



International Chamber of Commerce
The world business organization

Technology Development and Deployment to address Climate Change

for the UNFCCC 14th Conference of the Parties (COP)
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Prepared by the Commission on Environment and Energy
and the Commission on Intellectual Property

- Technology Development and
Deployment to address Climate Change
- Enabling Environments for Technology
Development and Deployment
- UNFCCC Perspective

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Abbreviations	
UNFCCC	United Nations Framework Convention on Climate Change
CDM	Clean Development Mechanism
EGTT	Expert Group on Technology Transfer
IPR	Intellectual property rights
TRIPS	Trade-related aspects of Intellectual Property Rights

Key Messages

The development and deployment of technologies to address climate change will be greatly facilitated if several key factors and fundamental conditions are met:

- a stable economic system including intellectual property rights protection, strong contractual arrangements and open trade;
- a long-term commitment and dedication of resources by all partners;
- performance criteria for acceptable technology, but no banning of technologies based on current performance;
- reduction and elimination of barriers to trade in environmental goods and services;
- cost-effective solutions and supporting mechanisms should be defined for advanced infrastructure development including broadband information and communications technologies;
- support to address investment risks related to technology development;
- enabling frameworks to advance capacity-building;
- recognition and support by the UNFCCC of many avenues for technological innovation and dissemination;
- the Clean Development Mechanisms (CDM) should be simplified and more accessible as well as keep all technology options open;

Introduction

Business is rising to meet the climate change challenge

Companies all around the world are acting to address the risks of climate change, a challenge inextricably linked with urgent needs for more energy, increased development and greater economic growth. Many businesses have already made major changes in how they operate and have seized the opportunities for progress, entering new markets and introducing new processes, products and services that reduce greenhouse gas (GhG) emissions.

Technology development and uptake are crucial

With an expected rise in global population from 6.5 to 8 billion, a 50% increase in energy demand and a doubling of economic output in the next 25 years, it is critically important to marshal the necessary technological resources to address sustainability challenges and increase the pace of technological innovation, cooperation and dissemination.

Economically feasible solutions necessary for climate change adaptation and mitigation

The International Chamber of Commerce (ICC) believes that the availability of economically feasible options to address the challenge of climate change will depend on the development, commercialization and widespread dissemination of both effective existing technologies and new, currently non-commercial technologies that can help reduce greenhouse gas (GHG) emissions into the atmosphere. Moreover, innovation will substantially improve the future performance of current and proposed technologies. The global economy today functions in the context of the market economy and, as highlighted in a recent report of the UNFCCC Secretariat¹, the private sector has been and will continue to be, responsible for the vast majority of investments and the development and diffusion of the new and improved technologies that will be essential to meeting the challenge of global climate change. The ability to amortize these investments and assure a return to those who supply the necessary capital is secured by patent protection of the inventions that will result from the private sector research and development effort.

Business has been primary source of innovation – often through cooperative actions

Business is the primary source of innovation and, provided with the right environment, is a critical actor in the development, demonstration, commercialization and dissemination of technology. Business does not do this in isolation and often forms partnerships with governments, academic and other non profit research organizations to leverage resources and benefits. However, government and academic contributions to innovation frequently are in the area of basic research and demonstration and require large investments of private capital to make the fruits of this research available to the marketplace. The most efficient means of rapidly moving government and academic research to market is the transfer of patent or the licensing of patents and related know how to the private sector thereby creating an incentive for the private partner to invest the necessary capital in the joint enterprise. In particular, the success of several public-private partnerships in North America, Europe and the Asia-Pacific regions highlight the importance of building on successful models already in practice. Governments should increase funding for basic research and ensure that policies facilitate innovation and dissemination of technology. They should also encourage more public-private partnerships, particularly at the local and city level, to address the critical challenge of climate change.

¹ UNFCCC (2007). Investment and financial flows to address Climate Change.

Enabling Environments for Technology Development and Deployment

Technology development and deployment is a multi-phase process

Global development and deployment of advanced technologies to address climate change will require appropriate institutional frameworks, intellectual property rights protection, market-based licensing of those rights, innovative funding mechanisms - such as the G8 Clean Technology Fund to accelerate promising technologies - and the removal of trade and investment barriers. Technology needs and capabilities will be different in the contexts of mitigation and adaptation to climate change. The successful deployment of technologies in either case cannot happen in a vacuum and will depend on the existence or strengthening of various factors, including enabling framework conditions, local conditions and the engagement of local business communities and public authorities, technology choices, infrastructure, and capacity building measures (see Graphic 1 and 2).

