UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

# Regional Dialogue on Technology Facilitation for Sustainable Development

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## Background Paper

## 1. Introduction

Development, transfer and dissemination of technologies are vital in enabling countries to attain sustainable development as well as in the achievement of Millennium Development Goals. The outcome document of Rio+20 (United Nations Conference on Sustainable Development) in 2012, entitled "*Future we want*"[1], echoes this point. The outcome document defines that poverty eradication, changing unsustainable and promoting sustainable patterns of consumption and production and protecting and managing the natural resource base of economic and social development are the overarching objectives of and essential requirements for sustainable development. In order to support sustainable development, the outcome document emphasizes the need to promote, facilitate and finance, as appropriate, access to and the development, transfer and diffusion of environmentally sound technologies and corresponding know-how, in particular to developing countries. In this connection, the document stresses the importance of cooperative action on technology innovation, research and development, and of exploring modalities in the relevant forums for enhanced access to such technologies by developing countries. The importance of technology transfer for developing countries was also highlighted in the Bangkok Declaration of the Asia-Pacific region on the United Nations Development Agenda beyond 2015[2]. In particular, the least developed countries (LDCs) have repeatedly called on the development partners to facilitate technology transfer including with the development of clean and renewable energy technologies, water treatment, waste management, and sustainable agricultural production, as emphasized in the Istanbul Programme of Action for least developed countries[3].

[1] Resolution adopted by the General Assembly on 27 July 2012 (A/RES/66/288), "Future we want"
[2] Outcome of Asia-Pacific Ministerial Dialogue: From the Millennium Development Goals to the United Nations Development Agenda beyond 2015, held in Bangkok, 26-28 August 2013.
[3] Programme of Action for the Least Developed Countries for the Decade 2011-2020 (Istanbul Programme of Action), A/CONF.219/3/Rev.1, May 2011.

This background paper is intended to support the Regional Dialogue on Technology Facilitation for Sustainable Development, which aims to share experiences in technology facilitation at national and subregional level and to discuss opportunities for technology facilitation mechanisms at regional scale in connection with post-Rio+20 global efforts for technology facilitation. In this regard, the paper highlights various aspects of technology facilitation initiatives by the international organizations discussed in the Secretary-General (SG)'s report, and review some of the experiences in ESCAP as an example when mapping out initiatives in the region to support technology facilitation.

## 2. Post-Rio+20 processes on technology facilitation

### *Discussion at global level*

The outcome document "*Future we want*" requested relevant United Nations agencies to identify options for a facilitation mechanism that promotes the development, transfer and dissemination of clean and environmentally sound technologies, and requested the Secretary-General to make recommendations regarding such a facilitation mechanism. In response, proposals by UN organizations and bodies, including ESCAP, were synthesized in the SG report to the General Assembly[4]. The report contains some on-going initiatives and proposals by UN organizations and bodies, as well as recommendations on possible initiatives to promote the development, transfer and dissemination of clean and environmentally sound technologies.

Despite a large number of capacity-building activities on technology, there is a perceived fragmentation of capacity-building and, in general, of all international technology facilitation efforts in this area. The SG report points out that it may reflect significant gaps, overlaps or insufficient coordination of those efforts, while it may also reflect diverse challenges and responses to address those challenges. Questions arise as to whether technology needs have been mapped systematically and whether the international programme and mechanisms to capacity-building correspond to the needs.

The SG report in 2013[5] provides a set of recommendations for accelerating technology facilitation efforts. Some are to examine needs and gaps and strengthen information flow and coordination on the existing structures; some are more ambitious, suggesting initiating an UN-led mechanism for technology transfer at global level. Such global mechanism could facilitate, for instance,

[4] "Options for a facilitation mechanism that promotes the development, transfer and dissemination of clean and environmentally sound technologies"; Report of the Secretary-General, issued on 4 September 2012 (A/67/348), and on 12 August 2013 (A/68/310)
[5] A/68/310

- a technology development and transfer fund[6] to assist with the transfer of privately owned technologies relevant in responding to urgent global sustainability challenges;
- global networks of national organizations relevant to different stages of the technology life cycle, such as science foundations, business incubators and intellectual property registration bodies;
- an international network of research/innovation policy makers that brings together representatives from technology leader countries, as well as developing countries, including LDCs, to discuss options for promoting technology cooperation that can address sustainable development challenges faced by developing countries, and, in particular, the poor and the vulnerable; and
- public-private-civil society partnerships designed to foster technology cooperation and the transfer of key technologies needed to advance progress towards specific sustainable development goals.

### *Special framework to support the Least Developed Countries*

The LDCs continue to be severely disadvantaged in development and deployment of technologies, including clean and environmentally sound technologies, despite a growing role of developing countries in the process.

