Paper No. 2:

A Flexible Framework for Meaningful and Effective Actions to Enhance the Implementation of Article 4.5 of the UNFCCC

Editor's note: Please note that the views expressed in this paper are those of the author and do not necessarily reflect the position of the UNFCCC secretariat.

Contact information:

Mr Sergio C Trindade
Email: strindade@email.msn.com

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LIST OF ACRONYMS

AMOCO	American Oil Corporation, now merged into British Petroleum
ANNEX I	Practically speaking the industrialized and Eastern European economies
ANNEX II	OECD countries less Republic of Korea and Mexico
BBL	Barrel
BELC	Business Environmental Leadership Council of the Pew Center on Global Climate Change
BOE	Barrel of oil equivalent
CARICOM	Caribbean Community
COP	Conference of the Parties to the UNFCCC
CPACC	Caribbean Planning for Adaptation to Global Climate Change
CTM	Climate Technology Mission (s)
EPA	Environmental Protection Agency, United States
EST(s)	Environmentally Sound (er) Technologies
FARN	Fundación Ambiente y Recursos Naturales, Argentina
FCCC	Framework Convention on Climate Change
IPCC	Inter-Governmental Panel on Climate Change
LAC	Latin America and the Caribbean
MCT	Ministério de Ciência e Tecnologia, Brazil
NON-ANNEX I	Practically speaking the developing countries
NREL	New and Renewable Energy Laboratory, USDOE
OAS	Organization of American States
OECD	Organization of Economic Cooperation and Development
R, D & D	Research, Development and Demonstration
SBTSA	Subsidiary Body for Scientific and Technological Advice
TCAPP	Technology Cooperation Agreement Pilot Project
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCTAD	United Nations Conference on Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNECOSOC	United Nations Economic and Social Council
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USDOE	United States Department of Energy

EXECUTIVE SUMMARY

Ultimately, the core issue that concerns the nations of the world most is the sustainable development of their peoples. In this connection, climate change may not be an immediate preoccupation to many developing countries in Latin America and the Caribbean (LAC). Some are still struggling to construct a broad-based set of sustainable development priorities supported by the consensus of their relevant stakeholders. Some are trying to develop a climate change policy that reflects their broader sustainable development policies and priorities. If wills could be mobilized, a stakeholders-based climate change policy would generate portfolios of prioritized climate initiatives (policies, legislation, regulation, plans, programs, projects), requiring mitigation and adaptation technologies and an enabling environment to get them implemented in a given LAC country (See Fig, 1). These prioritized climate initiatives and the sets of technologies needed to implement them can be structured into veritable **CLIMATE TECHNOLOGY MISSIONS (CTM).** Such CTM could cover many markets such as energy, including new and renewable energy sources; transportation; industry; waste management; agriculture; forestry; land-use change; coastal adaptation; etc.; and the required training, education and dissemination activities, etc. These CTM would operate in the environment defined by the existing Technological Innovation System, and if necessary, modify it.

Once LAC countries, or sub-regions within LAC, develop their portfolio of CTM they would be in a much better position to engage developed countries or groups of developed countries (including their private sector and bilateral cooperation organizations) and multilateral agencies, in technology transfer and diffusion initiatives. On the other hand, by and large, developed countries may have already achieved, formally or informally, a measure of CTM of their own. This proposed broad and Flexible Framework for climate technology transfer and diffusion (see Fig.2) will acquire concrete contours in the LAC Region once it is applied in practice, generating as many specific frameworks as needed by the LAC countries/sub-regions involved. For instance, the response of the Flexible Framework to the needs of large countries of the Region might be rather different than that of the small countries, as they address diverse CTM demands, and, in addition, in the case of the large countries, different regions within these countries. A Stakeholders' Function, in a variety of forms, instigated by government, should be part of any framework, providing policy guidance and coordination within government and civil society. An Executive Function is necessary to make any framework work. It may be located in government, as a Climate Change Entity of a Ministry, or as a separate government organization established specifically for this purpose, or it may be outsourced to the private sector, or derive from a mixed approach. Both these functions would rely on an Information (awareness and dissemination) Function based on currently available and powerful information technologies, as well as on independent sources of data and references on Norms, Technologies and Standards to keep the CTM abreast of the latest developments.

