aspect of the methodology, specific technology assessment criteria and guidelines should be developed for the CBD to ensure that the transfer of these technologies supports the specific objectives. Even though some methodologies developed for other processes may contain relevant elements or serve the main purposes that have synergies with the CBD, they may not be applicable for the CBD, as the possible impact of technologies may have long term and complicated implications to certain ecosystems, sites and living organisms within. Numerous technologies known as environmentally-sound in other circumstances can have either positive, negative or neutral impacts on biodiversity. For instance, although climate change adaptation activities can help species and ecosystems cope with changing climatic conditions, adaptation technologies, ranging from the construction of protective infrastructure to the development of corridors or the planting of resistant tree or crop varieties, can cause various impacts on biodiversity (See more examples in Box 1). Such impacts also point to the potential limitations of applying other methodologies for conducting TNAs for the CBD.

Box 1 Technologies and their impacts on biodiversity: some examples

"**Floating agriculture**" is a technology considered contributing to both climate change adaptation and food security: the technology increases the land available for agriculture and avoided building embankments or other hand defenses to protect farmlands. However, this technology could have negative impacts on biodiversity through aquatic invasive species used in floating agriculture. To

maintain the health of wetland ecosystems and biodiversity, a step-further technology solution is to combine the practice of "floating agriculture" with clearing waterways to collect invasive plants, to ensure its positive and sustainable features.

Biofuels is being promoted in several countries as an option of technology to mitigate climate change through reducing GHG emissions from fossil fuels. However, this emerging technology may have various impacts on biodiversity and may do little to mitigate climate change where they replace natural ecosystems. The land-use conversion from natural ecosystems, very often forests, to plantations can impose immediate threats to biodiversity, such as habitat loss and degradation.

Aquaculture is the fastest growing food production technology system that is argued by many to hold promise to produce sustainable supply of high quality seafood and to reduce the pressure on marine biodiversity caused by overfishing. Today, more than 360 species are produced in aquaculture worldwide; some 25 of these are of high value and traded globally. However, it also argued that, when being undertaken in a haphazard manner, aquaculture can cause serious biological threats to the well-being of farmed aquatic animals as well as to human health and ecosystems. Some of these risks are infectious diseases, animal pests, residues and resistance of antimicrobial agents, invasive alien species, release of genetically modified organisms, eutrophication in local waterways, and impacting sensitive environmental areas such as mangroves. Minimizing or eliminating these negative impacts is critical to the sustainability of introducing aquaculture method and technology. As suggested in The Status of World's Fisheries and Aquaculture (FAO, 2010), adequate knowledge base and technical capacity extended to the production level fish farmers for applying risk analysis would be at the heart of modern approaches to enhance biological security in aquaculture.

(Source: UNEP[6], UNEP-WCMC[7], SCBD[8], FAO[9])

[6] UNEP guide books for climate change adaptation and mitigation; http://tech-action.org/guidebooks.htm

[7] Campbell, A. & Doswald, N. (2009) The impacts of biofuel production on biodiversity: A review of the current literature. UNEP-WCMC, Cambridge, UK. http://www.cbd.int/agriculture/2011-121/UNEP-WCMC3-sep11-en.pdf

[8] The Potential Impacts of Biofuels on Biodiversity (UNEP/CBD/COP/9/26), http://www.cbd.int/doc/meetings/cop/cop-09/official/cop-09-26-en.pdf

(c) As a practical support to assist Parties in using TNA methodologies, user-friendly assessment tools could be developed. For example, **TNAssess** is an interactive system to guide users through the Handbook for Conducting Technology Needs Assessments for Climate Change. To familiarize users with biodiversity technologies, a description of relevant technologies in sectors and categories would be extremely useful. A **TEchWiki** with such function has been developed for climate change technology transfer, covering environmentally–sound technologies. This tool could be a potentially useful reference for CBD users, if the content could be expanded to include relevant technologies defined under the CBD.

ii) Gap in capacity building

17. The lack of capacity for conducting country-specific TNA on biodiversity has been recognized as one of the main constrains among the CBD Parties[10]. However, implementation support to pertinent capacity building and training for developing country Parties on TNA under the CBD has not shown much growth since the adoption of the **PoW-TT** in 2004. Particularly, financial support for organizing TNA capacity building activities remains a gap under the Convention comparing to the UNFCCC, which has been systematically supported by the GEF, UNDP, UNEP, CTI and developed country Parties. Even if the CBD Parties took the opportunity of the NBSAP revision to include TNA as a plan for action and to ensure that necessary resources would be allocated for this activity[11], this support can only address domestic arrangements, such as building a national TNA team. Without adequate multilateral and bilateral support, capacity for conducting TNA would still remain a substantial gap, particularly for developing country Parties.

18. From the experience of the UNFCCC, hands-on training at national level seems to be necessary to ensure that appropriate TNA tools and methodologies developed under the same framework are applied. Moreover, as unique conditions in every country rule out any generic approach to technology transfer, capacity building and training can also provide further tailored assistance to ensure that the application of a flexible methodology in TNA could respond effectively to circumstances and priorities in the particular country.

19. As an opportunity for exchanging experiences, training workshops can also help to validate the TNA methodology. Through the regional workshops organized by the CTI in collaboration with UNDP, UNEP and UNFCCC secretariat, the TNA methodology and the handbook has been "field-tested" and further improved with input from country experts[12]. As of today, some 95 TNAs have been conducted by Parties, with technical assistance and capacity building support from UNDP, UNEP, GEF and UNFCCC Secretariat in collaboration with CTI. In addition to the continued support for conducting TNA, the recent capacity building and training on TNA under the UFCCC has added new focus on "training-of-trainers" to develop project proposals for the implementation of TNA results.

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[9] The Status of World's Fisheries and Aquaculture, FAO 2010, http://www.fao.org/docrep/013/i1820e/i1820e00.htm

[10] See conclusions of the AHTEG meeting on Technology Transfer 2007, UNEP/CBD/AHTEG-TTSTC/1/5, available at http://www.cbd.int/doc/?meeting=EGTTSTC-02

[11] NBSAP Training Package. Version 2.1., http://www.cbd.int/doc/training/nbsap/b2-train-prepare-update-nbsap-revised-en.pdf

[12] UNFCCC: TNA implementation, http://unfccc.int/ttclear/jsp/TNA.jsp

20. The TNA progress achieved under the UNFCCC can be attributed largely to the support to building capacity of Parties over the past decade. The active involvement of developing countries in the development of the methodology and in exchanging knowledge and experiences is one of the key contributors to the implementation results[13].

21. At a quite different stage, the TNA process under the CBD is yet to be developed, starting from defining the methodology and conducting TNAs. Training and capacity building at this stage could be designed to support these immediate tasks. The future TNA national teams should be a priority group for the training, as their knowledge and capacity would contribute to the effectiveness of technology identification, prioritization, transfer (including acquisition) and adaptation by receiving countries.

3.2.1.4 Conclusions and recommendations

22. Comprehensive TNAs by Parties can provide a "big picture" of technology needs for the implementation of the Convention with details of specific needs of individual countries. The TNA results can enhance the effectiveness of other supporting activities to technology transfer, based on the priorities identified. The lack of a defined methodology and capacity of Parties for conducting TNA are gaps where support is needed.

