Draft annotated outline for the Report of the Secretary-General for the 2013 Annual Ministerial Review of UN ECOSOC

Informal inputs from DESA-DSD

I. Introduction

II. The nexus between science, technology and innovation (STI), and culture, the MDGs and sustainable development

The only feasible development in the long-run is sustainable development, i.e, development that meets the need of the present and does not jeopardize the capacity of future generations to meet their needs.[1] Hence, sustainable development has served as overarching framework for the United Nations since the UNCED in 1992, and Agenda 21 served as comprehensive plan for its achievement.

In June 2012, at the United Nations Conference on Sustainable Development, informally referred to as "Rio+20", Member States reaffirmed their commitment to sustainable development. The outcome document, entitled "The future we want" was endorsed in its entirety by General Assembly resolution A/66/288 of 27 July 2012. It provides a vision for the way forward, including through the establishment of a High-level Political Forum and a process for defining Sustainable Development Goals for the period after expiration of the MDGs in 2015.

Despite the wide acceptance of the definition of sustainable development put forward in the Brundtland report, there is no agreement on the precise scope of sustainable development, i.e., on what to sustain, what to develop, and for how long. Different foci arise from different choices of values. Yet, review of specific definitions of sustainable development showed that they typically combine selected elements of sustaining nature, life support, and community, as well as developing people, economy, and society.[2] Hence, sustaining culture and community are core elements of sustainable development.

Technology has greatly shaped society and the environment. While technology progress has addressed many problems, it has also added new problems. To varying degrees, all technologies consume resources, use land and pollute air, water and the atmosphere. While increasing eco-efficiency of technology use has greatly reduced the amounts of resources consumed and pollution produced per unit of output over the long run, absolute amounts of consumption and pollution have continued to increase unsustainably.

Among the major drivers of pollution, technology has most often been the policy lever of choice, as management of aspects of population, rising consumption and consumption has tended to be less acceptable politically.

Technology has been characterized as one of the "means of implementation" of Agenda 21 and other UN sustainable development commitments. Indeed, Governments have called for concerted actions to support economic development and accelerate change towards cleaner technology, which has also been referred to as "technology innovation imperative". The World Economic and Social Survey 2011 called for a "global green technological

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[1] Brundtland report, 1987

[2] Kates, R.W., Parris, T.M., and A.A. Leiserowitz (2005). What is sustainable development? Goals, indicators, values, and practice. Environment, April 2005, Science and Policy for Sustainable Development, Volume 47, Number 3, p. 8-21, http://www.environmentmagazine.org/Editorials/Kates-apr05-full.html

transformation, greater in scale and achievable within a much shorter time-frame than [in the past]" that "must enable today's poor to attain decent living standards, while reducing emissions and waste and ending the unrestrained drawdown of the earth's non-renewable resources."

Actual progress in technology performance at the global level has fallen far short of such ambitions. Prevailing "solutions" are insufficient to achieve the technically feasible factor of 4 to 5 increase in global eco-efficiency.

A. Science base, technology, innovation and capacity building for sustainable development
    a. Science-policy-society interface

Technology progresses along a life cycle from research to development, demonstration, market formation and diffusion. Science is a necessary input for all these stages. In the long-run, there cannot be progress in technology without progress in science and vice versa. Similarly, science and technology co-evolve with society and its institutions which ultimately determine the rate of progress and its direction.

In view of the complexity of sustainable development issues, science and societal stakeholders play an important role in sustainable development policies. At the global level, UN Member States have emphasized their role at Rio+20 which, inter alia, agreed to establish a High-level political forum on sustainable development under the General Assembly. §85, inter alia, to *"strengthen the science-policy interface" (*§85k).

The forum might provide a space for discussing the coherence of the increasing number of scientific assessments of relevance to sustainable development, as well as the increasing number of intergovernmental agreements addressing specific issues.

    b. STI education
    c. Research, monitoring and observations
    d. Science diplomacy
    e. Culture of science
    f. Access, usage and application of technology information
    g. STI policies
B. Culture and the role of the creative sector in supporting sustainable development
C. The changing geography and models of innovation
    a. New players in STI (BRICs, etc.)

In his report A/67/348 of 4 Sept. 2012, the Secretary General outlined recent trends in the models and geography of innovation. In the past twenty years, patterns of technology flows and transfer have changed significantly. A number of technology-intensive developing countries have gained a much greater role, but poorer and smaller economies have become increasingly marginalized. South-South clean technology transfer has become increasingly important, despite the persistence of barriers.