But, what would really make the framework operational in practice is a number of Partnerships between the public and private sectors, national and international, engaging

intermediation and implementation agents, such as government, business, banks, NGOs, international cooperation agencies, university, research centers, etc. These stakeholders gathered in public and private Partnerships would adopt various business models to implement the CTM interacting with governments at all levels and operating under the constraints and opportunities offered by the Technological Innovation System of the LAC country concerned. This generalized framework, or parts of it, can be found presently, one way or the other, in many countries. Thus, the key to promote climate technology transfer from developed countries, or groups of countries, to LAC countries or sub-regions, is to bring together the intermediation and implementation agents on both sides of the Flexible Framework to stimulate focused, long-term Partnerships addressing specific CTM. This concept relies on the interaction of two frameworks and the reduction of transaction costs: a LAC country/region framework and a framework for a developed country or group of countries (e.g. the European Union). Of course, there could be climate-related technology transfer between two developing countries. Also, the direction of transfer does not need to be always from developed to developing countries. At any rate, for technology transfer to actually occur, the Partnerships on both sides must actively seek to interact to implement the CTM of the LAC countries. UNDP may have a coordinating role to play in the interactions at country/regional level and as a co-convener of interactions between Annex II and developing countries/regions, as part of its broad mandate of UN coordinator at country level.

Governments of both LAC countries and developed countries can play a key role in promoting such interactions. In the first place, they can stimulate the stakeholders' dialogue processes leading to the definition of the CTM at the LAC country/sub-regional level, thus focusing on specific climate initiatives that respond to sustainable development priorities and plans and its subsidiary climate change policy. Developed countries and international cooperation organizations can partially finance the definition process of the CTM in the LAC countries and can mobilize the developed country potential Partnership members in the public and private sectors. The financial mechanisms of UNFCCC ought to stimulate, facilitate and implement the Flexible Framework, including a variety of capacity-building and information dissemination activities. Once CTM are in place in LAC, reporting on progress achieved in technology transfer and diffusion becomes more transparent and easier for the Executive Function of the Framework in each country/sub-region. LAC countries are speedily incorporating information technologies into their daily lives. They could set up websites or equivalent, to increase transparency, and at the same time report on results, under the terms of the Convention. The CTM ought to become an integral part of the National Communications of the LAC countries. The Flexible Framework proposed is dynamic in nature allowing for the CTM to evolve over time as the climate change demands of LAC vary in the future and the relevant stakeholders modify their consensus over climate priorities. If there is political will, if public opinion is sufficiently well informed, and if the climate related markets blossom, the Flexible Framework approach should not suffer from discontinuities in political administrations resulting from the normal democratic processes in the LAC countries.

1. INTRODUCTION

The overall aim of this paper is to stimulate discussion among Latin American and Caribbean countries (LAC) on possible frameworks to promote technology transfer and diffusion in support of climate stabilization. It first takes a broad-brush view of technology transfer. Next, it examines the meaning of frameworks and their relevance for concrete actions in the LAC Region. Then, it turns to the elements of possible frameworks, where it looks at climate technology transfer from several angles: the demand side, the supply side, the reporting and the information exchange process. Following that, a number of experiences are summarily reviewed. The document ends with a set of conclusions and tentative suggestions for the consideration of the discussants. Annexes provide other relevant background and a list of references and suggested reading.

Ultimately, the core issue that concerns the nations of the world is the sustainable development of their peoples. Climate change may not be an immediate preoccupation to many developing countries in Latin America and the Caribbean (LAC). Some are still struggling to construct a broad-based set of sustainable development priorities supported by the consensus of their relevant stakeholders. Some are trying to develop a climate change policy that reflects their broader sustainable development policies and priorities. A stakeholders-supported climate change policy would generate portfolios of prioritized climate initiatives, requiring mitigation and adaptation technologies and an enabling environment to get them implemented. On the supply side, Annex II countries, which might be interested in stimulating climate-related investment, trade and technology transfer by their public and private sector would seek lower transaction costs. They can achieve this goal by engaging in collaborative efforts, on one hand with the potential recipient LAC countries and in the other hand with their own public and private sector.