The Istanbul Programme of Action, adopted at the Fourth United Nations Conference on Least Developed Countries in 2011, envisaged the technology bank and science, technology and innovation supporting mechanism dedicated to the LDCs. The report of the Secretary-General on Technology bank and science, technology and innovation supporting mechanism dedicated to the least developed countries (A/68/217), in pursuant to GA resolution 67/220, proposed a technology bank comprising of (a) a patents bank to help the LDCs access and utilize appropriate technologies; (b) a science, technology and innovation supporting mechanism to help improve the scientific research and innovation base of the least developed countries; and (c) a science and technology research depository facility to promote global networking of researchers and research institutions in the least developed countries.

GA resolution 68/224 requests the Secretary-General to constitute a high-level panel of experts drawn from the LDCs and their development partners, the UN system and other relevant stakeholders, with support by the Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing

[6] Theme study of 68th ESCAP Commission Session also explored creation of a region-wide cooperation framework such as Asia-Pacific Technology Development Council (APTECH) and Asia-Pacific Technology Fund. for detail, see *Growing Together: Economic Integration for an Inclusive and Sustainable Asia-Pacific Century* http://www.unescap.org/commission/68/theme-study.html

States (OHRLLS), in order to carry out a feasibility study to examine its scope, functions, institutional linkage with the UN and organizational aspects.

### *Special framework to support action of developing countries on climate change*

United Nations Framework Convention on Climate Change (UNFCCC) urges developed countries to take all practicable steps to promote and facilitate the transfer of, or access to, environmentally sound technologies and know-how to developing countries. In this connection, UNFCCC has facilitated various intergovernmental dialogues and cooperation on technology transfer and since 1999 supported Technology Needs Assessments in more than 85 developing countries with financial support from Global Environment Facility. The Assessment helped not only identify technology needs in each developing country but also draw a global picture of prioritized technologies in both mitigation and adaptation sectors and types of barriers to technology transfer[7]. The role of UNFCCC in facilitating technology transfer has been further strengthened by the decision of the 16th Conference of Parties to UNFCCC in 2010, which agreed on launching Technology Executive Committee (TEC) together with the Climate Technology Centre and Network (CTCN) to promote accelerated, diversified and scaled-up transfer of technologies for climate change mitigation and adaptation, in developing countries, in line with their sustainable development priorities. In particular, the establishment of the operational arm of UNFCCC Technology Mechanism, the CTCN, implies moving from a rather ad hoc nature of mechanism and dialogue-led process, Expert Group on Technology Transfer, to a permanent and collaboration-led process by having a climate technology centre under UNEP and a network of 11 Centres of Excellence located in developing and developed countries including two centres in ESCAP region, i.e. Asian Institute of Technology (AIT), Thailand and the Energy and Resources Institute (TERI), India.

### *Discussion at ESCAP*

ESCAP's background paper for the "Asia and the Pacific Regional Implementation Meeting on the Rio+20 Outcomes" held in April 2013 highlighted key challenges and approaches related to development, transfer and dissemination of technologies, which include (a) the need for the proper combination of national regulatory policies, fiscal incentives, and public financing to foster innovation activities; (b) the need to improve the ability of key actors of innovation systems to access, absorb and use technologies once they are acquired; and (c) the need for strengthening weak science, technology and innovation and their interfaces to ensure transfer of clean and environmentally sound technologies to developing countries, particularly the LDCs.

[7] UNFCCC, Results and Success Factors of TNAs, 2013

During the Meeting, representatives of member States pointed out the strong need for capacity-building in relation to technology transfer, the important complementary role of South-South cooperation, the issue of intellectual property rights as an obstacle to the use of environmentally sound technologies, the need to address the issue of perverse incentives for polluters, the need for the establishment of partnerships with and learning from the private sector in relation to resource use efficiency. In this regard, the member States suggested that ESCAP facilitate and develop technical cooperation among members for transfer of environmentally sound technologies.

## 3. Changing context of technology transfer

The reports of the UN Secretary-General, which was presented to General Assembly in 2012[8] and 2013[9], highlighted the changing context of technology transfer as follows.

**Increasing development of clean technologies with the dominance of a few countries:** Clean technology patenting has increased faster than other sectors. While it has increased by 20 per cent each year since adoption of Kyoto protocol in 1997, 80 per cent of clean energy technology patents are owned by entities in six countries (Japan, United States of America, Germany, Republic of Korea, United Kingdom of Great Britain and Northern Ireland and France), according to a survey conducted by the International Centre for Trade and Sustainable Development.