Different stages of technology development

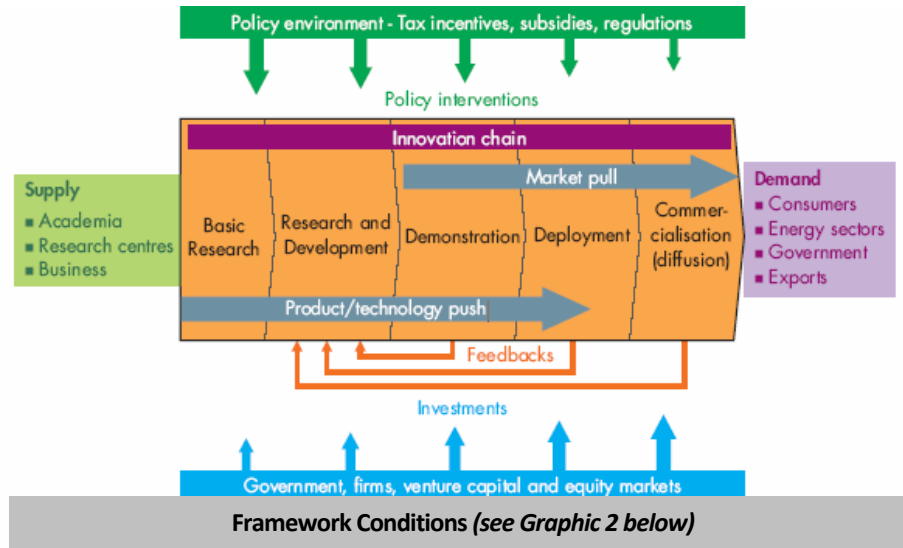
The barriers and challenges to, and instruments for, technology development and deployment are very different when talking about technologies in the Research and Development (R&D) phase or technologies that are new or mature. There is a particularly active role for the public sector at the beginning of the technology chain (e.g. in driving innovation), but as technologies move closer to commercial adoption, the role of the private sector grows accordingly.

Need for appropriate frameworks to encourage business to undertake research and development

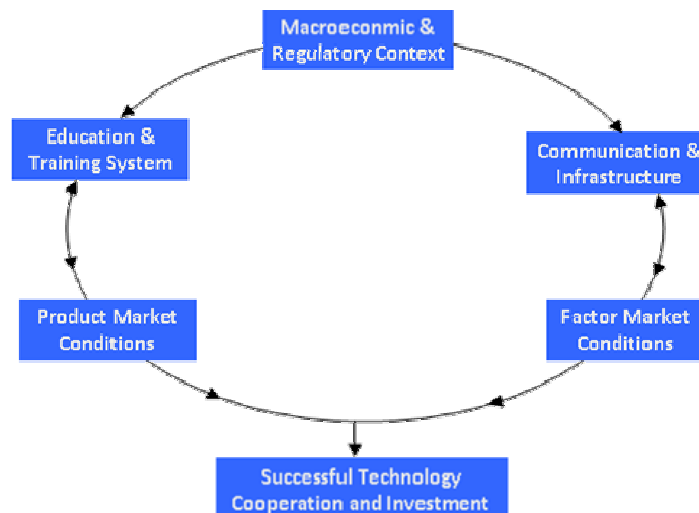
Government policies should encourage business to undertake the research and development required to create innovative technologies that will succeed in global markets, particularly in developing countries. Government policies should increase their funding of R&D and incentivize private research targeted at green information, communications technology (ICT) development and deployment. Governments should also establish a policy framework for an active contribution by ICT to energy efficiency.

Graphic 1: The research, development, demonstration, deployment and commercialisation cycle²

The transition between the research, development, demonstration, deployment and commercialisation phases are not automatic and not necessarily linear with many technologies failing at each phase. To induce private sector investment in innovation in the field of technology, governments need to create a framework that will value the public benefits that are achieved or to directly support R&D investment and activities to help move innovations to a point where they are commercial¹.



Graphic 2: Framework conditions influencing successful technology development and deployment³



ICC suggests that the following fundamental issues should be taken into account when considering what constitutes an environment conducive to the development and deployment of climate friendly technologies.