Not only the overall magnitude, but also the nature of cross-border technology flows has changed. Technology flows are increasingly embedded in global trade and foreign direct investment flows, thus forming part of international production systems, even though there are significant regional differences. In terms of manufacturing and export of clean technology, several large developing countries have become world leaders, and some are also emerging as the most important users.

b. Internationalization of R&D and innovation

Mirroring the changing patterns of technology flows, research, development and demonstration stocks and flows have changed, illustrating a much more important role for technology-intensive developing countries.

c. New models of innovation (open innovation, networked innovation)

Web-based technologies have made new forms of science and technology collaboration possible. In particular, free and open-source collaborations and solutions have emerged, which are viewed by some as alternative forms to the conventional intellectual property rights systems of patents and copyrights, whereas others have emphasized their complementarity.

A recent survey[3] found relatively low levels of out-licensing of clean technology towards developing countries. Scientific infrastructure, human capital, favourable market conditions and investment climate were considered more important than protection of intellectual property rights in the country of the licensee. The willingness to outlicense was found to be much higher than the actual level of licensing. In responding to the survey, 70 per cent of participants said they were prepared to offer more flexible terms when licensing to developing countries with limited financial capacity. Most respondents favoured collaborative research and development activities, patent out-licensing and joint ventures over patent pooling and cross-licensing.

d. Sectoral distinctions (ICTs, green technologies, pharma and medical technologies)

III. Shaping the course of development: the role of STI

A. Filling the MDGs Gap

a. Mainstreaming STI to support achievement of the MDGs

B. Integrating STI and sustainable development

a. Integrating STI to support the Sustainable Development Goals (SDGs)

b. Focus on new and/or priority challenges (clean energy, water technologies, technology for food security, non-communicable diseases)

See Section II above: STI is considered a "means of implementation".

C. Improving the application of STI for the post-2015 development agenda

D. Strengthening multi-stakeholder collaboration and building partnerships

a. Private sector

b. Public-private partnerships (especially those supporting transfer of technology and know-how as well as adaption and dissemination of tech)

In his report A/67/348 of 4 Sept. 2012, the Secretary General outlined elements of a potential global technology facilitation mechanism. The mechanism would facilitate global and regional networks and partnerships in all stages of the technology cycle.

[3] United Nations Environment Programme, European Patent Office and International Centre for Trade and Sustainable Development, Patents and clean energy: bridging the gap between evidence and policy, 2010.

IV. Shaping the course of development: the potential of culture

A. Filling the MDGs Gap

a. Mainstreaming culture to support the achievement of the MDGs

B. Integrating culture and sustainable development

a. Integrating culture to support the Sustainable Development Goals

b. Public-private partnerships (especially those supporting transfer of technology and know-how as well as adaption and dissemination of tech)

See Section II above: culture is a core element of sustainable development. Hence, there is no need to integrate it.

C. Incorporating culture into the post-2015 development agenda

It is suggested to integrate sections B and C. SDGs are part of the post-2015 development agenda. As affirmed by Rio+20, sustainable development is the new development agenda.

D. Strengthening multi-stakeholder collaboration and building partnerships

a. Private sector

b. Public-private partnerships

V. An enabling environment for transformative change in society towards sustainable development through STI and culture

Transformative change towards sustainable development is impossible without an adequate enabling environment at local, national and global levels. As sustainable development entails pursuing a multitude of objectives and country situations differ greatly, in practice policy makers are faced with the challenge of managing trade-offs and synergies among objectives. Furthermore, decisions are not independent from each other, but are part of a global system of decision making embedded in a global technology system. Bottlenecks, disincentives and inconsistencies abound and are difficult to remove, as they are often a result of addressing other important problems. Technologies are typically composed of (or require inputs) from many other technologies, requiring infrastructure, education, technical capacities, and a legal system. In addition, some argue that the policy space available to decision-makers especially in poorer countries has become increasingly limited.