**Increasing role of markets in technology development as well as technology transfer**: Technology flows are increasingly embedded in global trade and foreign direct investment (FDI) flows, thus forming part of international production systems, even though there are significant regional differences. To some extent, scientific infrastructure, human capital, favourable market conditions and investment climate can be more important factor than protection of intellectual property rights for out-licencing clean technology towards developing countries.

**Increasing role of developing countries in technology development:** While technology flows between developed countries are still dominant, rapid innovation of clean technologies in technology intensive developing countries increases the potential flows of clean technologies among developing countries through South-South cooperation.

**Technology collaboration through advancing ICT:** Advances in ICT development increased the potential for technology collaboration involving developing countries. Free and open-source collaborations through advancing ICT have increased new forms of science and technology collaboration possible, which is being recognized as alternative forms to the conventional intellectual property rights systems, to a certain extent. As a

[8] A/67/348
[9] A/68/310

result, the global research, development and demonstration network of clean technology cooperation has become almost universal. Today, entities in 182 Member States participate in some form of international clean technology cooperation, with potential knowledge flows among all of these.

## 4. Technology gap in Asia and the Pacific

The ratio of total research and development (R&D) expenditure against GDP is often used as a rough proxy for a country's innovation effort, although it should be noted that not all the efforts to generate new technologies are relevant to sustainable development[10]. The report of the SG (A/63/310) observes that, at global level, developed countries spend higher share of GDP on R&D than developing countries in general. There is a great variation particularly among middle-income economies, however, with some middle-income economies' share of R&D higher than high-income economies. It is also observed that the ratios are lower for many smaller economies. Among 50 countries in Asia and the Pacific for which data is available, more than half[11] of the countries record zero per cent share of R&D expenditure against GDP, of which almost all of them are countries with special needs (CSN)[12]. None of LDCs except Nepal has record share of R&D expenditure against GDP. On the other hand, excluding four OECD countries, Singapore, China and the Russian Federation spend highest portion of GDP on R&D among countries in Asia-Pacific. Moreover, given the size of the economy, China's expenditure on R&D is second only to Japan in the region.

As for agricultural sector, an indicator commonly known as "intensity ratio" is used as one of the ways to evaluate a country's agricultural R&D commitment. It is a ratio of agricultural research spending relative to agricultural GDP (agGDP). In the region, in the 19 countries surveyed, public agricultural R&D spending remained less than 1% in 2008, and has not changed much since 1996. While four high-income countries spent on 4.13% of agGDP on agricultural GDP, the ratio is less than 1% in the rest of the countries (except Malaysia)[13].

Recent efforts to measure innovation capabilities, such as Global Innovation Index, indicate similar patterns as R&D expenditure in GDP – while high income countries dominate top rankings, some middle or low income countries outperform higher-income economies. As stated in the report, the index is not meant to be the definitive ranking of countries with respect to innovation, and it places its emphasis on measuring the environment and infrastructure for innovation and on assessing related outcomes.

[10] A/68/310
[11] Excluding non-regional members
[12] Based on data available at http://databank.worldbank.org/data/home.aspx
[13] IFPRI (2013), Agricultural Science and Technology Indicators: Benchmarking Agricultural Research Indicators Across Asia–Pacific

Nonetheless, it is noteworthy that *innovation learners* - middle and low-income countries which are outperforming their peers with similar GDP per capita - include a number of developing countries of the Asia Pacific region, including landlocked developing countries, such as Armenia, Mongolia, and Tajikistan, in 2013[14]. Cambodia, one of LDCs in the region, is ranked 5th among the world's 21 low-income economies surveyed for the Global Innovation Index.

Similarly, while high-income countries dominate majority of patent filings at the IP office (64.5%), middle and low income countries take the majority of trademark filing (52.6%) and industrial design filing (64%)[15]. Patents filed by residents of China recorded the largest throughout the world in 2012.