23. Based on the existing activities and gaps identified, the following actions are recommended for international and regional organizations, sectoral organizations and bilateral agencies to support:

(a) **TNA methodology**

- To support the development of a methodology, relevant experiences could be drawn from other relevant processes, such as UNFCCC and ISSATD taking into account the needs for adjustments based on the specifics of the CBD (see section 3.2.2 and 3.2.3). Further exploration on the relevance to and the needs for adjustments of other TNA methodologies for adapting to the CBD's context could be supported as a follow-up to the previous analysis conducted by the Executive Secretary (UNEP/CBD/COP/8/19). The methodology should be consistent with previous guidance and decisions from the Conference of the Parties and recommendations from the AHTEG on technology transfer.
- In order to provide adequate technical support, a more permanent technology transfer advisory body could be established to carry out the extended functions of the previous AHTEG, including providing guidance for the development of the TNA methodology.
- User-friendly diagnostic tools to assist Parties to use the TNA methodology could be developed. Such tools could also be developed from expanding the functions of existing tools, such as the TNAssess and TEchWiki for the UNFCCC, to address the needs of the CBD.

(b) **Capacity building and training.**

[13] For example, one of the earliest TNA methodology paper produced by CTI in March 2002 received inputs from experts in a number of developing countries, including Malaysia, China, Guyana, Korea, Mexico, Botswana and Brazil (http://unfccc.int/ttclear/pdf/TNA/CTI/Tech%20Transfer%20Guidelines-12%20_final_.pdf).

- Capacity building and training workshops could be organized to address 1) the immediate need of developing and validating the TNA methodology for the CBD, 2) the mid-term need of assisting Parties, particularly, the developing country Parties, to apply the methodology to conduct TNA, and 3) to assist Parties and relevant stakeholders to implement the TNA results.
- The TNA process could be linked with relevant CBD tools, particularly National Biodiversity Strategy and Action Plans (NBSAPs) and National Reports, which could be used as mechanisms for reviewing and updating TNA results through every reporting and planning cycle. TNA could be included as a clear planning item in the post-COP10 revised NBSAP to ensure that necessary resources are considered in the national budgetary planning. The NBSAP could further map out a process for conducting TNA, including the constitution of a national TNA team. Identified technology needs could be published and updated through the national report and national CHM.
- Financial and technical support is needed for convening capacity building. Particularly, the agencies involved in the TNA capacity building and training under the UNFCCC may have accumulated valuable experience which could be brought to the CBD.

24. The ultimate goal of conducting TNA is to support the implementation of the TNA results, i.e. to facilitate the transfer of technologies identified as priority needs by Parties. To this end, completed TNAs could be compiled and disseminated through the Clearing-House Mechanism, and linked to the match-making service to be developed under the technology transfer programme of work (see below).

3.3 Pertinent capacity building and training

3.3.1.1 Requirements and needs

25. In accordance with the **PoW-TT** (programme element four), capacity building and training should be aimed at building or enhancing *technical*, *scientific*, *institutional* and *administrative* capacity towards achieving the following objectives:

(a) effective and timely conduct of technology assessments;

(b) building and strengthening of national or regional technology information systems;

(c) creation of enabling environments for technology transfer and cooperation.

26. The **Implementation Strategy** recognizes the role of capacity building for ensuring the "sustainability of technology transfer" (Para.19) , and requests technology providing parties to "recognize and act on any capacity-building needs of recipients" to this end. The Strategy also recommended that technology transfer as a cross-cutting tool should be integrated into existing capacity building and training programmes (Para.33).

27. Some specific needs for training and capacity building have been identified in the **AHTEG-TT**, where experts highlighted the need for building capacity of developing countries in order to undertake technology needs assessments. They also pointed to the importance of building trust among key stakeholders and providing training to policy-makers, which could be just as critical as for training technology specialists. Some

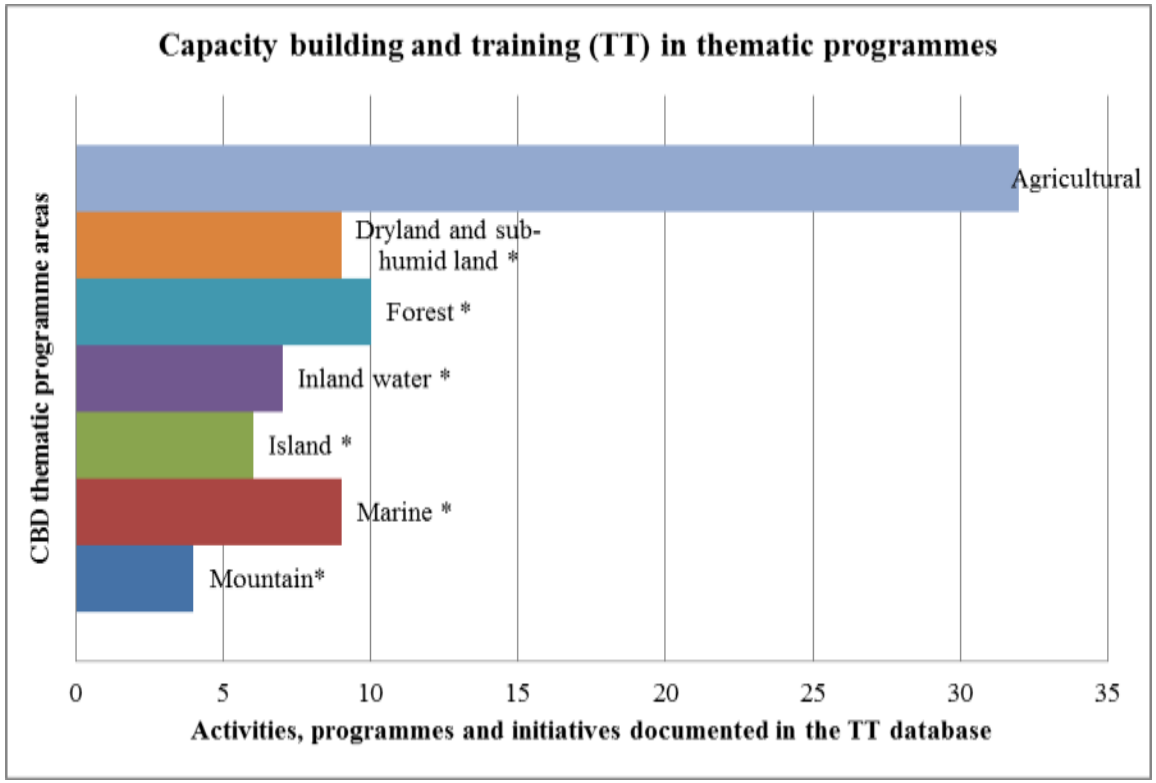
experts highlighted that capacity building in relation to ABS requirements, such as prior informed consent and benefit sharing, were important for developed countries as well.

28. Clearly, the needs for capacity building and training will keep evolving along with the new biodiversity issues arising and new technologies becoming available. For instance, the recent CBD workshop on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD+)[14] has identified a need to "further enhance technical capacity across African region to integrate safeguards into the planning and implementation of REDD+". Recent developments under the Nagoya Protocol also reveal the new funding opportunities to support technology transfer through the Nagoya Protocol Implementation Fund as approved by the Global Environment Facility (GEF), which would allow provider countries of genetic resources to introduce appropriate technology (including bio-prospecting) under ABS agreements.