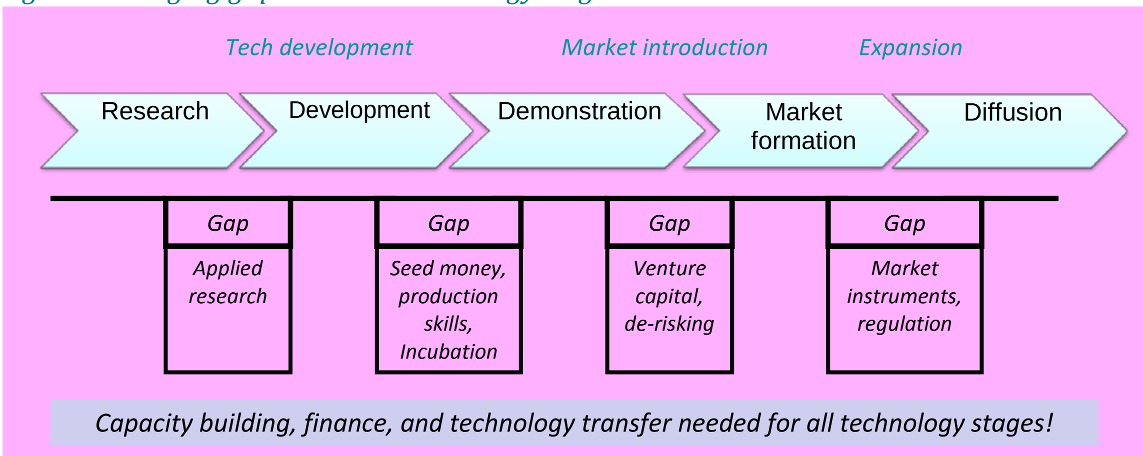
Against this background, this section highlights a number of salient elements of the enabling environment, including characteristics of the global technology system and efforts to foster green innovation systems; support activities by UN organizations and their partners; the institutional landscape, including international institutions, instruments and commitments; and concludes with ideas for greater global coherence, including through a technology facilitation mechanism and technology goals.

Global technology system

Technologies follow a well-known path through different stages in their life cycle, from research to development, demonstration, market formation, and eventual diffusion in the marketplace. Significant gaps exist between these stages and need to be overcome (see figure 1). One of these gaps is the commercialization gap. An effective technology innovation system is one that excels in each stage and seamlessly bridges the gaps between them. In such a system, capacity-building, finance and technology transfer can play an important role in all stages.

The global technology system is facilitated or constrained by the enabling environment which includes the macro-economic environment, geography/natural endowments, culture, institutions, policies and infrastructure.

Figure 1: Bridging gaps between technology stages



Source: UN document A/67/348.

Green innovation system

The World Economic and Social Survey 2011 suggested the systematic development of green innovation systems which would entail bridging gaps between technology stages with a focus on global increase in eco-efficiency and coherent policies, including in key sectors, and industry, science, social and education policies.

For the example of financing the energy technology cycle, table 2 illustrates the large differences in terms investment needs, risk-return profiles and typical instruments. In fact, a range of instruments and key actors need to work in tandem for the system to function. Investment needs are up to 1000-times larger in the maturity phase than R&D needs. Risks are high in the early stages, requiring very large returns on the order of 40 to 50 percent, severely limiting the choice of instruments and financing sources. Yet, for the technology system to perform even the non-conventional instruments must be operational and viable, which poses an enormous challenge for poor countries and small companies everywhere. Most often than not poorer countries aim to fill the gap in the early stages of the technology life cycle through government action which, however, becomes increasingly constrained by resource availability and international commitments. Hence, improving the enabling environment needs to be based on a comprehensive view of the technology life cycle.

Table 2: Financing the energy technology cycle

Stages	***Research***	***Development***	***Demonstration***		***Market formation***	***Diffusion***	
	R&D	***Proof of concept***	***Prototype and pilot scale production***	***Prototype system development***	***Pre-commercial scale-up***	***Growth/ commercial scale-up***	***Commercial replication (maturity)***
Investment need (multiples of R&D)	*1*	*1-3*	*2-8*	*7-15*	*15-25*	*25-100*	*100-1000+*
Typical risk return profile	*?*	*?*	*40-50+%*	*40%*	*35-40%*	*> cost of capital*	*> cost of capital*

Instruments	*National labs; strategic investors*	*Angel funding; bootstrapping*	*Early-stage venture capital*	*Venture capital; occasionally debt*	*Commercialization gap*	*Corporate debt; leases; private equity*	*Public-debt and equity; markets; infra funds*

Source: Yanosek, K., (2012). Policies for Financing the Energy Transition. Daedalus.

Other examples illustrating the importance of taking into account the full technology cycle are government policies and programmes to support clean technologies. These policies have typically focused on the supply side and the diffusion stage. Yet, overall technology progress is driven mainly by demand with great potential in end-use and efficiency improvements. Similarly, much lower investment needs mean that a greater impact could be achieved by governments with limited resources through investments in early stages of the life cycle. It should be noted that almost the entire global annual energy technology investment (public and private) is in diffusion (US$3.5trillion), 2.5 trillion of which is for end-use and efficiency improvements.

Institutional landscape: international institutions, instruments and commitments

In the past twenty years, the institutional landscape has also significantly changed, including in terms of institutions in the field of research, development and demonstration, policy instruments, support mechanisms of the United Nations system, international commitments and international law.