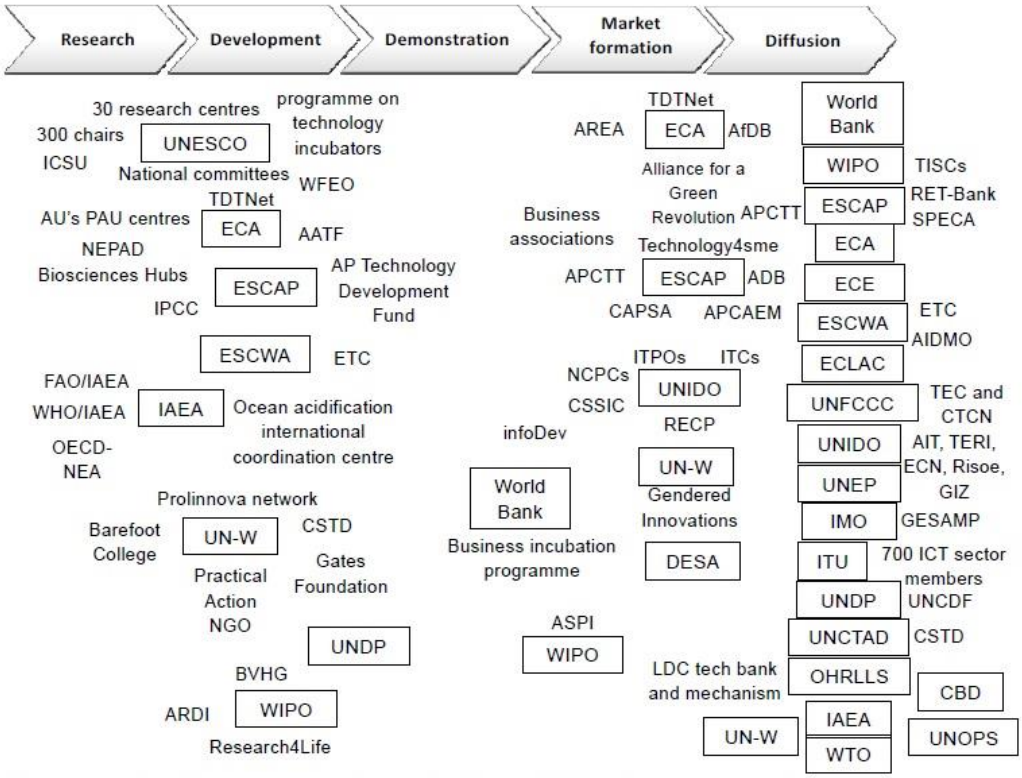
## 5. Technology facilitation initiatives by the UN organizations

There are wide array of possible interventions related to technology facilitation for sustainable development, for various priority areas, different stages of technology lifecycle, and through various modalities such as capacity building, networking, etc.

The Secretary-General's report[16] provides survey of the initiatives proposed or initiated by the UN entities and intergovernmental organizations. The **Error! Reference source not found.** provides an overview of the proposals provided in the report.

[14] Soumitra Dutta and Bruno Lanvin (2013), Global Innovation Index 2013; The local dynamics of innovation
[15] WIPO (2103), World Intellectual Property Indicators
[16] A/67/348

**[Figure 1] Overview of UN contributions and partnerships**




*Abbreviations*: AATF, African Agriculture Technology Foundation; ADB, Asian Development Bank; AfDB, African Development Bank; AIDMO, Arab Industrial Development and Mining Organization; AIT, Asian Institute of Technology; Alliance for a Green Revolution: Alliance for a Green Revolution in Africa; AP, Asia-Pacific; APCAEM, United Nations Asian and Pacific Centre for Agricultural Engineering and Machinery; APCTT, Asian and Pacific Centre for Transfer of Technology; ARDI, Access to Research for Development and Innovation programme; AREA, African Renewable Energy Alliance; ASPI, Access to Specialized Patent Information programme; AU's PAU centres, Pan African University centres of the African Union; BVHG, BIO Ventures for Global Health; CAPSA, Centre for Alleviation of Poverty through Sustainable Agriculture; CBD, Convention on Biological Diversity; CSSIC, Centres for South-South Industrial Cooperation; CSTD, Commission on Science and Technology for Development; CTCN, Climate Technology Centre and Network of the Framework Convention; DESA, Department of Economic and Social Affairs; ECA, Economic Commission for Africa; ECE, Economic Commission for Europe;

*Note: APCAEM was renamed to CSAM*
*Source: Report of the Secretary-General (A/67/348)*

The report also lists institutional proposals for improved technology facilitation categorized by stages of technology cycle, key objectives and the modalities, as well as key priority areas addressed by these proposals. (Table 1 below gives categories identified in the report and Table 2 shows priority areas highlighted in the report.) While most of the initiatives and proposals address market formation to diffusion, the last stage of technology life cycle, their focus are often on specific sector or particular region.

**[Table 1] Types of technology facilitation initiatives by stages**

| ***Stages*** | ***Objective*** | ***Means*** |
|---|---|---|
| Research to development (and demonstration) | Knowledge sharing | Partnership |
| | | Programme |
| | Strengthen research, development and | Fund |

| | | |
|---|---|---|
| | demonstration | Partnership |
| | | Legal |
| | Technology transfer | Fund |
| Development to demonstration | Business incubation | Partnership |
| | | Fund |
| Demonstration to market | Reduce risk | Fund |
| Market formation to diffusion (and further diffusion) | Technology transfer | Fund |
| | | Programme |
| | | Legal |
| | Reduce IPR constraints | Partnership |
| | Technology information | Programme |
| | Knowledge sharing | Programme |
| | Public participation | Legal |
| | Technology assessment | Legal |
| | | Expert advice |
| | | Partnership |
| Across (almost) all stages) | Technology facilitation | Partnership |
| | Knowledge sharing | Programme |
| | | Expert advice |
| | Public participation | Partnership |
| | | Legal |
| | Coordination | Partnership |
| | | Programme |