3.3.1.2 Existing activities: the compilation result

29. As a general remark, training and capacity building forms about 53% of the total activities covered in this study. Measured by the number of identified activities distributed across the seven thematic programme areas of the CBD (agriculture, dry land and sub-humid land, forest, inland water, island, marine and mountains), agriculture seems to receive the most active support in terms of technology related capacity building and training, as indicated in the graph below (Fig.4); to some extent however, this result may also be an artifact caused by the broad definition of agriculture as applied by CGIAR and FAO.

[14] This workshop, held during 20-23 September 2011 in Cape Town, South Africa, was the fourth in a series of workshops organized by the CBD Secretariat to discuss biodiversity aspects of REDD+. The report is available at http://www.cbd.int/doc/?meeting=WSCBREDD-AFR-01



Note: 1. In this graph, activities in the (*) areas also include relevant training activities categorized under "Protected Area" (marked as PA in the database). 2. ** Due to the broad scope of "agriculture" applied in the programmes and activities of FAO and CGIAR, many activities under this category have links or overlaps with other areas, namely, forest, marine and fisheries and water.

Figure 4 Support through capacity building and training distributed across the thematic programmes

(a) From the submissions to the Notification:

(a.1) Capacity building and training is the most common approach for technology transfer reported by Parties.

- In **Belgium**, the most relevant support is related to biodiversity information technologies (including CHM) through cooperation with Africa, and through the network-based support to the East European countries and other developing countries. Under the Belgian CHM Partnership Initiative, the Royal Belgian Institute of Natural Sciences has provided training to 36 countries since 1999.

- **Colombia** reported supporting activities undertaken by the Alexander von Humboldt Institute on biodiversity information management. Through this support, Columbia's National Information Program on Biodiversity (SiB) has evolved into a "national alliance" for biodiversity, involving over 100 institutions in various sectors. Within the capacity building component, a permanent national training programme has been developed and 15 workshops were organized in 2010. The training on metadata relating to biodiversity has been extended to nine countries in Latin America under the framework of the Ibero-American Platform for Biodiversity Information.
- Since 2005, **France** has been supporting regional cooperation networks on marine biodiversity. Through the French Agency for Development (AFD), cooperation between Pacific Island countries and their oregional partners, i.e. Australia, New Zealand and overseas France is being reinforced.
- **Poland** cited the project "Developing joint information platform and training system in Poland's National Parks" as an example of support from the national government and the European Union.
- The **UK**'s survey of the country's 113 organizations indicates that *in situ* and *ex situ* conservation and monitoring are the most frequently addressed components, followed by sustainable resource management, while technologies relating to the use of genetic resources for biotechnology appear to be rarely transferred. The UK's Darwin Initiative is focusing on the need for technical and scientific cooperation, as highlighted in Article 18 of the CBD. Under the support of this Initiative, nearly 700 projects in more than 150 countries have been implemented between 1993 and March 2010 (DEFRA 2010). However, within the broad scope, support to specifically address the access to and transfer of technology is relatively low (only 4% of a total of 724 projects in the Darwin Initiative database).

(a.2) Multilateral support under this item is largely concentrated on climate change under the **UNFCCC** technology transfer framework. In response to the priority needs of each implementation stage of this framework, capacity building and training workshops have been organized systematically through the Technology Mechanism, from hands-on training for Parties on conducting TNAs, to train-the-trainers for developing project proposals and accessing financing for implementation. In addressing the long-term aspects of technology transfer, the support is further extended to climate technology centers and a Climate Technology Network through the GEF's Long-Term Program on Technology Transfer. In support of the synergies between the implementation of the CBD and UNFCCC, **UNEP-WCMC** is collaborating with UNEP, UNDP, IUCN and developing country partners to provide technical support and training to decision-makers in developing countries on planning for ecosystem-based mitigation and adaptation. On agricultural biodiversity, **Bioversity International** is implementing a three-year training programme (2009-2012) on "building capacity for research on the conservation and use of Neglected and Underutilized Species of crops in West African and Eastern and Southern Africa" supported by the EU-ACP.

(b) From recent activities of the CBD: Training and capacity building as a way to enhance the capacity of developing countries for the implementation of the CBD decisions are mostly being organized under each respective programmes of work. Many regional and sub-regional capacity building series organized under the CBD themes have some relevance to certain technologies (often "soft technologies"). The workshops cover areas of Clearinghouse Mechanism, protected area management, NBSAP and national reporting skills, forest biodiversity and climate change, biosafety, marine biodiversity, agricultural biodiversity, tourism, traditional knowledge, taxonomy, invasive alien species and issues related to access and benefit-sharing (ABS). Particular emerging issues addressed through capacity building series include biodiversity safeguards

and REDD+, biosafety and risk assessment of living modified organisms, description of "Ecologically or Biologically Significant Marine Areas" (EBSAs), bushmeat, sustainable production and use of biofuel. Under the Nagoya Protocol on ABS, capacity building series is currently focusing on the early entry into force of the Protocol. Prior to the adoption of the Protocol, capacity needs were identified on the assessment and inventory of biological resources as well as information management, contract negotiation skills, legal drafting skills, and means for the protection of traditional knowledge associated with genetic resources. Online e-learning modules and a number of guidelines, principles and tools are available on the CBD's website. Under Article 16 and the PoW-TT, training and capacity building with a specific focus on technology transfer has not been organized yet.

(c) From web-based research, including CBD's TT database: Of many activities that are of relevance to the thematic programmes and issues of the CBD, training on "technology transfer" as a specialized expertise seems to be mostly available under the UNFCCC, where training and capacity building are organized systematically to support Parties and stakeholders access the resources provided under the same technology transfer framework, including funding opportunities through formulating technology transfer projects and targeted support to meet the needs specified in TNAs. With regard to the systematic support to technology transfer from researchers to end-users, the knowledge network of CGIAR presents a good example.

Box 2 CGIAR's global knowledge network supporting technology transfer

The CGIAR's global research network is powered by its 15 thematic research centers (the CGIAR Consortium). The System-wide Programmes is an engine transferring technologies among its research members which has a strong participation of developing countries. Through building strategic partnerships with National Agricultural Research Systems (NARS) and organizing annual Global Conference on Agricultural Research for Development (GCARD), the CGIAR's network is able to shape collectively a result-oriented research agenda which can address the end-user's technology needs. Through joint research, participatory learning and cooperation, technology recipients are also better engaged in identifying, introducing, adapting and further disseminating new technologies. The Participatory Learning and Action Research (PLAR) introduced by the African Rice Centre, for example, is adopted by every rice scientists within and beyond the sub-region. By engaging local rice farmers and communities in research, this method can rapidly transfer new technologies and disseminate knowledge about complex issues relating to integrated crop and natural resource management in rice-based cropping systems. In Côte d'Ivoire, PLAR-trained farmers were able to increase their rice production by over half a tonne per ha in the first year of their use of this approach.

Over the past forty years, CGIAR's network approach catalyzed intellectual capacity of around 8000 agricultural scientists and professionals around world for transferring agricultural technologies from lab to the filed.

