
INTRODUCTION

OBJECTIVE

Technology Without Borders presents case studies of successful transfer of climate-friendly technology and practices. It explores the causes for success and draws the lessons learned. Key messages are presented for the fight against climate destabilisation. The terms “climate-friendly technology” and “climate technology” used here refer to technologies, practices or techniques, which reduce greenhouse-gas emissions or assist countries in adapting to climate change.¹

WHAT IS TECHNOLOGY TRANSFER?

Technology transfer sounds simple. In reality, it is a highly complex process, influenced by domestic and international factors. Many players are involved, for example, in bringing solar panels to an African village or protecting the coast of an island in the South Pacific.

Technology transfer is *not* simply about the supply and shipment of hardware across international borders. It is about the complex process of sharing knowledge and adapting technology to meet local conditions. It strengthens human and technological capacity in developing countries. It promotes commercial markets for climate-friendly technology.

WHY IS CLIMATE-FRIENDLY TECHNOLOGY TRANSFER IMPORTANT?

Scientific evidence that greenhouse gases (GHGs) contribute to global climate change grows stronger year by year. Governments, as well as private firms, are beginning to take action to curb emissions. After more than two centuries of economic growth fuelled by the burning of fossil fuels the

¹ The United Nations Framework Convention on Climate Change refers to “environmentally-sound technologies and know-how”.

prospect of decarbonising Western economies is daunting indeed. The industrialised countries have expensive infrastructure based on fossil fuels and little experience with alternative technologies. Energy technologies are long-lived capital stock.

Developing countries and the economies in transition emit less GHGs per capita than do the industrialised countries. Based on current trends, however, emissions from these countries will soon be greater than those from the industrialised countries. By 2020, the International Energy Agency estimates, 60% of GHG emissions will come from the economies in transition and developing countries, up from 49% today.²

Developing countries need to “leapfrog” a technological generation or two if concentrations of GHGs are to be stabilised. Economic and social development inevitably leads to increased demand for energy services. In most industrialised countries these demands were met initially by coal and water power, then by oil, natural gas electric and nuclear power. We are now seeing the emergence of renewable-energy technologies. Developing countries’ infrastructure and economies are not as dependent on fossil fuels as the industrialised countries are. They can, therefore, avoid the fossil-fuel trap and move directly to environmentally-sound technologies.

Few countries will choose a more expensive technology if its only benefit is avoiding the potential adverse effects of climate change. Yet climate-friendly technology can provide associated benefits, such as reduced air and water pollution. But, an available clean technology is often passed over because of factors such as poor access to information or a lack of financing. Technical assistance programmes can help overcome these barriers.

TECHNOLOGY, ECONOMIES AND GREENHOUSE GASES

Technology is a critical factor in determining the real costs of economic and social development and environmental effects. A recent IPCC report explores future energy and environment scenarios and concludes that technology is at least as important in reducing emissions as demographic

2 International Energy Agency, 2000. *World Energy Outlook 2000 Edition*. Paris (France): IEA/OECD.

change and economic development.³ An IPCC report concludes that, regardless of other factors, the atmospheric concentration of GHGs can be stabilised at an appropriate level *only* with a significant shift in the patterns of technological development and diffusion.⁴

All nations should factor the development and diffusion of environmentally-sound technology into their investments in energy infrastructure.

TECHNOLOGY TRANSFER IN INTERNATIONAL AGREEMENTS

Reducing GHG emissions and providing aid to countries that are vulnerable to the effects of climate change are global environment and development priorities. The 1992 United Nations Framework Convention on Climate Change (UNFCCC) provides a way for countries to address climate change issues. The central goal of the UNFCCC is to achieve “stabilisation of greenhouse gas concentrations in the atmosphere at such a level that would prevent dangerous interference with the climate system. Such a level should be achieved in a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner”.⁵

Conscious of the critical role of environmentally-sound technology in the development process, signatories to several international agreements have made specific commitments to support technology transfer. The UNFCCC and Agenda 21, a United Nations action plan for sustainable development, contain such provisions. Article 4.5 of the UNFCCC states that industrialised countries should “take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally-sound technologies and know-how to other Parties, particularly developing country Parties...”.⁶

Ratification of the UNFCCC obliges industrialised countries to assist developing countries to mitigate and adapt to the effects of climate change.

3 IPCC, 2000b. “Emissions Scenarios”, *A Special Report of Intergovernmental Panel on Climate Change Working Group III*. Cambridge (UK): Cambridge University Press.