*(A/67/348)*

**[Table2] Priority areas for the technology facilitation mechanism, as proposed by United Nations organizations**

| ***Scope*** | ***Priority technology areas*** |
|---|---|
| General | All technologies (beyond scope of existing instruments)<br>Publicly owned or publicly funded technologies<br>University-industry-government technologies<br>Public participation<br>Gender |
| Health and safety | Public health (neglected tropical diseases, malaria, tuberculosis)<br>Industrial safety<br>Disaster risk reduction |
| Environment | Sustainable procurement<br>Environmentally sound technologies and production<br>Low carbon technologies |

| | |
|---|---|
| | Air pollution (including ozone)<br>Environmental monitoring and assessment<br>Green economy |
| Energy | (Clean and/or renewable) energy<br>Access to modern, clean energy services<br>Energy efficiency and conservation (including in transport sector) |
| Infrastructure | Sustainable infrastructure and transport<br>Water<br>Waste management<br>Green buildings<br>Information and communications technologies |
| Resources | Oceans and marine technology<br>Agriculture and food security<br>Forests |

*(A/68/348)*

## 6. Technology facilitation and ESCAP initiative

Complementing technology facilitation mechanisms at global level, technology facilitation at regional level provides immense opportunities to find solutions to common challenges such as health, nutrition, affordable and accessible sustainable energy or low-cost building materials by focusing on certain elements of technology facilitation that are either common among or unique to countries of the Asia-Pacific region.

Regional mechanisms have certain unique advantages including geographic proximity among countries within the region, existing social, cultural, political, environmental, economic and/or business linkages among nodal institutions in partner countries, better understanding of the national scenario related to technology transfer in countries with in the region or ease in comparison of cost.

Many developing countries and CSN need technologies that are cost-effective and can be adapted to local conditions. It is relatively easy to identify technologies that can match this criterion through a horizontal technology facilitation mechanism with emphasis on South-South Cooperation within the region.

Close economic cooperation and integration efforts among countries at sub-regional levels (e.g. ASEAN, SAARC) provides a favorable environment for horizontal as well as vertical technology facilitation among countries within the region.

Furthermore, given the similar geographic and socio-economic characteristics and constraints across countries and sub-regions, sustainable agriculture is one area where sharing of knowledge and good practices, including locally generated innovation, may be better addressed at regional and sub-regional level.

### *Technology facilitation through ESCAP regional institutions*

ESCAP has been working towards inclusive and sustainable development, and has supported transfer of technologies in the region, in particular through its regional institutions dedicated to technology transfer and technical cooperation. Experiences and areas of work of the three ESCAP Regional institutions are highlighted here to expand the overview of capacity building efforts at global level described above (Figure 1, Table 1 and 2), as an example for mapping technology facilitation capacity building initiatives in the Asia Pacific region.

**The Asian and Pacific Centre for Transfer of Technology (APCTT)** was established in 1977, with the objective of assisting ESCAP member countries to strengthen their capacities in developing and managing national technology innovation system and facilitating technology transfer[17]. **The Centre for Alleviation of Poverty through Sustainable Agriculture (CAPSA)**, founded in 1981, links research and policy making on sustainable agriculture, with an overall goal to reduce poverty and enhance food security by promoting sustainable agriculture[18]. **The Centre for Sustainable Agricultural Mechanization (CSAM)**, started operations in 2004, built on the achievements of the Regional Network for Agricultural Machinery (RNAM) established in 1977, to promote technical cooperation for sustainable agricultural mechanization and technology transfer[19]. These institutions have been playing catalytic roles in promoting technology transfer in their respective areas of specialization with the goal of promoting sustainable development and reducing poverty.