(Source: CGIAR, African Rice Center)

3.3.1.3 Gap analysis

30. Under the broad definition of technology adopted by the **Pow-TT**, including both "hard" and "soft" technologies, almost all training and capacity building activities could be considered relevant to technology transfer. However, as a general programmatic gap, there is a lack of emphasis on specific tools and approaches to supporting technology transfer. Existing activities do not meet the capacity building needs as

specified in the PoW-TT, i.e., on technology needs assessment, technology information system development and the creation of enabling environment for technology transfer:

a) Training and capacity building on technology needs assessment under the CBD. As emphasized in previous meeting reports on technology transfer under the CBD, the gap in building national and sectoral capacity for identifying and prioritizing technology needs remains unaddressed (see also in section 3.2.3).

b) Specialized technology transfer knowledge, operation and tools. Training on specialized technology transfer knowledge, operational skills and the application of practical tools, for example, on IPR issues, traditional knowledge and technologies embedded in material transfer agreements (MTAs) in accordance with the principles of ABS, options for financing technology transfer projects and for technology adaptation have not been found. The importance of these specialized trainings is to assist Parties to fully apply technology transfer as a general tool for the implementation of the Convention, not limiting their benefit to the offer of a single technology transfer project.

c) Integrating technology transfer as a cross-cutting tool in other capacity-building activities under the CBD. Although technology transfer is recognized as a cross-cutting tool for countries to choose and use to overcome certain barriers, technology transfer has not been widely integrated in capacity building and training activities across the CBD themes and issues. Only a few examples can be found, such as under the Programme of Work on Protected Areas (the e-learning curriculum includes a chapter on appropriate technologies) and the CBD's Biodiversity and Tourism Network (with its User's Manual of the CBD Guidelines on Biodiversity and Tourism Development).

3.3.1.4 Conclusions and recommendations

31. Based on the existing activities and gaps identified, the following recommendations could be considered:

(a) Support capacity building and training for conducting **technology needs assessments** (see recommendations under section 3.2) for national and regional players positioned to carry out the assessments;

(b) Develop a **toolkit for developing technology transfer projects under the Convention** as a capacity building material to facilitate Parties to access available financial mechanisms that support technology transfer, such as the Nagoya Protocol Implementation Fund.

(c) Integrate "technology transfer" as **a common tool** into the **training materials** for capacity building activities under all the thematic programmes and cross-cutting issues of the CBD, as in the PoWPA e-learning material on appropriate technology for protected area management.

3.4 Pertinent seminars and symposia

3.4.1Requirements and needs

32. Seminars are considered as a **training format** for technology transfer mentioned in the **AHTEG-TT** report. Therefore, many capacity building and training workshops fall under this category too and observations of the previous section (Section 3.3) apply accordingly. There is no direct guidance on types of seminars or symposia in the text of the **PoW-TT.** The **Implementation Strategy** recommends the convening of "technology fairs" as an element to the TT facilitating mechanism. None of these documents, however, provide a clear description of the differences between seminars and symposia and other training and information dissemination methods. For the purposes of this study, seminars and symposia were considered relatively short public information and knowledge dissemination events with a general training level (in contrast to those in-depth training programmes offered for targeted and relatively small groups). Given that seminars and symposia usually require in-person participation, they are normally more interactive than web-based information dissemination methods. Should the focus on technology transfer be clear, seminars and symposia could also be a forum to develop policy guidance.

3.4.1.1 Existing activities: the compilation result

33. In total, 30 supporting activities from the TT database are categorized as supporting biodiversity related technology transfer through seminars and symposia.

(a) From the submissions to the Notification: Although a few symposia and seminars might have touched to a small extent technology transfer during presentations and discussions, in general, there has not been any symposium or seminar reported as specifically focusing on technology transfer related to biodiversity.

(b) From the recent activities of the CBD: CBD's events mostly target thematic issues and engage an identified group of experts. On the specific issue of technology transfer, the Meeting of the Ad Hoc Technical Expert Group Meeting on Technology Transfer and Scientific and Technological Cooperation (**AHTEG-TT**) was organized by the Secretariat of the CBD in cooperation with UNEP and UNCTAD in 2007, in response to decision VIII/12 of the Conference of the Parties. As a policy development and implementation strategy identification seminar, AHTEG-TT concluded with concrete recommendations to guide the implementation of the Programme of Work towards the 2010 Target. [15]

Activities considered as seminars and symposia also include some public awareness raising activities, such as the Ecosystem and Climate Change Pavilion (renamed as "Rio Conventions Pavilion" since June 2011), launched at the CBD COP10. The Pavilion, however, does not have a technology transfer focus.

(c) From web-based research, including CBD's TT database: Most of the seminars and symposia identified through this study on biotechnologies are frequently organized with support or involvement of private sector and industrial associations. Relevant technology fairs supported by public sectors and international organizations are found in the areas of agriculture and water management. The Global

[15] UNEP/CBD/AHTEG-TTSTC/1/5, November 1, 2007.

AgriKnowledge Share Fair, hosted by IFAD, for instance, provides a forum for participants to learn and share knowledge, experience and innovations on emerging trends relating to agriculture, climate change, food security, mobile technology, social media and influence future rural development activities. In line with national strengths and priorities, some countries offer seminars and symposia through scientific and research institutes. For example, Korea's National Institute of Biological Resources hosts annual international symposia on ABS as a platform for knowledge exchange on the third objective of the Convention.

3.4.1.2 Gap analysis

34. **Pertinent seminar / symposium on the topic of biodiversity technology transfer**. Given that a significant number of training and capacity building activities on take the forms of workshop, seminar or symposium, gaps observed in the previous section should also apply in this category. While many activities were found to be somewhat relevant, there is typically no specific focus on technology transfer of relevance to the Convention (the AHTEG-TT in 2007 being the exception). "Convening technology fairs" was considered as a facilitation method to support technology transfer in the Implementation Strategy; however such activities have yet to materialize**.**

35. **Links between other seminars/symposia and the CBD.** Some existing global and regional seminars and symposia are touching on the relevant topics of biodiversity technologies, such as the Global AgriKnowledge Share Fair mentioned above; There is however no explicit linkages to the implementation of the programmes of work on agricutlrual biodiversity or on technology transfer.

3.4.1.3 Conclusions and recommendations

(a) Seminars and symposia as activities to promote and facilitate technology transfer and cooperation have not been adopted widely under the Convenetion. It could be considered to establish **partnerships** with the organizers of relevant seminars and symposia included in the database with a view to strengthen their promotion biodiversity technology transfer. Relevant seminars and symposia are found in the areas of ABS (e.g. ABS International Symposium organized by Korean National Institute of Biological Resources), agricultural knowledge and technologies (e.g. the annual Global AgriKnowledge Share Fair organized by IFAD); water resource management (e.g. Water Technology Funding Platform and International Symposium on Asia-Pacific Water Summit, organized by International Water Management Institute) and genetic engineering and biotechnologies (e.g. seminars, theoretical and practical courses organized by the International Center for Genetic Engineering and Biotechnology). These partnerships could be **complemented** with other information services, e.g. helpdesks, websites (see discussion below), and with an option of accessing in-depth training programmes and other extended technical support as needed.

3.5 Information dissemination

3.5.1.1 Requirements and needs

36. Information dissemination is part of the important enabling environment for promoting and facilitating technology transfer, as emphasized in the **PoW-TT**, the **Implementation Strategy** and the **AHTEG-TT**.