To promote discussion on possible frameworks, under the aegis of the Subsidiary Body on Scientific and Technological Advice (SBSTA), the UNFCCC secretariat implemented regional workshops on the consultative process. They were held, for Africa in Arusha, United Republic of Tanzania, on 16 to 18 August 1999, and for Asia and the Pacific in Cebu, Philippines, on 17-19 January 2000. This background paper relates to the regional workshop for Latin America and the Caribbean, in San Salvador, El Salvador on 29-31 March 2000. These workshops were requested in Decision 4/CP.4 (and its annex), as expressed in its item 9, as follows:

"… 9. *Requests* the Chairman of the SBSTA to establish a consultative process to consider the list of issues and questions contained in the annex to this decision, as well as any additional issues and questions subsequently identified by Parties, and to make recommendations on how they should be addressed in order to achieve agreement on a framework for meaningful and effective actions to enhance implementation of Article 4.5 of the Convention. Such a process should also consider issues identified in the secretariat progress report on transfer of technology (FCCC/CP/1998/6) and in submissions from Parties. The consultative process could include, resources permitting, regional meetings, regional workshops and a SBSTA workshop, arranged with the assistance of the

secretariat and drawing upon the roster of experts and, as appropriate, experts engaged in the IPCC process;" (UNFCCC, 1998a).

Article 4.5 of the Convention requires that developed countries, in addition to their own commitment to lower greenhouse gas emission levels, take the following steps described below:

"… Art. 4.5 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." (UN, 1992)

The Kyoto Protocol also addresses the collaboration between developed and developing countries in its Art. 4, Art. 10, items (c) and (e), Art. 11, para. 2 (b) and Art.12 (UNFCCC, 1997b).

Furthermore, the SBSTA requested the Chairman, with the assistance of the UNFCCC secretariat, to make every effort, before the twelfth session of the SBSTA, to identify possible elements of a framework for meaningful and effective actions to enhance the implementation of Article 4.5 of the Convention. This effort should take into account the results of the three regional workshops, common elements and areas of divergence based on submissions by Parties on how the issues and questions listed in the annex to Decision 4/CP.4 should be addressed. Also to be considered is the IPCC special report on methodological and technological issues in technology transfer.

2. THE BROAD VIEW OF TECHNOLOGY TRANFER

This section paints a broad-brush picture of the process of technology transfer and diffusion and its management.

As mentioned in FCCC/TP/1998/1, "this paper is based on the assumption that the transfer of technology (both hard and soft) is a process of many day-to-day activities involving several stakeholders, who are influenced by the social, economic, legal, technological and political circumstances in each country. It is assumed that technology can be transferred between private partners, between private partners and governments and between governments, but that, having ratified the Convention, governments have a unique role." (UNFCCC, 1998b)

The special report on technology transfer of IPCC, due later in 2000, will further elaborate the concept of technology transfer, or better, the management of technology change. The process is embodied in the actions taken by individuals and organizations.

There are many different forms of technology transfer, such as: investment and trade decisions made by firms; acquisition of knowledge and skills by individuals through formal education and on-the-job experience; purchase of patent rights and licenses; assimilating the published results of public or private research, development and demonstration (RD&D); and migration of skilled personnel with knowledge of particular technologies.

In the case of Latin America and the Caribbean (LAC), the requirements of export markets in the OECD countries can promote environmentally sounder technologies. Affiliates of transnational corporations in LAC countries can also raise the mitigation and adaptation performance of their operations. This is due to the transfer of better practices from headquarters, especially for those companies engaged in environmental and climate change leadership initiatives, such as the Pew Center Business Environmental Leadership Council (Pew Center on Global Climate Change, 1999).

Technology transfer can also be influenced by government, bilateral and multilateral aid and financing programs, and by multilateral bank lending. Environmental and climate policies can influence technology development and diffusion in many LAC countries (Trindade, 2000). LAC governments can implement policies that promote R&D programs that address global climate change concerns. Markets bearing on climate change comprise: energy, including new and renewable energies; transportation; industry; waste management; agriculture; forestry; land-use change; coastal management and adaptation; and the required training, education and dissemination activities. Governments are especially important for those climate-related technologies, which might not be immediately viable and profitable, such as in the case of adaptation to climate change.

Sustaining development globally will require radical technological and related changes in both developed and developing countries. Economic development is most rapid in developing countries, but it will not be sustainable if these countries simply follow the historic polluting and greenhouse gas emission trends of industrialized countries. Rapid development with modern knowledge offers many opportunities to avoid bad past practices and move more rapidly towards better technologies, techniques and associated institutions. But to achieve this, developing countries, in LAC and elsewhere, will require assistance with developing human capacity (knowledge, techniques and management skills), developing appropriate institutions and networks, and with acquiring and adapting specific hardware. Technology transfer must therefore operate on a broad front covering these “software” and “hardware” challenges, and ideally within a framework of helping to find new sustainable paths for economies as a whole. A key element is choice. Hence the development of societal and organizational structures that enable well-informed choices of technologies, which promote climate stability, adaptation to the effects of climate change and sustainable development is essential. To a large extent, the state of the environment today is the result of the technological choices of yesterday (Trindade, 1991). Similarly, climate change and its impacts in the 21st century will be determined largely by the technologies we choose today.