The table below shows the areas of contribution by these regional institutions in technology facilitation mechanism for sustainable development, referring to the priority areas and stage of technology lifecycle described above in Table 1 and 2. Most of these initiatives rely on publicly owned or publicly funded technology sources.

| ***Technology areas[20]*** | | ***Research to development (and demonstration)*** | ***..*** | ***Market formation to diffusion (and further diffusion)*** | ***Across (almost) all stages)*** |
|---|---|---|---|---|---|
| General | All technologies (beyond scope of existing instruments) | | | **Technology information** (programme) - APCTT | **Technology facilitation –** ICT network platform, capacity building, policy analysis on technical innovation (partnership and programme) – APCTT |

[17] Ref. APCTT website
[18] Ref. CAPSA website (about CAPSA)
[19] Ref. CSAM website
[20] Technology areas identified in the SG report A/68/348

| | | | | | |
|---|---|---|---|---|---|
| | | | | | **Knowledge sharing** (Programme, Expert Advice ) – APCTT<br><br>**Knowledge sharing** Through Regional Forum on Sustainable Agricultural Mechanization - CSAM |
| Environment | Environmentally sound technologies and production | | | **Knowledge sharing** on sustainable agriculture technology (programme) – CAPSA<br><br>**Technology information** on Ozone layer protection – APCTT | **Knowledge sharing** on sustainable agriculture mechanization strategies (SAMS), (programme) – CSAM<br><br>**Knowledge sharing** (Programme & Partnership) – APCTT<br><br>**Technology Information** (Programme) - APCTT |
| Energy | (Clean and/or renewable) energy<br><br>Air pollution (including ozone) | **Knowledge sharing** – renewable energy technologies primarily in the following areas: solar, biomass, wind and hydro power – APCTT | | **Technology transfer** – renewable technology bank (programme) – APCTT<br><br>**Technology information** – non-conventional energy (programme) - APCTT | **Knowledge sharing** (programme) - APCTT<br><br>**Coordination** (partnership) – Renewable Energy Cooperation-Network for the Asia Pacific (RECAP) mechanism of APCTT |
| Infrastructure | Waste management | | | **Technology information** on Waste management – APCTT | |
| Resources | Agriculture and food security (sustainable agriculture) | **Knowledge sharing** - sustainable agriculture technology; capacity building and knowledge transfer (partnership and programme) – CAPSA & APCTT<br><br>**Strengthen R&D and demonstration** - agricultural machinery (partnership) - CSAM<br><br>On-site demonstration programme - CSAM | | **Technology transfer** - Network for knowledge transfer on sustainable agricultural technologies and improved market linkages (programme) – CAPSA & APCTT<br><br>**Technology information** on Food processing technologies – APCTT<br><br>**Business development** through the Regional Council of Associations of Farm Machinery – CSAM | **Knowledge sharing** – on integration of research and extension – CAPSA / APCTT<br><br>**Coordination** – regional coordination mechanism (partnership) – CSAM<br><br>**Technology information** (Programme) – APCTT<br><br>**Knowledge and information sharing + coordination** – Asian-Pacific Network for |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | Testing of Agricultural Machinery (ANTAM) – CSAM<br><br>**Information sharing**<br>Statistics and data on farm machinery – CSAM |

### *Examples of good practice*

**Knowledge sharing on innovative sustainable agricultural technologies:** CAPSA is implementing a project titled 'Network for Knowledge Transfer on Sustainable Agricultural Technologies and Improved Market Linkages in South and Southeast Asia' (SATNET – www.satnetasia.org). As part of this project, a wide network of public, private and civil society organizations has been established in South and Southeast Asia countries reaching out to approx. 900 participants. This network is helping facilitate knowledge sharing on innovative sustainable agricultural technologies and practices suitable for smallholder farmers, thus promoting food security and poverty alleviation in the region. CSAM has launched the Asian-Pacific Network for Testing of Agricultural Machinery (ANTAM), with an aim to harmonize testing codes and procedures and to raise the institutional and technological capacity of member countries through knowledge and information sharing, thereby contributing to sustainable agricultural mechanization.

**Demonstration of technologies:** CSAM's on-site demonstration programmes of specific farm mechanization equipment and technologies, often conducted back-to-back with the Regional Forum on Sustainable Agricultural Mechanization, provide government officials, researchers and extension workers, farmers and the private sectors with exposures to new developments in cost-effective and adaptable technologies.

**Online technology transfer:** APCTT's web-based online technology transfer facilitation mechanism, called Technology4sme.net (http://technology4sme.net), brings together buyers and seekers of technology could be expanded, with suitable adaptations, to serve as a repository, including of clean and environmentally sound technologies that are being sought by member countries as well as those that are available for transfer by owners of technology[21].

### *Gaps in capacity building for technology facilitation*

Gaps in capacity building for technology facilitation in the region, identified in the process of implementing those initiatives, include the following.

[21] http://sustainabledevelopment.un.org/content/documents/1251escap.pdf

**Limitations of STI policy support:** Current national science, technology and innovation (STI) policies are aimed at building and supporting the manufacturing capabilities. In the context of sustainable development it is important to fine tune the existing policies to ensure contribution of manufacturing capabilities to specific areas of immediate national interest such as health, food and nutrition, sanitation, water, transportation and sustainable agriculture. In addition, FDI policy and regulations could be streamlined to focus on the co-development and co-sharing of environmentally sound technologies which contribute to sustainable development.