37. According to the **PoW-TT**, critical support to strengthen national, regional and international information systems should include the development and use of common formats, standards and protocols, providing, *inter alia*, access to information on existing technologies for the

purposes of the Convention. Improvement of the Convention clearing-house mechanism as a central gateway to such information systems is crucial for the implementation of Articles 16 to 19 of the Convention.

3.5.1.2 Existing activities: the compilation result

38. As would be expected from the relatively low investments required to replicate web-based information tools or sources, more than 62% of entries (majority) relate to information dissemination. The CBD's CHM and its national and regional CHM networks is a main vehicle for biodiversity information sharing.

39. From all the submissions to the Notification: Web-based information dissemination is mainly undertaken through Parties' links to the CBD's CHM. For example, a special section on technology transfer and cooperation is under development on the **Belgian** CHM. Other national information databases, such as the Darwin Initiative project database in the **UK**, also contain a wealth of information on technology transfer initiatives. Academic and research institutes are also a main source of technology information in almost all formats. The Humboldt Institute (see the submission by **Colombia**) has published a large series of books, booklets, audio-visual products and image documents in support of information dissemination.

40. From the recent activities of the CBD: Under article 16, the Secretariat is developing and improving the technology transfer database, the most dedicated information system to biodiversity technology transfer practitioners, including available technologies, enabling environment, tools and other instruments. Supporting activities collected under this study have been incorporated into this database. To assist Parties in establishing and strengthening national information systems to be linked to the CBD's data centre in order to promote the exchange of biodiversity related date, information and knowledge, the Secretariat created a CHM toolkit (http://www.cbd.int/chm/capacity.shtml). Further, regional capacity building workshops have been organized in collaboration with Parties and partners, namely Belgium, EU and ASEAN.

41. From web-based research, including CBD's TT database: There are a number of online information portals on environmentally sound technologies (EST). The best databases are not only well maintained with large collections of latest technologies, but also linked to services facilitating their transfer. For instance, the US Environmental Protection Agency's Environmental Technology Opportunity Portal provides technology advisory services funding options (e.g. small grants) as an incentive for the adoption of technologies. The Enterprise Europe Network Technology database is Europe's largest database of cutting-edge technologies containing more than 13,000 profiles and offering information between "offer" and "request" sides. It is noteworthy that these databases do not provide an explicit focus on technologies of relevant to the convention (for instance, in form of a dedicated, searchable category or sub-category). As a result, technologies of relevance to the Convention are typically distributed throughout a number of categories or sub-categories, which makes an effective and comprehensive retrieval exceedingly difficult.

42. Moreover, in developing countries, such comprehensive technology information systems are not available, thereby increasing the importance of those offered by international and regional organizations (such as ESCAPs' ACPTT), which do not seem to receive sufficient support for updates.

3.5.2 Gap analysis

43. **Information capacity gaps in developing countries.** The lack of capacity to build and maintain technology information systems remains a challenge for many developing countries. Most of the supporting activities are found only on the technical aspects, such as data formatting and information system management tools (see examples of UNEP-IETC's "builder", and CBD's CHM Toolkit). There seems to be little support to enhance the quality and sustainability of these information systems.

44. **Links between technology databases and the CBD.** Many active technology transfer platforms and updated technology databases currently have no explicit cooperation with the CBD, thereby making this wealth of information provided in these databases not easily available. Previous experience has shown that it is technically and institutionally difficult to implement and maintain inter-operative databases, alternative approaches could be explored through, for example, increasing the support for maintaining, updating and strengthening the CBD's Technology Transfer database, and/or to invest in an extended advisory service that can overcome the limitations of a web-based database (see below the recommendation of "TT-Helpdesk").

3.5.3 Conclusions and recommendations

45. Technology transfer as a sub-component to the CBD's Clearinghouse Mechanism can be further developed with technical support provided by the Secretariat in collaboration with Parties, as the CHM is the Convention's central information dissemination system. This study has found that many active biodiversity-related technology information systems are actually hosted outside the CBD and do not necessarily focus on CBD needs/objectives. Many "global information systems", such as the Global Biodiversity Information Facility, Global Forest Information Service and the Global Invasive Species Database, are good information sources but not designed with technology transfer in mind. In this light, it could be considered to establish an **advisory service or** "**TT-Helpdesk**" to assist Parties to make informed choices, operated by a dedicated biodiversity technology transfer specialist. This service could add value to the CHM and its current technology transfer database by catalyzing the wealth of knowledge, experiences and information on biodiversity in a user-oriented manner. Specific advisories and information could include, for example, the economic, social and environmental applicability of particular technology, possible risks and long-term impact on biodiversity and ecosystems learned from the existing experiences, costs and availability compared across the CBD Parties, possible funding options through multilateral and bilateral funding mechanisms, as well as the provision of offer/buyer's profiles. As the information needs to be compiled and updated on a day-to-day basis and delivering on requests may require tailored approaches, the establishment and operation of the Helpdesk would have staffing implications and imply funding needs accordingly.

3.6 Other implementation activities, including match-making, catalyzing networks and facilitating twining arrangement

3.6.1.1 Requirements and needs

46. The **Implementation Strategy** describes these activities, and underlines the importance of the work of **intermediate institutions, networks**, **research consortiums** and **cooperative partnerships** with pertinent experience in different areas on this regard. **Match-making** programmes are emphasized for their particular merit of engaging private sector in long-term cooperation and broad partnerships.

47. According to the **AHTEG-TT** report, experts recognized the good examples of long-term cooperation and partnerships between between governments, universities and research institutes, which "deserve more attention and visibility". The existing partnerships with **CGIAR centers** were particularly noted as providing a model of successful partnerships. Parties also pointed to the importance to introduce new concepts on "facilitating TT" at CBD meetings like COP and SBSTTA, which "allow the exchange of ideas and facilitate contact building between future partners". Parties also proposed that special and TT-focussed "TT Fairs" or workshops "to meet the need" could be organized at these meetings.

3.6.1.2 Existing activities: the compilation result

48. Match-making, cooperation facilitating and network catalysing are common objectives of most of the technology transfer services and information network services. Activities and programmes identified under this category in this study have an identifiable and involved "receiving end" and "providing end". Accordingly, 49 programmes and initiatives documented in the TT database are found relevant. Nearly all of them have other functions in either "information dissemination" or "capacity building", or both.

49. From the submissions to the Notification: Support to facilitate new partnerships and cooperation opportunities are largely in the context of South-South cooperation, facilitated often by international organizations. For instance, **Biodiversity International** supported two educational networks- ANAFE and RUFORUM were founded in Africa, with participation of Benin, Ghana, Kenya and Malawi. Within the framework of The 10 Year Strategy of the UNCCD, which emphasizes the role of South-South on technology transfer, **Global Mechanism** has engaged in facilitating partnership agreements between local authorities from developed and developing countries on food security and natural resource management. Through the regional workshops organized by the **UNFCCC**, experts from non-annex I countries exchanged best practices and lessons learned on conducting TNAs. The workshops also brought together representatives of developing countries and private sector to explore new funding opportunities based on the TNAs. Bilateral support in this area is also quite common. **France**, through financial and technical support, reinforced regional cooperation networks on marine biodiversity in the Pacific. In **UK**, match-making and partnership-building activities are often associated with scientific cooperation or joint research. In **Belgium**, institutions and universities are involved in technology transfer through joining sectoral and global consortia, including the Consortium of Scientific Partners to the Convention, the Central African Botanic Gardens Network and the African Plant Initiative.