² Adapted from IEA (2008). Energy Technology Perspective, Scenarios & Strategies to 2050

³ Adapted from OECD (1998). Trends in OECD Countries' International Competitiveness. The Influence of Emerging Market Economies

■ Macro-economic and Regulatory Context – *The Use of the Marketplace*

Governments should keep all technology options open

Establishment of lists of favoured or prescribed technologies would only hinder effective long-term use of the most appropriate technologies in the countries where they are to be used. Decisions to prohibit certain technologies or substances may lead to a potential loss in emissions reductions due to a sharp decline in investment to optimize that technology and could result in a significant increase in mitigation costs. Innovation may over time overcome the near-term identified barriers to the use of certain technologies. Consequently, it is important for governments to specify performance criteria for acceptable technology rather than to ban or restrict technologies based on current performance. Decisions about appropriate technology should be part of the process by which projects are approved by host countries. Governments should utilize energy efficient technologies themselves and encourage the adoption of innovative technology solutions that will enable end users to make good energy, carbon-saving choices and businesses to facilitate carbon accounting.

Commercial transactions play a major role for technology dissemination

Technology dissemination usually takes place in the context of commercial transactions between private or public bodies. Most companies engage in bi-lateral, company to company commercial arrangements as well as company to consumer relations. Companies enter such transactions based on many factors, the “right” partner, an “attractive” market, access to raw materials, transparent, stable and equitable legal and financial structures, safe and secure working conditions and a good local workforce. In these situations, companies are encouraged to make a long-term commitment and to integrate with local culture and values. Governments have to be aware of this commercial context when trying to determine policies to enable technology development and deployment in the climate change context.

Voluntary market-based approaches offer favourable cost-effective and flexible conditions

A wide range of voluntary approaches, initiatives, and agreements involving business provide custom-tailored long-term responses, offering early and cost-effective action and allowing for great flexibility to suit the different conditions and circumstances in various countries and industries. A broad diversity and range of voluntary actions have helped to promote technological progress, many of which include setting goals, taking measures to achieve them, and monitoring and communicating their progress and achievements. This is an iterative process that promotes learning, development of best practices and modification of goals to promote continued improvement.

Box 1: Key contributions and considerations for technology cooperation and capacity building

Enabling frameworks should also be created and maintained within the business community and by individual companies. Technology cooperation and capacity building (human and institutional) should be seen as 'value-adding' to the core business. Key contributions and considerations from business include:

- Respecting the needs of countries and communities in which the technologies will be used
- Providing education, training facilities and programs⁴
- Protecting the environment
- Building relations with stakeholders
- Realising mutual benefits

Intellectual Property Rights (IPR) are essential for technological innovation and deployment

Intellectual property rights, particularly patents, provide the primary means for assuring necessary private sector investment in the invention, development and deployment of the technologies needed to reduce emissions. When governments consider potential mechanisms to foster transfer of technology in the UNFCCC context, they should not resort to solutions that might jeopardise the essential role of patents by creating additional burdens on intellectual property owners. In particular, the restrictions on the use of mechanisms such as compulsory licensing contained in the TRIPS Agreement, should be respected when technologies are transferred from one national market to another. Any limitations on free market licensing of technology should be limited to extremely rare short-term situations involving true national emergencies in which there is no alternative. Compulsory licensing should never be used to obtain commercial advantage for the country receiving the technology. To do otherwise would jeopardize all transfer of technology across national boundaries and prevent the transnational cooperation essential to addressing environmental issues that transcend national borders.

Evidence of the correlation between IPRs and the purpose of foreign direct investment (FDI) projects has been evident in Eastern Europe and the former Soviet Union where, according to the World Bank *"an increase in IPR protection shifts foreign investors' preference away from projects focusing solely on distribution and towards setting up manufacturing activities⁵".* The results (...) *"suggest that weak IPRs have a negative effect on the likelihood of investments being made. In addition, the enforcement of IPRs affects the type of investments made: companies tend to avoid investing in local production if IPRs are weak and concentrate instead on distribution facilities. (...) These results are consistent with the notion that intellectual property protection stimulates formal technology transfer".⁶*