Capacity building

A system of capacity-building mechanisms for technology and sustainable development has emerged that is increasingly fragmented, including within the United Nations system. A survey of activities within the United Nations system[4] illustrates the range of capacity-building activities, which remain largely uncoordinated and ad hoc in terms of objective, content and country coverage. There is no global framework, agreement, assessment or monitoring mechanism for science and technology for sustainable development. It is encouraging, however, that - in their inputs for SG report A/67/348 in July 2012 - UN entities offered a wide range of contributions and over 1000 partners for a potential future technology facilitation mechanism. Most of the contributions focused on further diffusion and technology transfer, and few support the link between demonstration and market formation.

RD&D collaboration networks

The global research, development and demonstration network of clean technology cooperation has become almost universal, whereas twenty years ago it involved essentially only developed countries. Today, entities in 182 Member States participate in some form of international clean technology cooperation, with potential knowledge flows among all of these. However, the structures of technology cooperation networks differ greatly between technology clusters, reflecting national policy priorities, resource endowments and political considerations.

Markets

[4] Department of Economic and Social Affairs and United Nations Industrial Development Organization, “Technology development and transfer for climate change: a survey of activities by United Nations system organizations” (working paper, 2010).

In line with a general trend, today's technology policy in many countries emphasizes market and price instruments as levers of choice, with much less focus on technology mandates and standards than in the past. Various forms of taxation, subsidies, feed-in tariffs and permit trading systems have been introduced to stimulate green technology. For example, government support for renewables amounted to US$57 billion in 2009 and the amount is expected to quadruple in the next 20 years.[5]

Global norm setting

Technology commitments in UN resolutions: In preparation for the United Nations Conference on Sustainable Development, the Department of Economic and Social Affairs reviewed the global commitments on science and technology for sustainable development. One quarter of these commitments specifically address environmentally sound technologies. Commitments have typically followed a technology-centric perspective, which aims to facilitate technology transfer, in particular from developed to developing countries, for which it is considered crucial to raise financial resources and build capacity (see e.g., Rio principles 7 and 9). In Agenda 21, technology was referred to more than any other issue. It is prominent in every single chapter with a wide scope. In 2003 and 2005, the World Summit on the Information Society adopted principles and an action plan to bring 50 per cent of the world's population online by 2015. The 2005 World Summit Outcome 28 contains a section on science and technology for development, which emphasizes the importance of access to and the development, transfer and diffusion of technologies to developing countries, The outcome document of the United Nations Conference on Sustainable Development, adopted on 22 June 2012, contains 12 paragraphs that focus on science and technology for sustainable development. They address clean technology transfer and diffusion; research, development and demonstration and the science-policy interface; capacity-building and stakeholder participation; and the policy environment. Resolutions of the Economic and Social Council on science and technology for development (e.g., 2009/8, 2010/3 and 2012/6) are important examples, The regional commissions and specialized organizations of the United Nations have adopted a large number of resolutions on specific technology sectors, which provide more detailed guidance.

Technology transfer provisions in int'l agreements: There are many technology provisions in international agreements, conventions and protocols, especially in the areas of environmental, health and safety technologies. The impact of these agreements on technology transfer has been mixed. For example, the Montreal Protocol has been hailed as a great success in terms of its impact on technology transfer, whereas views are divided about the impact of the United Nations Framework Convention on Climate Change. The future Climate Technology Centre and Network, as established by the Conference of the Parties to the Framework Convention, is expected to promote technology transfer on a larger scale.

The *Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)* which is the most comprehensive international treaty on intellectual property rights has frequently been invoked in debates on the practical impact of those rights in promoting or constraining innovation in clean technologies. In WTO, within the Council for TRIPS and the Working Group on Transfer of Technology, there has been a long-running debate over technology transfer and the patent system. It relates to implementation of article 66.2 of the Agreement, which requires developed countries to provide incentives to entities located in

[5] International Energy Agency and the Organization for Economic Cooperation and Development, World Energy Outlook 2010, Paris.

their territories in order to promote and encourage the transfer of technology to the least developed countries. Current debates about technology transfer and the environment therefore raise the question of whether this is just another intellectual property and technology transfer debate, or whether environmentally sound technologies present distinctive challenges.

There are a number of ongoing, high-profile *UN processes* all of which address some issues relevant to science and technology for sustainable development. Examples include the follow-up to UNCSD ("Rio+20"), follow-up to the UN Conference on Least developed Countries, the Post-2015 development agenda, and the implementation of resolution A/C.2/67/L.45.

