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Viewpoints

The *Natural Resources Forum — A United Nations Sustainable Development Journal* is running a special series over the 2009–2011 period on themes to be considered by the United Nations Commission on Sustainable Development in its 18th and 19th sessions: sustainable consumption and production, transport, chemicals, waste management and mining. In this issue, experts address the question:

'What would be the three key preconditions for jumpstarting or scaling up the transfer of environmentally sound technologies for climate change to developing countries?'

My own research and global experience working directly with impoverished communities demonstrates that, from the perspective of sustainability, there's little lasting value to transferring any technology to another nation or culture without the following preconditions: 1. Those intended to use the technology must have the capacity to maintain it over time, adapt it to changing local conditions, and, ultimately, manufacture future generations of the technology. This implies that significant investments in capacity-building must be made prior to technology transfer. 2. Those offering the technology as a solution must justify its appropriateness in the local context into which it would become embedded — i.e., the ecological, environmental, socio-cultural, and economic setting. The burden of proof is on the proponents of the technology and sizable resources must be invested in researching how the technology might function in the local context; and 3. Authentic, locally-controlled institutions must be engaged in the process of adopting, maintaining and adapting the technology. There must be evidence of local investment in the technology and a meaningful process of community consultation in which the technology is selected voluntarily from amongst multiple options. If these preconditions are not met, our good intentions are likely to transform into technological imperialism, benefiting few.

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When looking for the key ingredients to effectively deploy clean technologies in developing countries, it is very important to consider the interplay between technological, institutional, economic and social factors; simply transferring cash or the latest inventions from North to South does not yield the desired outcome. By combining several promising developments strategically we can hope to achieve something that these developments are in danger of missing separately: 1. The bottom billion customers and local needs as focus for clean tech developments, with active participation of local stakeholders driving the process; 2. Inclusion of environmental aspects in Base of the Pyramid initiatives; and 3. Free availability of inventions (patents) that are not actively used (see Eco-Patent Commons).

Successful deployment is an interplay of several heavily context-specific factors. High tech inventions without connections to the context may be hopelessly ineffective. Additionally, if local needs and capacities drive the process, the involved stakeholders will be empowered as partners in providing solutions, instead of merely being the recipient of a new form of (structural) development aid. This creates a cooperative basis instead of a largely funding-dominated one. And who knows, 'developed' nations may learn something as well . . .

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In our opinion, the three most important preconditions for jumpstarting or scaling up the transfer of environmentally sound technologies for climate change to developing countries are: 1. Changing the entire mindset from the transfer of technology towards that of knowledge. Technology is just a medium; knowledge on how to use it — and not to use it — is what matters most. The 'hardware' (technology, tools, infrastructure etc.) needs to always be complemented by 'software' (knowledge, institutions etc.), both in terms of mitigation of and adaptation to climate change; 2. Related to the above, understanding that the transfer of technology and knowledge is not a one-way path is critical. Both environmentally sound technologies and, above all, the knowledge on how to use them in the most

appropriate way in specific contexts do exist in developing countries as well. The transfer should therefore be a synonym for active collaboration and joint learning between the two parties, instead of passive transfer from one actor and place to another; and 3. The transfer of technology and knowledge should be economically and socially beneficial to both the delivering and receiving parties. This can be achieved by establishing a global knowledge and technology transfer fund, in line with existing legal instruments on climate change.

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Traditional technology transfer models and sustainable development efforts — whether for developing or developed countries — pay insufficient attention to first creating enabling socio-political and informational conditions. Distilling into three preconditions: 1. *Socio-political*: forging meaningful capacity building partnerships for climate-change mitigation among stakeholders — civil society, government agencies, private sector, aid donors and researchers. Benefits must be tangible and equitable; 2. *Informational*: gathering sufficient information on climate change-relevant social and environmental conditions to establish a baseline against which alternative technologies can be compared (in terms of expected impacts) and to choose a preferred option; and 3. *Strategic*: implementing and monitoring the most sustainable option on a pilot scale. Before any scaling-up or large-scale jumpstarting, a synergistic network of smaller-scale demonstration projects — representative of the diverse social and environmental conditions of the country — should be designed to achieve 1, 2 and 3, monitor performance and learn valuable lessons. 'Jumpstarting' is not 'quick-fix'; the urgency of climate-change mitigation requires a fast-track strategic approach that engages the diversity of social actors, engenders joint ownership, and yields *tangible and complementary benefits* beyond climate change mitigation — like poverty reduction and health — that resonate with those actors and sustains their commitment to positive socio-technical change.