**Inadequate institutional mechanism for technology facilitation:** In supporting micro, small and medium enterprises (MSMEs), one of the critical gaps in many countries in the region is an inadequacy or lack of institutional mechanisms at various stages of the technology transfer process. It ranges from technology screening, short-listing, negotiation, and providing guidance on opportunities for financing legal issues related to technology transfer and finally leading to the preparation of a contractual agreement among the interested parties which will form the basis for a technology-based partnership.

**Technology assessment capacity:** A key challenge for Asia-Pacific countries is to enhance their capacity to assess technologies that could contribute to national sustainable development. In this context, there is a need to assist countries in carrying out country- and sector-specific technology needs assessments in the context of sustainable development. This would include systematic research across a broad range of technologies relevant for sustainable development with special attention to their unique features and characteristics, contextualized localization as well as primary and secondary job creation. In addition, technology assessment is also essential to examine the actual or potential impact of its applications on critical sustainability issues at the national and regional levels.

**Gap between R&D and diffusion:** R&D is mainly public-funded and most countries of the region have a top-down approach for technology development and commercialization. In this scenario, the gap between the R&D institutes or universities and the industry has been fairly wide, thus commercialization of public research outputs remains a challenge. It is considered essential to close this gap through fostering collaboration between R&D institutes and universities and industry as well as strengthening their R&D management capacity in critical aspects such as public-private partnership in R&D, IP protection and valuation, commercialization of research results, as well as safety, standardization, testing and certification. In the context of sustainable agriculture, the integration between agricultural research and extension services is also a critical gap.

**Weakness at diffusion stage:** In agriculture sector, most of the Asia-Pacific region suffers from weak extension services with insufficient staff and operational resources.

**Weak link between public and private sector:** In the area of sustainable agriculture, there is also a relatively weak integration between public and private service providers, especially for technologies that are relevant to smallholders. As a subset to this problem, there is no quality control, and no 'certification' of private sector led technology transfer.

**Overlooking local innovations:** In the context of sustainable agriculture, solutions are still very much sought in the public and commercial domain. There is a tendency not to consider farmers as researchers, and useful examples of local innovations can therefore be overlooked.

**Problems in technology transfer and adoption due to inadequate skills:** In the case of LDCs and many developing countries in the region, due to financial and industrial restrictions, the key stakeholders in these countries are unable to attract the required skills for a successful technology transfer process. Some of the reasons include, but not limited to the following:

a) lack of experience and skill shortages of the transferee's workforce; and lack of sufficient training of transferee personnel;
b) absence of incentives or promotional systems for enabling them to learn and assimilate new technologies;
c) language barriers between transferor (technology provider) and transferee personnel (technology seeker) which impede the process of vital communication of technological information;
d) need to compete with international competitors due to trends in globalization, the widening free trade and phasing out of tariff barriers;
e) the changes that have been taking place in the international economic scenario have brought challenges for SMEs; and
f) adaptation to technologies to the local needs has always been of lower priority for the transferors

**Limitations of technology transfer mechanisms:** There are many technology transfer platforms operating at national, regional, international and sectoral levels. The online technology transfer platforms predominantly service the formal manufacturing industry sectors. On the contrary, there are no adequate technology facilitation mechanisms aimed at technologies referred to as traditional or grassroots or community or village or rural technologies. There is a need to develop mechanisms to identify, upscale and deploy such technologies across the country for distributed manufacturing of products that are affordable and meeting the sustainable development needs of people, such as health, food and nutrition, water, transportation and agriculture. New and emerging approaches for technology innovation and commercialization could be promoted which include accessing open source technologies, adopting open innovation approach, facilitating cooperative R&D for technology development, establishing patent pools and repositories of voluntary patent donations.

**Diversity of the needs in the region:** The Science, Technology and Innovation (STI) policies and national or market driven support mechanisms for technology transfer and acquisition are at various developmental/operational stages in the region. This incoherence within and among the countries, poses challenge to successful technology facilitation, particularly technologies for sustainable development.