3. ACTION FRAMEWORK CONCEPT

This section examines the notion of framework and explores the dimensions of an action framework.

According to two well reputed dictionaries, a framework is a structure, which holds the parts of something together or support something constructed or stretched around it or more broadly the basic structure, arrangement or system (Guralnick, 1972). Put simply, a framework is a supporting structure around which something can be built (Procter, 1996). An action framework is a framework, which promotes actions to reach commonly agreed goals, such as those contained in Article 4.5 of the Convention.

Frameworks, at national and international levels, can be very useful to promote international cooperation in transferring technology to support the Climate Convention. Although the specific application of the frameworks may vary from country to country in the LAC region, there are basic common elements among them that can help the process.

One of the issues that must be addressed in this process - hopefully via a stakeholders' dialogues approach - is the compatibility between the climate technology transfer activities and the national development strategies and objectives and how could climate-related technology transfer contribute to achieve such objectives and strategies.

Another component that must be examined is the status of the Technology Innovation System, that is, the institutional arrangement at national level, which would promote technology transfer and diffusion, considering government, private sector and non-governmental organizations (NGOs). The participation of the private sector is of special interest in view of its reputed vision of efficiency, objectiveness, results orientation and simplicity of approach and procedures. Despite their evolving role (The Economist, 2000), NGOs are also important institutional avenues, as they bring a focus to social and environmental concerns and may have a good foundation of knowledge and access to networks at the grass roots level.

The framework for LAC must also consider the sub-regional trading, integration and cooperation groups of the Region. These sub-regions include the Andean Pact, Caricom, Central American Integration, Greater Amazonia, Mercosur/l. They must also consider other international conventions to which LAC countries are signatories, such as on Biodiversity, Desertification, Montreal Protocol, Forests, etc., and environmental agreements within trade treaties. In the case of LAC, the framework must also conform to regional and sub-regional understandings and agreements. Examples are Initiatives No. 59, 60, 61 and 62 of the Plan of Action for the Sustainable Development of the Americas, derived from the Bolivia Summit in 1996. The countries of the Americas have also made commitments to address the causes and consequences of climate change in their First Summit, in Miami in 1994 (Section IV), and in the Second Summit, in Santiago in 1998 (Section II) (OAS, 1999e)

At the same time that climate technology transfer activities reinforce sustainable development objectives they must conform to national laws, rules and regulations of the LAC countries. The framework at national level must be backed by appropriate legislation, which defines clearly the responsibilities for a national effort on technology transfer and diffusion to support implementation of the Climate Convention and facilitate the work of international cooperation. Other framework elements to consider include: operational tools that implement the institutional framework, national sustainable climate plans, institutional strengthening and capacity building, national carbon inventories, investment promotion and financial resource mobilization.

Frameworks to be considered must reflect the UNFCCC (UN, 1992); the Kyoto Protocol (UNFCCC, 1997b); the subsequent COPs, especially COP4 and COP5; Agenda 21, especially chapter 34 (UN, 1993); OECD work on technology change management (OECD, 1991 and 1999); and public-private Partnerships for developing environmental technologies and policies aiming at diffusing them.

The specific frameworks ought to evolve from the analysis of the technological innovation system and pathways of managing technology change. Along any pathway, technology transfer typically follows five “stages”: assessment (including identification of needs); development of actions and agreement to support implementation; implementation; evaluation and adjustment; and replication. The stakeholders involved and the specific decisions and actions taken at each stage differ greatly depending upon the pathway. By analyzing, in the specific context of LAC and its integration and trade blocs, the interests and influences of different stakeholders at each stage, it is possible, in principle, to determine how various barriers to technology transfer might be overcome. There is a background of experience in LAC, which could illustrate the major features of the frameworks with respect to priority setting, donors' involvement, monitoring, diffusion and information dissemination.

Whatever final form the frameworks might take they should consider the following principles (Benioff, 2000):

(i) "Developing countries can drive the technology cooperation process by establishing well defined technology cooperation priorities that will meet their development needs and undertaking actions to remove barriers to effective technology transfer.

Climate change technology cooperation priorities can be selected based on the potential economic and development benefits to the country as well as the potential GHG-emission reductions. Developing countries may need support in defining these needs through a rigorous analytic and consultative process that engages the private sector and non-government organizations. Once these needs are identified, developing countries can then implement actions (together with donor support and business participation where appropriate) to remove key policy, institutional, capacity, financing or other barriers that are limiting effective technology transfer.