In view of the above, there is a need for a mechanism for building synergies and ensuring a minimum level of coherence among all relevant processes and institutional arrangements,

Technology goals

One way of supporting coherence is by considered technology goals for inclusion in future development goals, such as the sustainable development goals. The UN Secretary General, in his report A/67/348 outlined a potential direction for technology goals for consideration (table 3).

Table 3: Potential direction for technology goals

Principle	*Potential goal*	*Elaboration on potential targets*
It needs to make sense globally	Global technology performance improvement by a "factor 4"	This goal might be elaborated in the form of eco-efficiency targets for 2030 and 2050, for example: • Increase global resource and energy efficiency by a "factor 4" by 2050. This might mean doubling the level of energy services, while halving primary energy and resource use and overall pollution • Issue-specific technology performance targets for 2030: reduce energy and resource/materials intensity by at least 40 per cent and double the use of wastewater treatment and solid waste management • Issue-specific technology performance targets for 2020: increase water efficiency in agriculture and energy, as well as food supply-chain efficiency, by 20 per cent
Need for equity	Universal access to sustainable technology	This goal might be elaborated in the form of universal access targets in such areas as modern, clean and affordable energy and transport services; clean water, sanitation and wastewater treatment; recycling and solid waste management; and modern information and communications technologies, by 2030
Institutions need to be prepared for the challenge	Global green innovation system for sustainable development	This goal might be elaborated in the form of institutional and inputs targets by 2030, for example: • Global research, development and demonstration cooperation system that is open for participation by entities from all countries • Global intellectual property rights system that promotes technology development, innovation, access and transfer. It would value quality over quantity and support new forms of licensing, voluntary patent pools, and free and open-source collaboration • Combined public and private investment of at least 2 per cent of gross domestic product in research, development and demonstration in all countries, and at least 3 per cent in technologically advanced economies • Publicly funded technology, scientific discoveries and creative works made freely available for sustainable development

Source : UN document A/67/348

Technology facilitation mechanism

In the same report, the Secretary General also states that "there is a need for a technology mechanism that can accelerate technology progress on a global scale and that is commensurate with the sustainable development challenge." The technology facilitation mechanism could suggest overall technology-related sustainable development goals and promote four types of global and regional networks (initially based on existing institutions): networks of science foundations; networks of business incubators; networks of policy, intellectual property and organizations that aim to reduce and share risk; and networks of technology transfer mechanisms and related instruments.

Lessons-learned

Whatever approach Member States might take in improving the enabling environment for STI for sustainable development, the following lessons learned are suggested for consideration. We need to find ways and means to:

(a) Address gaps throughout the full technology cycle, from research to development, demonstration, market formation and diffusion;
(b) Address these gaps in all countries, poor and rich;
(c) Provide special support to the least developed countries, and other poorer, smaller, or especially vulnerable countries, which have been increasingly marginalized despite the development success of other countries;
(d) Promote partnerships to reduce poverty, by enabling the poorest to contribute to knowledge and technology development;
(e) Foster a truly global, cooperative undertaking that engages all interested Governments and major groups, including the private sector;
(f) Be practical and flexible in order to quickly adjust to new challenges and opportunities;
(g) Take national action at the sector and cluster levels, but monitor progress against global, cross-sectoral, technology-related sustainable development goals;
(h) Take action across sectors and countries to address issues related to technology convergence and underpinning technologies;
(i) Greatly improve technology transfer, including between developing countries;
(j) Pragmatically address intellectual property rights constraints for technology transfer, wherever they exist, by exploring innovative voluntary approaches;
(k) Promote voluntary technology assessment through a global network;
(l) Build and greatly expand open international networks of collaboration in research, development and demonstration that allow for the participation of all countries, including the poorest;
(m) Better coordinate capacity-building work by the United Nations through partnerships to achieve truly global reach;
(n) Build partnerships to better coordinate and support the implementation of technology-related international commitments, agreements and conventions.

A. National level
    a. Improved coordination among multiple actors providing technical advice and assistance

B. Regional Level
    a. Regional technology markets

b. South-South cooperation, especially on technology transfer

C. International level

a. Improving measurement of STI, including through WIPO Global Innovation Index

VI. Toward coherent policy and action frameworks: the role of the ECOSOC System

VII. Recommendations

Member States are encouraged to consider the following issues for consideration:

- Promote global cooperation on STI and provide special support to poor and vulnerable countries.
- Further explore options for a support mechanism that can accelerate technology progress on a global scale and that is commensurate with the sustainable development challenge.
- Find ways and means to build and synergies and ensure consistency among international institutions, instruments and commitments on STI for sustainable development.
- Cooperate on building sustainable, green innovation systems.