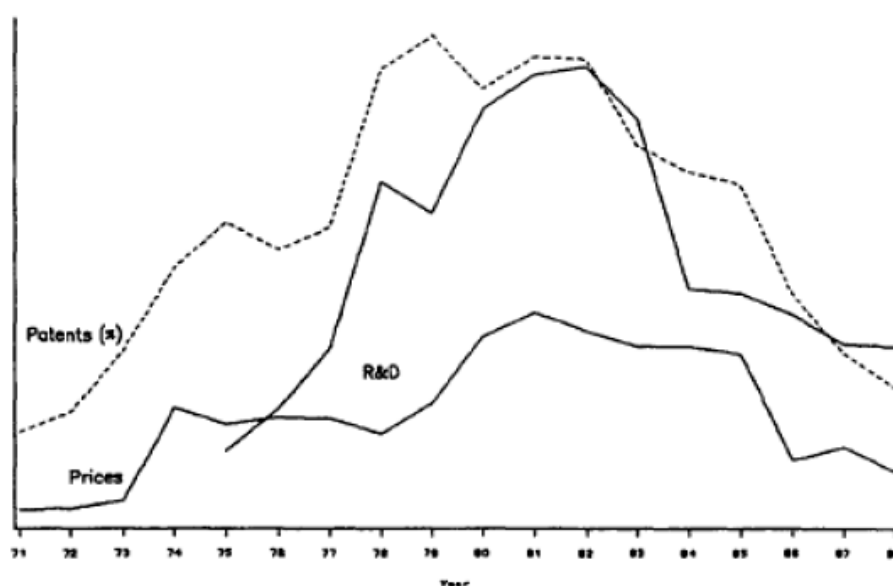
⁴ The sustainability and scalability of such activities are among the considerations.

⁵ The World Bank (2003). "Foreign Direct Investment, Technology Transfer and Protection of Intellectual Property Rights". Presentation from Javorcik, B. WIPO-WTO Joint Workshop on Intellectual Property Rights and Transfer of Technology.

⁶ The International Bank for Reconstruction and Development / The World Bank (2005). "Intellectual Property and Development, Lessons from Recent Economic Research", New York : The World Bank and Oxford University Press. p. 13 and 8

Graphic 3: Correlation between patents and R&D in alternative energy in the United States

“Cohen et al. (2000) emphasize that there is a mutual causation between R&D and patents, and that patenting tends to stimulate R&D, in line with one of the objectives of patent legislation. Lanjouw and Mody (1996), for example, found a strong positive correlation between patents and R&D in alternative energy for the US⁷.”



“Alternative energy. Patents, energy prices, R&D. Note: patents (%) is alternative energy patents / total U.S. patents. Source: R&D funding. Chemical and Engineering News”.

Source graphic: Lanjouw and Mody (1996⁸)

Box 2: Role of Intellectual Property Rights to encourage technology development and deployment

Intellectual Property Rights serve a number of important roles, including:

- **Providing incentives for business** to invest in risky (research) projects aimed at meeting market needs. IPR provide the incentive for companies to invest in the development of low-carbon technologies, particularly patents. Businesses will invest if they have reasonable certainty that they will benefit from their success. This certainty is provided by the ability to protect revenue through IPR.
- **Giving legal clarity and certainty** for technology transfer transactions to take place. IPRs are necessary to identify what technology to transfer. IPRs provide the framework around which legal agreements for technology transfer can be structured.
- **Enhancing, in the case of early patents, research and development** as well as encouraging technology diffusion - patents require the publication of technology, a valuable tool for research and development.

⁷ Kemp, R and Pearson P. (2008). "Final report MEI project about measuring ecoinnovation", Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006). UM-MERIT, Maastricht.

⁸ Lanjouw, J.O., and A. Mody (1996). "Innovation and the International Diffusion of Environmentally Responsive Technology" Research Policy 25: 549-71.

■ Factor Market Conditions – *Partnerships, Open Trade and Incentives for Technology Innovation and Deployment*

Business is the main source for technology development and deployment

Business has been, and will continue to be, the main source of innovation, development, commercialization, and wide spread dissemination of technologies. Companies bear the costs of developing such technologies and need to realize a return on their investments for them to be sustainable. Research and development of new technologies require significant investment in both hardware and scientific expertise. Most ideas regarding technology leads fail to become commercial products/services/applications, and for every successful innovation, many good ideas fall by the wayside – some require substantial funding before this happens.