- Potential Approach: Preparation & Implementation of Technology Transfer Plans by Developing Countries:

These plans would identify specific technologies that hold the greatest potential for meeting development needs while reducing GHG emissions or facilitating adaptation to climate change. For each priority technology, the plan would define key market barriers and would propose specific actions that the countries could take coupled with donor support and business participation to overcome these market barriers and accelerate private investment and technology transfer. The countries would select priority technologies and technology transfer actions through an inclusive consultative process and rigorous analysis of the market potential, GHG mitigation (or adaptation potential), and development benefits of alternative technologies. In-country and international businesses would participate in the process to ensure that the plans reflect input from the private sector on technology market potential and barriers that are limiting investment in these technologies. Developing countries would then implement the actions in the plans designed to overcome barriers to effective technology transfer (with donor support and business participation where appropriate).

(ii) Technology transfer initiatives will be most effective if focused primarily on enabling private sector activity", especially with reference to mitigation efforts.

"Since commercial markets are the primary vehicles for technology transfer, the most important role for government is to enable private-sector activity. The private sector, including both international and in-country business, can be engaged in the process of establishing country priorities and designing implementation actions to ensure that these priorities and actions in fact reflect the best opportunities to create self-sustaining technology markets.

- Potential Approach: International Private Sector Participation in Technology Transfer Implementation through International Business Networks:

An international business network could be created, or existing networks or institutional arrangements utilized, to facilitate the participation of international businesses and investors in working with the countries on the development and implementation of their plans. The new or existing networks would provide countries with a mechanism to get private sector input on the most promising investment opportunities, on key market barriers, and on actions to overcome these barriers. These networks would also provide countries with an efficient mechanism for informing international businesses of new investment opportunities and for achieving active business participation in responding to these opportunities.

(iii) Technology transfer is most successful when it occurs through a holistic approach that integrates a country-driven definition of priorities with proven approaches for joint action by government agencies, the private sector, and international donors in responding to these priorities.

It will be necessary to establish efficient approaches for feeding country priorities into the design of implementation programs and for ensuring that such implementation programs actively engage all key domestic and international stakeholders

(iv) Technology transfer must go beyond the simple sale or transfer of hardware. Successfully establishing a program of sustained technology transfer requires the development of in-country enabling conditions and capabilities."

Agenda 21 can be considered the ultimate framework for sustainable development. It has several chapters (8, 9, 10, 11, 14, 28, 30, 31, 33, 34, 35, 36, 37 and 39) dealing with the integration of environmental and climate concerns into social and economic policymaking and implementation (UN, 1993). The most relevant chapters are chapter 8 (Integrating environment and development in decision-making), chapter 9 (Protection of the atmosphere), chapter 28 (Local authorities' initiatives in support of Agenda 21), chapter 34 (Transfer of environmentally sound technology) and chapter 37 (National mechanisms and international cooperation for capacity building). Agenda 21 offers one of the first global recommendations on public policies to promote technology transfer aiming at environmental objectives. These recommendations reflect not only the need for hardware but also the importance of developing local capacity and providing market intermediation. Furthermore, its chapter 34 targets specifically environmentally sound technology transfer. The strategies of chapter 34 focus on:

(a) National, sub-regional, regional and international information networks and clearinghouses to disseminate information, provide consulting and training;
(b) governmental policies building up conditions favorable to access to and transfers of technology in the public and private sectors;
(c) institutional support and training to build capacity to assess, develop and manage new environmentally sounder technologies;
(d) collaborative networks among technology research and demonstration centres;
(e) international cooperation and assistance in research and development and capacity building;
(f) build technology assessment capabilities in developing countries through international and private sector organizations;
(g) long-term collaborative arrangements between private enterprises, including partnerships, foreign direct investment and joint ventures.

UNFCCC is a broad framework geared towards climate change. The Kyoto protocol is another climate-related framework, which began to introduce operational concepts for implementing the Convention.

With so many possibilities at hand, one has to ponder whether creating entirely new frameworks is really necessary to tackle the climate change technology transfer issue or whether one should bring the topic to the existing networks, making adjustments as required. The next section examines the question in detail, including the steps and options available to implement the frameworks to stimulate discussion among the relevant stakeholders of the LAC countries.