**Financial constraints:** Sustainability of the activities and follow-up actions are often constrained by financial availability. Priority activities perceived by the regional institution (such as standalone capacity building) do not always match with donors' preference (such as research-cum capacity building)

### *Institutional links*

Linking existing knowledge and institutes available in the region is an important element of technology facilitation. The regional institutions' existing and potential partners are shown below with indication of provider (P) and recipient (R) of technology, innovation, know-how skill, knowledge, etc.

| **ESCAP Regional Institutions** | **Partner Institution (P: provider, R: recipient)** | **Roles of the Institution** |
|---|---|---|
| APCTT[22] | (P) CABI South Asia | Knowledge partner in sustainable agricultural technologies at the sub-regional (South Asia) level |
| | (P) Industrial Technology Development Institute (ITDI), Philippines | Transfer of renewable energy technologies at the regional level |
| | (P) Korea Advanced Institute of Science and Technology (KAIST), Republic of Korea | Transfer of renewable energy technologies at the regional level |
| | (P) International Centre for Environmental Technology Transfer (ICETT), Japan | Transfer of environment-friendly technologies at the regional level |
| | (R) National Plant Protection Centre (NPPC), Ministry of Agriculture and Forests, Bhutan | Skills and knowledge transfer related to sustainable agricultural technologies at national level |
| CSAM | (P&R) All major national research institutes in agricultural engineering and machinery in the region, notably the China Agricultural University (CAU) through its College of Engineering; Chinese Academy of Agricultural Engineering (CAAE); Chinese Academy of Agricultural Mechanization Sciences (CAAMS); and Central Institute of Agricultural Engineering (CIAE), India | R&D of sustainable agricultural mechanization technologies and equipment; Training and capacity building; and Technology transfer |

[22] Indicative list of APCTT's partners. For brevity, the entire list is not included in this document.

| | | |
|---|---|---|
| | (P&R) National farm machinery extension and testing stations in major countries across the region | Extension and technology transfer |
| | (P&R) National ministries of agriculture | Policies related to R&D, extension and technology transfer |
| | (P&R) National associations related to farm machinery in selected countries | Technology transfer, extension and business development (trade and investment) |
| CAPSA | (P) APCTT, The World Vegetable Center (AVRDC), Food Security Centre of the University of Hohenheim, Trade and Investment Division of ESCAP, Ministries of Agriculture and Ministries of Trade and related institutions in various countries of the Asia-Pacific region (in particular Afghanistan, Bangladesh, Bhutan, Cambodia, India, Indonesia, Lao PDR, Myanmar, Nepal, Pakistan, Philippines, Timor-Leste) various civil society and private sector organizations part of SATNET Asia initiative of CAPSA | Facilitating collection of sustainable agricultural technologies and practices as well as trade facilitation technologies and practices; assessing the technologies and practices in respect to sustainability; and implementing workshops and other capacity building activities |
| | (R) Ministries of Agriculture and related institutions in various countries of the Asia-Pacific region (noted above), various civil society and private sector organizations part of SATNET Asia initiative of CAPSA | Recipient of training and capacity building on sustainable agricultural technologies and practices as well as trade facilitation technologies and practices, especially government employees and civil society representatives, and further dissemination to end-users |

## 7. Way forward

There is a large array of initiatives to facilitate technology transfer, by United Nations, international organizations, development partners, and increasingly more initiatives by developing countries themselves.

While there is no question that technology facilitation is a shared objective of all countries, international organizations and other stakeholders[23], needs and available assistance, capacity, modality of capacity building initiatives vary across sectors, type of technology, targeted beneficiaries, etc. Thus mapping out capacity-building efforts is one of the key

[23] A/68/310

areas for improving of international capacity building activities. It is equally important to take account of the links with national institutions, academia, and other relevant institutions.

Identifying gaps and capacity building initiatives at regional level thus serve two purposes: (i) to provide a regional map of technology facilitation initiatives as a foundation for global technology facilitation mechanism; and (ii) to identify key areas where technology facilitation at regional level is most effective and complementary to global level initiative.

In this connection, the following questions need to be answered during the Regional Dialogue.

- Drawing from national experiences in technology facilitation, what are the most important enabling conditions and constraints (such as intellectual property rights, scientific infrastructure, human capital, favourable market conditions, investment climate, etc.)? And what are the lessons for technology facilitation?
- How to identify and ensure that the needs of beneficiaries and supplier are matched?
- What are the gaps and needs that the relevant institutions are trying to address and how?
- What are the motivation and challenges in expanding the scope of technology facilitation beyond national level and up-scaling such initiatives to regional/international level?
- How intellectual property rights could be used as incentive for technology facilitation across countries?
- What are the gaps and needs that the relevant institutions are trying to address and how?
- What are the roles of key sectors – public institutions, academic institutions and the private sector – in building multifaceted, multi-layered partnership for acquisition, development and deployment of technology?
- What are the opportunities and challenges in scaling up the current instructional linkage to regional/global level?
- What are the existing/prospective links with other national/regional/international institutions related to technology facilitation?
- How the ongoing efforts of technology facilitation at regional level can be effectively linked to and complement the initiatives at global level in clean technology facilitation such as Clean Technology Centre Network (CTCN)?
- How regional perspectives and experiences on technology facilitation can be reflected in the discussion at the global level, in the context of means of implementation of Rio+20 outcomes?