Business needs support to address investment risks related to technology development

Technological innovation is inherently risky, yet it will be increasingly essential to deploy and develop innovative solutions necessary to mitigate and adapt to climate change. Business must be encouraged to take these risks. Policies that fulfil the expectations of both the providers and the users of such solutions must be identified and implemented.

Public-private sector cooperation can stimulate investment and fill gaps

Public-private sector partnerships predicated on sharing of good practice and technologies, and stimulating investments in developing countries, should be pursued. The challenge is to encourage more such transactions in global markets of technologies and processes that can contribute to the objectives of the UNFCCC. UN agencies and intergovernmental organizations can hereby facilitate the partnership between the private sector and governments by filling the gaps through:

- Building capacity
- Supporting infrastructure investments
- Raising awareness
- Funding

Box 3: Asia-Pacific Partnership on Clean Development and Climate

Inaugurated in January 2006, the Asia-Pacific Partnership between Australia, Canada, China, India, Japan, Republic of Korea, and the United States aims to accelerate the development and deployment of clean energy technologies related to climate change, energy security and air pollution. Eight public-private task sector forces have been approved by the partners: 1) aluminium, 2) buildings and appliances, 3) cement, 4) cleaner use of fossil energy 5) coal mining, 6) power generation and transmission, 7) renewable energy and distributed generation, and 8) steel⁹.

⁹ Asia-Pacific Partnership. <http://www.asiapacificpartnership.org/>

Open trade and the economic growth provide the conditions in which technology development and deployment is best achieved

Trade liberalization is a key factor in the diffusion and deployment of climate friendly technologies particularly to developing countries. Indeed, international trade and the economic growth it creates will continue to foster the development of clean technologies and their deployment and dissemination worldwide. Effective policies to combat the challenges of climate change will be helped by the positive development of the multilateral trading system. Trade and investment are important means for business to promote capacity building and technology development and deployment, especially through foreign direct investment. In that regard, businesses will site investments according to acceptable requirements for investment security and with the potential for a competitive return. One very tangible measure to improve the synergy between trade and climate policy is the reduction and elimination of barriers to trade in environmental goods and services, so that more climate-friendly technological solutions will be more widely accessible and affordable. Although the World Trade Organization is the appropriate forum for these discussions, it is an example of how the UNFCCC discussions can catalyze action in other areas.

■ Product Market Conditions - *the Choice of Technology*

All technologies are important as no one-size-fits-all solution exists

A wide range of technologies will be needed, with the choice of which technology being dependent on local circumstances. There is no “one size fits all” solution. No single technology appears to have the potential to provide the majority of emissions reductions necessary to stabilize atmospheric concentrations of greenhouse gases. Many technologies can make a difference now, and in many cases, are available now given the right conditions. For the long-term, innovative technologies will have to be developed and brought to market.

Assessment is needed to set priorities

Many options have been identified for improving greenhouse gas emissions reduction technologies. Properly conducted technology assessments are useful in deciding which technologies are most appropriate for given circumstances, which options are likely to have the highest probability of success, and what research might improve future cost and performance.

Box 4: Example of carbon mitigation technology

Carbon dioxide capture and geological storage (CCS) is a technology with a very great potential to contribute to emissions reduction from large point sources of CO₂ emissions, especially from coal-fired power plants. For instance, the IEA estimates that the use of CCS would account for 20% of the global GHG emissions reduction effort to 2050 in an active mitigation scenario relative to their Baseline Scenario where no further action to reduce emissions is assumed and that “CCS for power generation and industry is the most important single new technology for CO₂ savings¹⁰”. Other studies of stabilization find that CCS begins to make an important contribution to mitigation in the period around 2030, with large-scale deployment in the latter half of the century. Many countries are dependent on fossil fuels to meet their energy needs and are committed to their continued use.

Box 5: Example of climate change adaptation technology

In many cases, adaptation technologies already exist. To disseminate these technologies more widely, appropriate mechanisms must be put in place to build the necessary capacity. For example to :

accommodate the changing climate by storing water in dams so it can be available during drought periods, and
improve seed varieties with traits, such a better tolerance of stress, salinity, drought, and temperature extremes that will be important for adaptation to climate change.