4. ELEMENTS OF THE POSSIBLE FRAMEWOKS

This core section considers technology needs, donor's response, metrics of technology transfer and information exchange on the transfer of technology. A proposal is made for a Flexible Framework, which upon application to specific LAC country/sub-region situations would become working frameworks for climate technology transfer.

In many ways the concept of Latin America and the Caribbean as a region is an abstraction, as the area is extremely diverse in many respects. However, the larger region is an aggregate of sub-regions, each of which exhibit a shared history, a common culture, a similar natural resource base and geographic features, the same language, etc., which justifies a joint approach to their common issues. Nevertheless, for sustainability and climate change issues to penetrate permanently the public and private decision making processes in the LAC region, radical changes in culture, attitude, and the ensemble of social relations and power sharing are required (Carvajal, 1999). Part of this great challenge is to scale up to national, sub-regional and hemispheric dimension, the multitude of local, small-scale sustainable development and climate related initiatives taking place in the LAC region.

In 1997, Latin America had a population of about 490 million people, with a GDP of (1990) US$ 1,460 billion on average exchange rate terms, and (1990) US$ 2,879 billion on purchase power parity basis. Emissions of carbon dioxide reached 1,224 million tons. A few large countries - Argentina, Brazil, Colombia and Mexico - account for the bulk of these figures. But, there are medium-sized countries and small countries in South and Central America, and the island states in the Caribbean, which may not account for much emission even in absolute terms, but may be more vulnerable to the impacts of climate change and natural disasters. Thus, it makes sense to design a non-prescriptive Flexible Framework that will take definitive and specific contours as it is applied, through the consensus of the relevant stakeholders, to concrete situations in countries, regions within a large country, or sub-regional groups of countries in LAC.

Such a Flexible Framework, which is proposed in this background paper, would be subjected to a variety of driving forces, such as the market, the UNFCCC, the private sector, the donor community, etc.

Any framework would have to consider the building blocks of technology transfer at the level of the supplier and recipient sides, which includes:

(i) the supplier (products, processes, resources, objectives, strategies, operations, decision-making);
(ii) the technology transfer process (investment, management, ownership, agreements, licensing, sub-contracting, quality control, risk and insurance);
(iii) the recipient (similar to supplier).

Frameworks would also have to consider in detail the stages of the process (technology transfer typically follows five "stages": assessment, including identification of needs;

agreement; implementation; evaluation and adjustment; and replication), which encompass:

(i) identification of technology demands;
(ii) search for adequate technologies and sources of supply;
(iii) choice of technology and supplier;
(iv) negotiation (agreement and conditions);
(v) transfer (organization and substance);
(vi) adaptation, integration and operation;
(vii) further development by receiver;
(viii) implementation and diffusion by receiver.

In the context of the Convention, the framework must look at the specific climate technology transfer activities from the perspective of the countries involved. As a way of example, the approach of the Technology Cooperation Agreement Pilot Project (TCAPP) of the USA, with activities in LAC (Brazil and Mexico), which is focused on energy technologies, is presented below (Benioff, 2000):

(i) "A country-driven process for identifying technology transfer priorities, barriers to investment in these priority technologies and market sectors, and defining actions that can be taken by host country governments together with developed countries and multilateral donors and the business community to overcome these barriers.
(ii) A process for international business participation to help design and implement actions that will be effective at stimulating private investment and to be prepared to respond to the investment opportunities/needs that emerge from technology transfer activities.
(iii) A process for donor participation so that donors can help developing country governments by supporting implementation of actions to address barriers to technology transfer
(iv) International coordination and technical support to provide technical assistance to countries as they define technology transfer priorities and design and implement actions to attract investment in these priorities and to couple the work of developing countries with international business and donor participation."

The preceding workshop of this series, on Asia and the Pacific, held in Cebu, Philippines, raised several key and important issues, which might guide the context of discussions and development of a framework of relevance to Latin America and the Caribbean.

One emerging issue is the definition of technology transfer under business as usual vs. technology transfer under the UNFCCC as mandated by Article 4.5. This is a very narrow question which needs to be addressed in terms of Annex I country government commitments under Article 4. The baseline for this discussion would be the entering into force of the convention. The proposed Flexible Framework allows a resolution of this question in LAC from both the private sector and government perspectives. It does so through the portfolio of prioritized climate initiatives, which is generated via a process of

stakeholders´ dialogues engaging both private sector and government. These climate initiatives and the technologies to implement them constitute the Climate Technology Missions (CTM). The Flexible Framework promotes the interaction between developed and developing countries, stimulating contact between Public and Private Partnerships from both sides and the transfer of technology and know-how from a developed country or group of countries, in response to the needs contained in the CTM of a given developing country.