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Developing countries, in general, have not fully appreciated potential applications of environmentally sound technological advances for climate change which are likely to significantly change the development paradigm. An important reason for this non-appreciation is that politicians and policymakers in the developing world have very little, if any, regular contact with professionals from emerging technologies like biotechnology, information and communication technology, and nano-technology where large developments are taking place. Extensive interactions with such professions and effective utilization of information and communication technology tools are crucial.

The right mindset also matters. This second key lies in creating and nurturing a whole new business-as-usual mindset that is able to identify and promote environmentally sound technologies. This requires substantial attention and additional investments to capacity building and forward-looking education and training, and research programmes for technology absorption and adoption. It should be realized that under rapidly changing climatic conditions, tomorrow's development challenges can no longer be identified, let alone addressed, with yesterday's knowledge and the day-before-yesterday's technology.

The third precondition involves the contextualization of technology and long-term community building. It is important to develop environmentally sound technologies depending on local conditions and traditional value systems. Interestingly, much of the research and development into environmentally sound technologies is carried out by multinational companies who target markets in developed countries. Quite obviously, the technologies are not optimized for national resource endowments in developing countries. This must change. There needs to be a global framework — embedded within the social responsibility context — for environmentally sound technology development for developing countries. Moreover, governments and businesses must engage with communities to stir interest and gain social licence to embrace environmentally sound technologies.

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The most important precondition is that these technologies benefit those living in poverty and in vulnerable conditions in developing countries. However, UNFCCC debates on technologies have been dominated by discussions on mitigation technologies that are more economically attractive and profitable.

Most of the developing world needs adaptation technologies to deal with the impacts of climate change that are underway. However, adaptation technologies have been largely marginalized from technology transfer discussions. Technology transfer debates have been dominated by

discussions of the importance of promoting research and development (R&D), with advanced developing countries as the main target (i.e. China and India). Developing countries, especially the Least Developed Countries (LDCs), Small Island Developing States (SIDS) and vulnerable countries in Africa require robust and drastic action all along the technology chain: research and development; demonstration, deployment, diffusion and transfer.

Therefore, the three key preconditions for scaling up the transfer of environmentally sound technologies for climate change to developing countries are: technologies that can provide synergy between mitigation and adaptation; technologies that can be transferred, diffused, scaled up and replicated within and across developing countries and technologies that will not cause or lead to maladaptation in the long-term.

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Developing countries are currently more concerned with the implementation of projects to help them adapt to climate change than with reducing their greenhouse gas emissions. Thus, for technology transfer to be successful, the emphasis should be on understanding and improving the local context more than on perfecting the choice of energy-producing technologies.

Simultaneously, poverty must be acknowledged as a major threat to the environmental integrity of developing countries. The transfer of environmentally sound technologies to tackle climate change impacts must therefore integrate consideration of all dimensions of ecodevelopment: environmental, social, economic, technological, and civic.

Emphasis on ecodevelopment means emphasis on local conditions and needs. Thus, the main actors should be citizens who are equipped with the information and skills necessary to understand, implement and adapt new technologies. This involvement is a delicate process which requires time, education and sustained monitoring. The success of such transfers therefore rests on the preparation and technology design processes, of which there are three key conditions: 1. Accurate understanding of local needs; 2. Collaborative involvement in planning and decision-making; and 3. Collective implementation and sustained monitoring of technology transfer projects.

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Developing countries do not have the luxury or the resources to finance climate change mitigation measures. In many instances, these countries lack the solid administrative and planning capabilities needed for long-term planning or short-term application. More often than not, the initiative lies in the hands of the private sector. Accordingly, the most important precondition for the successful transfer of environmentally friendly technologies is financial viability of the measures taken. If the technology generates income for entrepreneurs or the county, then its adoption will be rather simple. Issues such as GHG storage will not be of interest if no mechanism exists that rewards such action. Improving energy efficiency is always a winning option. The second prerequisite is capacity building through hands-on experiences in which tangible results are obtained. This is in contrast to many so called 'workshops' that focus on lectures and telling people about experiences which they might not be able to duplicate. The third prerequisite, is technology transfer that would enable people to make essential equipment locally without resorting to expensive imports which, in the event of breakdown, they might not be able to fix.