50. From the recent activities of the CBD: In support of South-South cooperation on biodiversity, the Secretariat has organized three expert meetings with an objective of facilitating knowledge exchange and technology transfer between centres of excellence in developing countries. In the last one, a match-making exercise produced several project outlines. Through the Consortium of Scientific Partnership, the Secretariat brings together twenty research institutes, botanic gardens and museums to collaborate in support of the CBD's research agenda. LifeWeb is a reference match-making financial platform focused on the establishment or strengthening of strategic specific protected areas. Friends of PoWPA, GLISPA and many other similar programmes and initiatives under the CBD all have the nature of promoting partnership building and catalysing cooperative networks, although not necessarily with a specific technology transfer perspective.

51. From web-based research, including CBD's TT database: This type of support is normally motivated by the need for scientific cooperation or business partnership. Sectoral associations and international organizations are playing the facilitator's role in most cases. At international level, UNDP supported SS-Global Asset of Technology Exchanges ("SS-GATE") is a public-private partnership for facilitating technology transfer through professionalized "technology intermediary" and a decentralized in-person contact through its network of 29 workstations distributed in Africa, Asia and Latin America. Web-based match-making mechanisms are more frequently adopted in the networks of OECD countries where

information systems are more advanced and technology market is better developed. The Europe Enterprise Network, for example, facilitates the exchanges of research and commercial applications at the rate of about one thousand submissions per month, with "technology request" and "technology offer" received from 50 countries. On the other hand, web-based match-making function of developing country-oriented TT websites seems to be much less effectively used. The numbers of "offer/request" under each technology cluster on the "technology market" page of the Asia Pacific Center for Technology Transfer (UN-ESCAP) are as low as one-digit, while a "biotechnology" cluster is not yet available.

3.6.1.3 Gap analysis

52. **Online match-making function on the CBD's TT-database**. As biodiversity technology related general information and learning resources are being made more and more available through the CBD's technology transfer database, an online match-making function, with "technology request" and "technology offer", has not been developed yet.

53. **TT match-making event.** No CBD TT-Fair or match-making event has yet been convened. As web-based mechanism may not provide sufficient match-making support for developing countries, match-making events that can offer in-person contact opportunities, such as technology transfer fairs, exhibits, seminars, capacity building and training workshops, could be supported and facilitated.

54. **Knowledge networks.** As noted, scientific research and business cooperation are two drivers for technology transfer through match-making and partnership-building. This study also finds that in the sectors where large research networks exist, technology transfer seems to be more active. Specifically, the global knowledge networks led by the CGIAR centers transfers a large number of agricultural technologies rapidly from research centers to end-users through participatory research and learning. The network also enables technologies flow more freely between the members. A knowledge network is particularly important for biodiversity which is among the most interdisciplinary sciences and often requires integrated solutions. In other CBD thematic areas which are not well covered by knowledge networks yet, more support to catalyse existing resources through, for instance, identifying centers of excellence in those fields and formulating networks among them, would be needed.

3.6.1.4 Conclusions and recommendations

55. This type of support creates conditions for bringing together the potential "receiving end" and "providing end" who would be directly involved in technology transfer. As many organizations and mechanisms including bilateral agencies are already involved in such supporting activities, the following recommendations seek to strengthen existing mechanisms:

(a) Supporting **online match-making** through the development of **an interactive "technology market" component** to the CBD's technology transfer database, to receive and dissiminate the information of "technology request" and "technology offer" from CBD Parties and partners.

56. **TT match-making events** could be organized regularly back-to-back with major meetings and conferences of the Convention.

57. Match-making and networking for technology transfer could be **synergized** with other relevant activities under the CBD, such as scientific and technical cooperation, ABS, South-South cooperation, and Consortium for Scientific Partners. Thematically, special support could also be given to the areas where a knowledge network has not been formed yet, with an objective of identifying centers of excellence in that field to facilitate the transfer of technologies, in collaboration with the CBD.

3.7 Other findings

3.7.1.1 Relevance to economic sectors pertinent to biodiversity technology transfer

58. In this study, pertinent economic sectors are identified for the purpose of analyzing sectoral impact from existing technology transfer support and gaps.

59. **Agriculture and food.** This sector relies very much on genetic and biotechnology innovation and commercialization and is active in technology transfer in many formats as well. Agriculture, cattle ranching and other livestock industries, as well as related business chains (fertilizers, pesticides, seed and herbicide distributors and grain wholesalers, food processers and producers, food, nutrition and health retailers, etc) are arguably the largest and most clearly implicated sector, since its output is purely biodiversity-based. It is therefore no surprise they figure so significantly in this database (although only part of this broader sector – that directly related to agriculture – reports most of the entries).