A second issue raised in Cebu is that Article 4.5 is about government commitments under the convention to enhance technology transfer. The question becomes what have governments done, and specifically in terms of Article 4.5, what have developed country governments done or should do to enhance technology transfer. In some sense, this may get to the heart of the issue of "framework". Even though the private sector can do much with delivery and dissemination of technologies, their actions are not those of the governments and how/should they be accepted here. Under what framework would this make sense? The proposed Flexible Framework responds to this issue, by having governments instigate a cascaded decision making process from sustainable development priorities, strategies and plans through to generating a climate policy, followed by a portfolio of prioritized climate-related initiatives and the technologies, investment and trade necessary to implement the resulting CTM. Furthermore, under the Flexible Framework, governments can put in place the Functions (Stakeholders; Information; Standards, Technology and Norms; and the Executive Function) to promote interaction between the Public and Private Partnerships from both developed and developing countries, which actually implement the CTM.

Along the lines of the Flexible Framework proposal introduced by this background paper, it is suggested (Benioff, 2000) that "the primary role of governments should be to remove market barriers to enable private sector investment in response to developing country needs. This then leads to the question of relative roles of developed and developing country governments," which is articulated as follows:

(i) "Developed Countries can support technology transfer of Environmentally Sound Technologies (ESTs) through various actions, including:

- Support efforts by developing countries to define their technology transfer needs and to design programs to attract investment and support for these needs.
- Coordinating and supporting effective donor response to these technology transfer needs. This includes both coordinating response across all multilateral and bilateral donors and ensuring that each developed country's bilateral aid program is responsive to developing country needs
- Facilitating private sector investment in climate change response technologies in developing countries. This can include supporting investment conferences and other business matchmaking and financing assistance as well as outreach activities to inform businesses of opportunities for investment in specific technologies in developing countries
- Refining export credit and lending policies to encourage investment in climate change mitigation and adaptation technologies and help developing countries create sustainable markets. Such efforts are already being undertaken through last year's G8

and OECD Ministerial mandates that export credit agencies develop common environmental guidelines by the 2001 Summit.

(ii) Developing Countries can support technology transfer of ESTs through various actions, including:

- Defining their technology transfer needs. This can include identification of priority technologies that will support development and climate change response goals and defining market barriers to investment in these technologies and specific actions that the countries can take together with developed countries, the private sector, and donors to overcome these barriers
- Securing support from key domestic agencies for implementation of programs to address technology transfer barriers and communicating needs for international donor and developed country support for these programs
- Implementing programs to overcome barriers to technology transfer in collaboration with developed countries, the donor community, and the private sector. These programs can range from business training and capacity building to policy reforms depending on the nature of the barriers identified
- Engaging in-country businesses and investment organizations in design and implementation of technology transfer programs to ensure that these programs will build their capacity to manufacture, adapt, and deploy climate change technologies."

A criticism on the predominant role of the private sector is that, a technology transfers mechanism based on the private sector, as the main delivery vehicle will miss sectors in which a market is not likely to develop.

Again, the proposed Flexible Framework is partly in line with the statement (Ben off, 2000) "that it is the role of governments through technology transfer to promote development of private sector markets for priority climate change response technologies through various mechanisms (e.g. policy reforms, financing incentives, business capacity building, agglutinating projects, etc.) For some technologies, this will require stronger government (both developing and developed) intervention than for others, but in the end the investment must still come from the private sector – the only source of capital available to address this problem in a sustainable way." In the language of the Flexible Framework, the stakeholders-led process that generates the climate policy of a given country should be able to recognize the variety of practical situations and institute measures, which stimulate the private sector, as needed.

Nevertheless, adaptation technologies are less likely to be transferred via the private sector. Further, in some of the smaller countries (e.g., islands) or poorer countries, viable, sustainable markets may also not develop to deliver technologies. In these instances, the proposed Flexible Framework should be able to formulate government responses to meet these needs, and consider addressing a group of countries that share common traits, such as CARICOM. This is illustrated for instance by the Caribbean Planning for Adaptation to Global Climate Change (CPACC) programme. When technologies are in the public domain or the property of governments, as in many adaptation situations, then developed country governments have a special responsibility to transfer them to developing

countries that need them. This can be accomplished through joint projects and capacity building initiatives.