4 IPCC, 2000a. “Methodological and Technological Issues in Technology Transfer”.

5 UNFCCC Article 2.

6 Other relevant UNFCCC Articles include 4.1, 4.3, 4.4 and 4.7.

But the commitments of Annex I countries to assist developing countries under the UNFCCC are sadly lacking in specifics.⁷ Chapter 34 of the UN's Agenda 21 provides some guidance on how participants can co-operate to accelerate technology transfer. Neither agreement provides a readily comprehensible strategy for action.

A key point in international climate-change negotiations has been how to distinguish between technology transfer efforts undertaken specifically to address UNFCCC commitments and technology transfer that would have taken place anyway.

In recent years, the World Bank and the Global Environment Facility (GEF) have started to include climate-relevant technology-transfer in their portfolios.⁸ But, energy projects financed by the World Bank and its private-sector lending arm, the International Finance Corporation (IFC), still go primarily for carbon-intensive power projects and large-scale hydropower projects.

The Kyoto Protocol

The Kyoto Protocol, an international agreement within the UNFCCC framework, was adopted in 1997. It will enter into force when ratified by 55 countries which together produce at least 55% of the total emissions from Annex I Parties. The Protocol requires Annex I countries to reduce their GHG emissions by an average of 5.1% from 1990 levels. It also requires Annex I countries to undertake climate-friendly technology transfer.

The international community's thinking on technology transfer is evolving. The Kyoto Protocol emphasises *co-operation* between industrialised and developing countries. It formally recognises the role of the private sector and the need for an "enabling environment" to promote investment.

Two specific mechanisms in the Kyoto Protocol could further accelerate the development and transfer of climate-friendly technologies. Projects under the Clean Development Mechanism (CDM) and Joint Implementation could advance technology transfer, but their effect will depend on still unsettled details. Under the CDM, investors in climate-friendly projects in

⁷ Annex I of this book Lists Annex I countries.

⁸ Information on the GEF climate change portfolio is contained in Martinot, E. and O. McDoom, 1999. *Promoting Energy Efficiency and Renewable Energy: GEF Climate Change Projects and Impacts*. Washington, D.C. (US): Global Environment Facility.

developing countries may be eligible for emission-reduction credits. Ratification of the Kyoto Protocol would stimulate markets for commercially viable clean technology.

WHO AND WHERE ARE THE PLAYERS IN TECHNOLOGY TRANSFER?

The participants in technology transfer include those involved in the direct transactions – private firms, state-owned companies and individual consumers. But others play important roles “behind the scenes” – financiers, aid agencies, national governments, international institutions and local community groups. Technology transfer works best when all stakeholders communicate and actively participate.

Local and regional governments are often well positioned to promote environmentally-sound technological development and diffusion through leading by example. Local governments can identify, and respond to local needs. It is difficult, however, to co-ordinate many decentralised government units. National governments can play a critical role in co-ordinating and setting policy, and providing legal and regulatory framework to encourage environmentally-sound technologies.

The private sector is responsible for most of the innovation, development and diffusion of technology. It also provides most of the capital through direct investment, commercial lending and equity investment. In some countries and in certain sectors, however, official development assistance forms the bulk of foreign capital flows.

Various barriers hinder or even prevent technology transfer altogether. International initiatives, such as the International Energy Agency’s GREENTIE and Centre for the Analysis and Dissemination of Demonstrated Energy Technologies (CADDET) and the United Nation Environment Programme’s OzonAction Clearinghouse, seek to overcome one very significant barrier: the lack of adequate information.⁹ Such initiatives co-ordinate information flow and research and development (R&D) by forming collaborative stakeholder networks.

9 [Http://www.unepic.org/ozonaction.html](http://www.unepic.org/ozonaction.html), <http://www.greentie.org> and <http://www.caddet.org>.

International efforts to promote environmentally-sound technologies focus on co-ordinating markets rather than driving them. This requires guiding the private sector and other interested parties, such as non-governmental organisations and universities. When policy-makers “pick favourites” by strongly supporting a specific technology, the result can be that an unviable technology is maintained at public expense while innovative technologies are held back. Providing opportunities for many new technologies allows the best of them to shine through.

GEOGRAPHIC COVERAGE

The scope for climate-technology diffusion is global; the applications are local. Case studies presented in this book are selected from four regions with economies that are developing or in transition: Latin American and the Caribbean, Africa, Asia/Pacific and Central and Eastern Europe.