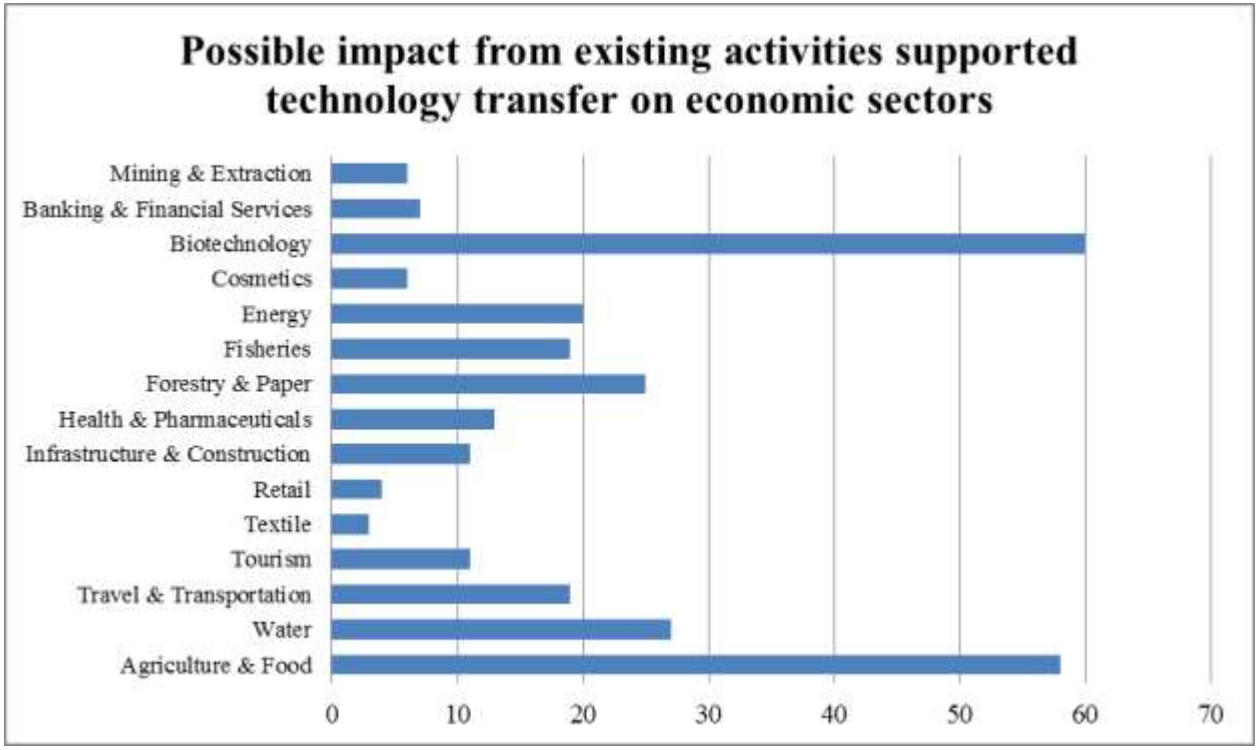


Figure 5 Relevance between existing activities and pertinent economic sectors

60. **Biotechnology.** The result of information compilation (see Fig 5 above) shows that biotechnology leads the number of exchanges and many related technologies are being transferred through business transactions or research cooperation, although in general the biotechnology sector does not yet fully participate in CBD processes. In this study, most of the activities were actually found outside of the CBD as well. In relation to the CBD's objectives, biotechnology related technology transfer support seems to be available only in three areas: biosafety, agricultural biodiversity and ABS. Support has been focusing on the aspects of regulations, impact and risk assessments. BioTrack, for instance, is an appropriate identification system adapted from the database of Biosafety Clearing House of the Cartagena Protocol. The adapted system was developed under the cooperation agreement between the secretariats of the OECD and the CBD, for assisting OECD members to easily share information on products derived from the use of biotechnology in terms of food, feed and environmental safety.

61. **Pharmaceutical and cosmetic.** These industries are among the biggest users of biotechnologies transferred with patents or licences along the business value chains. Pharmaceutical and cosmetic industries also relate directly to the sustainable use of biodiversity as source of genetic variability as resistance factor to disease, as an insurance for the diversity of sources of components and for nutrition value. Available support to technology transfer in these areas is usually found at the level of non-sectoral specific information dissemination or online match-making. The Nagoya Protocol on ABS offers a window of opportunity (also the needs for supporting activities) for technology transfer between stakeholders in these sectors. The GEF Nagoya Protocol Implementation Fund has specified technology transfer as an area for support with multilateral funds, with intention to encourage the engagement of private sector in the implementation of ABS.

62. **Infrastructure**, **construction** and **mining**. In spite of their very significant impact on biodiversity, these sectors presently seem to have not been involved in promoting biodiversity-friendly technology transfer, nor has the biodiversity community called for that. With expanding urbanization and accessibility even in rural areas, industries involved in construction and infrastructure development arguably occupy center stage in terms of biodiversity footprints. China and India still indicate urbanization levels below 50% (in spite of a recent call for the improvement of statistics on those issues), and the success of voluntary associations such as the Cement Sustainability Initiative indicate the dimension that a concerted effort from these industry sectors towards biodiversity could exert. By working closely with local authorities, the construction and infrastructure sector can also assist in the implementation of the Convention at local level. Mining and extraction companies, due to their potentially high initial impact on biodiversity in the areas of their direct use, can significantly improve their footprint by minimizing the extension of impact areas, containing tailings, devolving exploited concessions into protected areas (such as the Camisea mine in Peru) and helping raise awareness among the industry and its associates – including again relevant local authorities and associations.

63. **Tourism.** Tourism has proposed a diversity of biodiversity-friendly policies and programmes. Sustainability has been proposed (though still not widely implemented) in aspects related to cleaner production and consumption, reduction of carbon emissions, development and poverty eradication, and even biodiversity directly (through IUCN). Knowledge sharing for sustainable tourism is incentivized by sustainability criteria and certification schemes. Sustainability criteria have been defined considering the CBD's guidelines (Decision VII/14). Related to tourism, the complex web of industries related to travel and transportation can interact with biodiversity and its services through the reduction of their carbon and biodiversity impacts (for instance through reduction in GHG emissions through gains in productivity, improved design of transportation hubs and airports, and voluntary support from customers).

64. **Banking** and **finance**. These sectors, including insurance, have clear and growing links to biodiversity as they finance and insure several direct users (agriculture, pharmaceutics, timber and fisheries, just to take a few) and indeed, through credit and risk analysis and feasibility studies, have an opportunity to incorporate and mainstream biodiversity in financing and insuring decisions for many other sectors with significant impacts

(land and urban development, infrastructure and housing, waste management, transportation). Presently, there is no significant involvement of these sectors through technology transfer lens in the CBD, which could be proposed for instance through the UNEP-supported Sustainable Financing Initiative.

65. **Energy** relates to biodiversity not only for the mitigation effect of living ecosystems (REDD+) as carbon sinks, but also for the feasibility of biofuels and for the ecosystem value of disaster-risk reduction in distribution systems. Solutions for energy are often the same for biodiversity: improved transportation and energy efficiency with bus corridors in Curitiba also resulted in parkways and conservation corridors. The growing and often unsustainable use of biofuels has been identified as a threat to biodiversity, particularly through palm oil and sugar cane plantations, and has been integrated into CBD's programme of work on agriculture, forest and technology transfer, with an emphasized focus of making sure that the technologies on biofuel production and use are sustainable for biodiversity.

66. **Fisheries**, **waster**, **forestry**, **textile** and **paper** industries are direct users of biodiversity and most have assumed a stewardship role toward nature – also through clearly established biodiversity-friendly policies and voluntary initiatives, which are still implemented only to a limited rate.

(a) While the technology transfer needs of fisheries are shifting from productivity towards sustainability today, a CBD platform on technology transfer could provide further technical advice to ensure it is biodiversity-friendly.

(b) For the textile industry, in spite of progress in certain areas (organic cotton, fair trade products, the engagement of the fashion/retail sectors), the potential of sustainable production, consumption and public procurement has still not been fully utilized. The low percentage of reported exchanges in sectors closer to consumers, such as retail and textile, points also to the need for awareness-raising on their links to biodiversity.

(c) With regard to the technology transfer in sectors of water, forestry and paper, support comes mainly through climate change mechanisms and activities, which promote low-carbon technologies primarily, although biodiversity-related practices are critically important. As the role of forest biodiversity in REDD+ under the UNFCCC is being increasingly recognized, the approaches for identifying, prioritizing and transferring appropriate technologies to safeguard forest biodiversity would be recommended by the CBD.

(d) Finally, the prospecting, production, management and distribution of freshwater through landscape-level watershed management, have wide-ranging links to biodiversity. Technology transfer is largely embedded in the umbrella programme on integrated water resource management supported through UN agencies and water specialized institutes. The UN-Water Decade Programme on Capacity Development (UNW-DPC), for example, supports capacity building, education, training and institutional development related to water towards achieving MDGs.

67. In conclusion, this preliminary analysis of biodiversity technology transfer opportunities by economic sector offers new insights. More research is suggested, and the further and stronger involvement of these sectors in any future initiative will ensure success.

3.7.1.2 Key actors and their role

68. An overview of key actors (divided as per their "provider" of "facilitator" roles, and by their origin as developed or developing Party or international organization) involved in the existing activities (see Fig. 6) and their respective roles identifies a priority to build the capacity of technology transfer organizations in developing countries, which are shifting from being only the technology **recipients** to regional technology

disseminators, exchange **facilitators** and even technology **providers** through increased participation in joint research, South-South and triangular cooperation. Furthermore, the graph highlights the crucial role of international organizations as both facilitators and providers. These conclusions also correspond with the findings from the analysis on the needs for capacity building, information dissemination and match-making support, as elaborated in the previous sections of this report.