■ Infrastructure - Long-term Investment

International coordination and conditions needed to address long-term investment risks

Investment decisions for long-lived facilities and infrastructure typically involve considerations extending for decades. Consequently, these decisions may be affected by the details of an international arrangement. These can include operative period, emissions obligations, participating parties, covered gases, global warming potentials, flexibility mechanisms, and procedures for compliance and non-compliance. These details need to be worked out and defined transparently so that investment risk can be assessed.

¹⁰ IEA (2008). “Energy Technology Perspectives” p. 41

Infrastructure needs to be in place for successful technology deployment

Technology deployment may not be useful or even possible without human resources and physical infrastructure like access to electricity, CO2 pipelines, roads, buildings or “old” as well as “new” communication technologies to develop, implement, manage, monitor and maintain technologies. Infrastructure development often presents challenges for countries due to high cost and long-term planning cycles. However, to allow technology development and deployment to address climate change, cost-effective solutions and supporting mechanisms should be defined by governments for infrastructure development and infrastructure. Centres of excellence that brings researchers and engineers from different countries together to enhance research and innovation could offer one possible solution.

■ Education & Training - *Capacity-Building for Technology Deployment*

Human and physical resources necessary to assure technology deployment

Technology cooperation is inextricably linked to capacity building. Technologies are in and of themselves not sufficient, and issues of infrastructure, national circumstances, training and maintenance have to be factored into the formulation of policies. For the benefits to be realized in a country, necessary human and physical resources must be available to utilize the technology.

Box 6: Recommendation to advance capacity building

To advance capacity building, governments should:

- Unleash technology innovation and nurture knowledge-based development.
- Create incentives and market premiums for technologies and business processes that meet the climate change challenge
- Enhance communications infrastructure and tools, such as Internet services especially broadband, to facilitate access to and transfer of information
- Nurture knowledge to industry associations and professional associations to support the private sector in developing tools to address climate change
- Build scientific, technological, and management capacities in developing countries to enable people, governments, and enterprises to directly assess and assimilate the challenges posed by climate change and initiate effective actions
- Ensure that adequately trained persons are available to work technologies obtained

UNFCCC Perspective: Technology Development and Deployment

ICC encourages the UNFCCC to enhance technological development and deployment through an extension of existing and new market mechanisms

Technology transfer is underlined in the United Nations Framework Convention on Climate Change in Article 4.5¹¹ and has been managed by the Expert Group on Technology Transfer (EGTT) which has carried out considerable work including the development of technology needs assessments. It is also a fundamental part of the Bali Roadmap. We encourage the UNFCCC to recognize and support the many avenues for technological innovation and dissemination that contribute, whether specifically under the Convention, through partnerships, or in commercial transactions. Traditional technology development and implementation needs to be enhanced and broadened to help support the implementation of climate policies and objectives under the UNFCCC and Kyoto Protocol through tools such as the Clean Development Mechanism.

Box 7: Recommendations on the evolution of the Clean Development Mechanism

Countries that participate in the Kyoto Protocol have recognized that the Clean Development Mechanism (CDM) has not lived up to expectations in bringing investment and technology to developing countries and support their efforts to pursue cleaner energy pathways. CDM and other Kyoto mechanisms will need to evolve to contribute to the necessary actions in developed and developing countries. Its procedures should be simplified and rendered more accessible.

- a) The CDM should continue to recognize national circumstances and priorities as especially important, while fostering maximum cooperation, for instance, through sectoral approaches that promote clean development while addressing host country local needs and priorities.
- b) The CDM should keep all energy and technology options open, and allow the host country to render definitive decisions on the projects that are to be sited in their jurisdictions, avoiding positive or negative technology lists.

¹¹ *“The developed country Parties and other developed Parties included in Annex II shall 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, to enable them to implement the provisions of the Convention. In this process, the developed country Parties shall support the development and enhancement of endogenous capacities and technologies of developing country Parties. Other Parties and organizations in a position to do so may also assist in facilitating the transfer of such technologies. »*

The International Chamber of Commerce (ICC)

The International Chamber of Commerce is the largest, most representative business organization in the world. Its thousands of member companies in over 130 countries have interests spanning every sector of private enterprise. A world network of national committees keeps the ICC International Secretariat in Paris informed about national and regional business priorities. More than 2000 experts drawn from ICC's member companies feed their knowledge and experience into crafting the ICC stance on specific business issues. The United Nations, the World Trade Organization, and many other intergovernmental bodies, both international and regional, are kept in touch with the views of international business through ICC.



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