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In the authors' views, policy options to overcome some of the key barriers for jumpstarting environmentally sound technologies for climate change such as Renewable Energy Technologies (RETs) are: 1. Policies that promote focussed R&D for cost reduction, high performance and funding of large-scale demonstration programmes: There is a need to review the existing R&D policies and projects, develop programmes to promote coordinated R&D projects for cost reduction and performance enhancement, and implement large-scale demonstration programmes. Such policies are necessary for several RETs to generate information on the technology's performance and create awareness of feasibility and potential benefits; 2. Policy to promote a participatory approach, encourage private sector participation and a rational energy pricing policy: there is a growing realization of the need to involve individual users and local communities, particularly in rural areas, in planning, implementation and management of RETs. Capacity-building and institutional development programmes among NGOs, rural communities and rural entrepreneurs are required to enable their effective participation in the implementation of RETs; and 3. Periodic assessment and evaluation of technologies policies and programmes: It is crucial to provide information on various aspects of the technologies to policy-makers, manufacturers, entrepreneurs and end-users. In India, lessons have not been drawn from the technologies

disseminated, programmes implemented or policies adopted. There is an urgent need to generate knowledge and disseminate information on the performance of different RET designs in different field situations and the performance and impact of programmes, financial mechanisms, and policies implemented.

These policy initiatives can help to frame appropriate environmental regulations, to develop mechanisms to enforce these regulations, and to access environmental and socio-economic impacts of the technologies.

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Most barriers are not related to the climate change technologies themselves. Instead, the barriers result from international agreements (EU, NAFTA, WTO) or the domestic macroeconomic policy framework. In addition, the enforcement capacity of environmental policies in most (developing) countries is rather weak.

In my opinion, therefore, it is crucial that all strategies to promote the transfer of climate change technologies are robust enough to operate in an imperfect and sometimes even hostile environment. One critical success factor then is that the user needs to have a strong incentive for acquiring the technology. This may be reduced costs, increased output, improved efficiency, more flexibility. A second key element is that the market mechanism is allowed to play a role in the transfer. As such, it is more likely that the user will perceive a potential gain by adopting the new technology. However, the market usually does not assure that the environmental benefits are achieved. Then, thirdly, to assure that climate change is indeed addressed, the technology transfer needs to be accompanied by soft technologies. Here, examples are technology partnership programs, integrating climate-change criteria in policies and contracts, educating decision makers about climate change technologies, and environmental technology assessment.

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Technologies that are environmentally sound may be available but they may not perform equally well everywhere, as their performance and relevance vary across regions and over time. Jump-starting or scaling up of the technologies requires appropriate targeting to geographic and social niches to ensure the technologies have the greatest impacts and meet the needs of potential users. Second, uptake of the technologies is strongly influenced by the policy and institutional context within which they are disseminated to potential users. Policies may send positive or negative economic signals that potential users often react to and which influence their uptake of the technologies.

Third, programmes to scale up environmentally sound technologies should be designed to respond to climate change from the perspective of sustainable development, especially in food deficient and low income nations where the poverty level is high.

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Firstly, a comprehensive and objective regulatory framework is critical to the transfer of environmentally sound technology. Such a framework should encompass political and institutional conditions that facilitate the actual transfer process taking place. In the context of climate change, strong environmental regulation and enforcement will also lead to organizations acquiring new technologies. Secondly, transferring EST to developing nations cannot produce the desired result without capacity building. Where there is inadequate institutional and technical capacity and capability, successful transfer of technologies to either adapt to or mitigate climate variability and change becomes seriously compromised. Therefore, transferring EST involves building capacities through existing and new institutions. Lastly, in most developing countries, inadequate financial resources to acquire new technologies are often major barriers to EST transfer. Therefore, absorption and diffusion of EST in a developing context will require a combination of these identified preconditions.

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