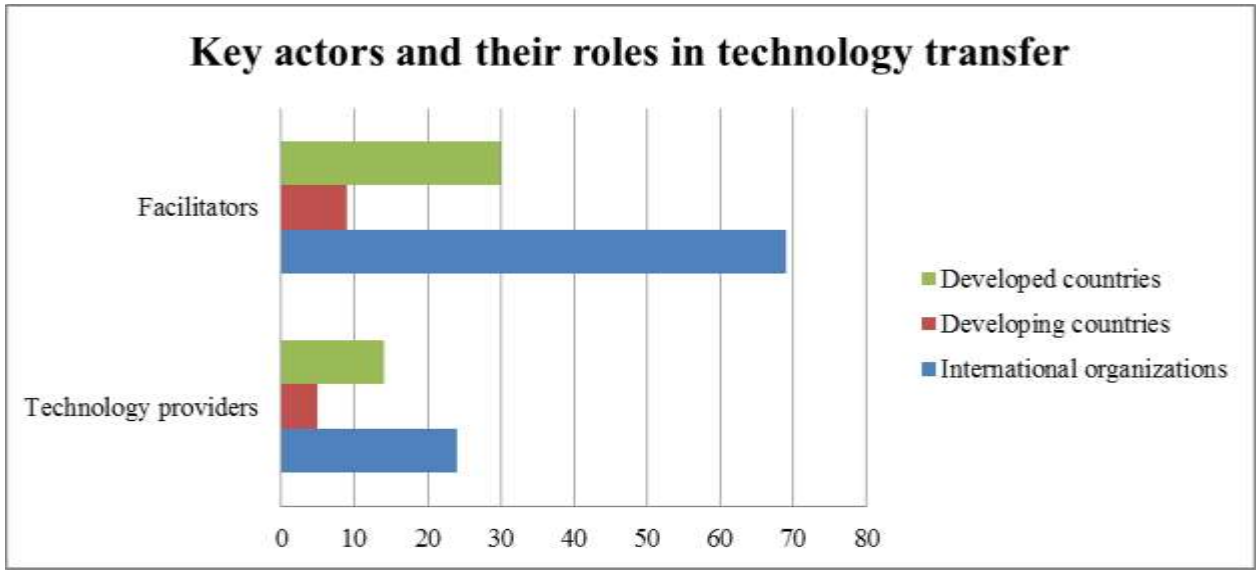


Figure 6 Key actors and their role in TT

4 Conclusions and recommendations

69. As a general remark, activities supporting technology transfer are distributed in a wide spectrum of biodiversity related areas, as categorized by the thematic programmes and issues under the Convention on Biological Diversity. With few exceptions, large-scale, long-term supporting activities found from technology transfer mechanisms or networks outside of the CBD's coordination. The overall gap thus appears to be the lack of a coordination mechanism under the Convention to engage these activities respond to Parties' technology needs in a systematic manner.

70. As summarized in preceding chapters, some gaps are identified under each type of supporting activities:

(a) technology needs assessments remain a gap area under the CBD, with specific needs for the development of a TNA methodology and capacity building for conducting TNAs;

(b) among a number of capacity building and training activities aiming at transferring certain knowledge and technologies, training on applying specific TT knowledge (e.g. IPRs, TT agreement drafting skills, project formulation and financing, etc.) in the implementation of the Convention, has not been organized yet under the CBD; while some thematic training workshops or online materials have addressed technology issues, technology transfer as an inter-disciplinary subject and a cross-cutting tool has yet to be integrated more widely to support all the thematic programmes under the Convention;

(c) seminars and symposia supported as a general training format are available on various issues, yet such activities with specific focus on the role and implementation of technology transfer in light of the new CBD Strategic Plan and Targets towards 2020, and other emerging issues and new policies related to biodiversity technology transfer, have not been organized yet since the last AHTEG-TT in 2007;

(d) as the most dedicated information system supporting biodiversity technology transfer, the clearing house mechanism of the Convention and its database on technology transfer lacks support for developing some highly useful functions, such as match-making, online glossary and technology advisory services; more information dissemination formats could be developed to overcome the limitations of web-based tools;

(e) although there are several centres of excellence in biodiversity technologies across Parties, their potential of supporting a Convention's system-wide technology transfer (similar to the CGIAR's model) would require effective coordination and networking support.

71. It is important to note that these five types of support are interdependent in a technology transfer process and should be coordinated in the same framework in order to function coherently and be mutually-supportive. The result of technology needs assessments, for instance, can provide useful information for designing targeted capacity building and training. Before TNAs become available, match-making would be difficult to be effective. Information dissemination could also be more relevant if needs are clear. When seminars and symposia are convened as an introductory approach to disseminate general knowledge relating new technologies, in-depth capacity building and technical training normally would be needed to support the adoption and adaption of these technologies. Clearly, without a coordination mechanism in place, a collection of disconnected activities can hardly serve the specific purpose of the Convention and support technology transfer as a process.

72. These gaps seem to support the value and timeliness of a dedicated biodiversity-focused technology transfer initiative under the CBD, with specific responses to each of the above gaps and challenges. The main function of such an initiative could be to (a) catalyse existing activities into a useful framework action to support the Convention and (b) provide technical support and tailored solutions, in response to the specific technology needs of Parties.

73. Particularly, towards bridging the gaps identified, support in following areas would need to be strengthened:

(a) **Technology needs assessments.** A permanent advisory body could be established to provide guidance on the development of TNA methodology and training formats. TNA could link to the CBD's national reporting and NBSAP. Training on TNA could be organized by the CBD in collaboration with relevant international organizations. The result of the TNA would be the guiding reference for other activities facilitating technology transfer, including capacity building and training, financing, technology match-making events, information dissemination and others. The unmet technology needs could be submitted by Parties through the Secretariat to WGRI as an input to the implementation review.

(b) **Strengthening CHM's match-making and networking function for technology transfer**. As many supporting mechanisms are active in developed countries and regions, it seems that any BTI should focus on bridging North-South technology information gaps through

facilitating access. To achieve this, the clearing house mechanism could facilitate match-making and online exchange, building on the existing database on technology transfer, with participation from technology providers and receivers. Specifically, this could be achieved by:

(c) **Establishing a TT-Helpdesk to provide specialized support to Parties.** In order to keep Parties informed on the latest technologies and their availability, a CBD TT Helpdesk could be established to provide specialized services and updates. Particularly, as technology transfer needs and conditions are highly diverse, there is no "one-size-for-all" solution. The Helpdesk could thus provide advisory services towards a tailored solution.

(d) **Organizing TT-specific training and capacity building**. Specialized TT knowledge, such as IPRs, TT contract drafting, project formulation and financing, could be prepared as an implementation tool for Parties. Training and capacity building initiatives to develop technology transfer projects under the ABS agreements could be considered, in line with the criteria for the specific GEF fund for the implementation of the Nagoya Protocol.

(e) **Latest technology updates and alternative information dissemination format**. Updated information on latest technological development could be disseminated by the Helpdesk through regular e-newsletters. On thematic issues, loose-leaf "latest technology information" could be produced and distributed at CBD's training and capacity building workshops.

(f) **Regular technology "fairs"** could be convened at the margins of the major CBD meetings to facilitate direct contact and cooperation.