A further issue emerging in the Cebu discussions was the recognition that sustainable technology transfer needs to involve partnerships, domestic/international, private/public. There seems to be a growing consensus of the Parties on this matter. The proposed Flexible Framework devotes especial attention to this concept. In fact, the Public and Private Partnerships are the pillars on which the Flexible Framework is built.

The Flexible Framework addresses the supply and demand sides of the technology transfer, including actions and activities that developing countries may take to create proper enabling environments for technology transfer and initiatives the developed world can consider in the context of Article 4.5. The interactive nature of the Flexible Framework is designed to stimulate and assist the LAC countries to prepare submissions for cooperation, and to encourage developed countries to spell out commitments and actions under Article 4.5. The Flexible Framework considers the question of how could Annex I governments respond and how could the framework make this possible. The transaction costs for the transfer process can be cut down by the Flexible Framework due to the lowering of market penetration barriers brought about by the market organization that the CTM induce. Furthermore, Annex I countries would be helped by the proposed coordinating role for UNDP at the level of the developing country and the co-convening of business conferences for the implementation of the CTM of countries or regions.

The general design of the Flexible Framework would consider broadly the same phases as the TCAPP program (Benioff, 2000):

(i) "Priority setting e.g. needs identification through a consultative and analytic process.

(ii) Designing and securing support for actions to overcome market barriers for these priority technologies.

(iii) Implementation and evaluation."

The Flexible Framework also provides and opportunity to balance multilateral vs. bilateral effort of technology transfer, considering the merits and drawbacks of these vehicles. Multi-lateral approaches are usually untied to particular sources of supply of goods and services, but are normally much smaller than bi-lateral cooperation. The stakeholder-led process of generating the CTM, and the interactions among the partnerships would weight the share of bi- and multi-lateral participation.

4.1 Identification, prioritization and communication of technology needs to Parties

The LAC countries are at various stages of developing their national sustainable development priorities, strategies and plans, "through the widest possible participation", as suggested in para. 8.7 of Agenda 21. Many have implemented National Councils for Sustainable Development. A recent consultation on LAC's progress towards

sustainability was held in Santiago, Chile, on 19-21 January 2000 (Trindade, 2000), in preparation for the Special Session of the General Assembly of the United Nations, which will take stock of the global sustainability achievements, on the 10th. anniversary of the UNCED conference.

The programme proposed in chapter 37, para. 37.3, of Agenda 21 aims at:

"(a) promoting an ongoing participatory process to define country needs and priorities in promoting Agenda 21 and to give importance to technical and professional human resource development and development of institutional capacities and capabilities on the agenda of countries, with due recognition of the potential for optimum use of existing human resources as well as enhancement of the efficiency of existing institutions and non-governmental organizations, including scientific and technological institutions;

(b) reorienting technical cooperation and, in that process, setting new priorities in the field, including that related to transfer of technology and know-how processes, while giving due attention to the specific conditions and individual needs of recipients, and improving coordination among providers of assistance for support to countries' own programmes of action. This coordination should include non-governmental organizations and scientific and technological institutions, as well as business and industry whenever appropriate;"

Chapter 37 of Agenda 21 also states, in para. 37.2, that "Technical cooperation, including that related to technology transfer and know-how, is effective only when it is derived from and related to a country's own strategies and priorities on environment and development and when development agencies and Governments define improved and consistent policies and procedures to support this process."

Who are the CTM stakeholders?

- ***Sources and developers of technology***

Individuals/organisations who undertake original research to develop technology. Typical developers include scientific research organisations, R&D departments within private firms, and government-sponsored research entities. Technology can be developed in either the public or private sector.

- ***Owners and suppliers of technology***

These usually include private firms, state-owned enterprises, and government agencies. Technology developed in the public sector often is "spun off" to the private sector, since the private sector is seen as better able to exploit the market potential of the technology. In some countries, however, public sector organisations now compete with suppliers of technology that are based in the private sector.

- ***Buyers of technology***

The primary stakeholders in the technology transfer process. Buyers of technology usually are private firms, but can also include state-owned enterprises, government agencies, and individual entrepreneurs.

- ***Financiers of technology transfer***

Those who lend to technology buyers, or invest in them to enable the buyers to acquire the technology from the suppliers. Organisations involved include commercial banks, international financial institutions (e.g., the International Finance Corporation), and individual or institutional investors.

- ***Information providers***

Include organisations such as UN agencies that have no commercial interest at stake and whose objective is to facilitate matchmaking between the buyer's needs and the suppliers by providing objective, unbiased information. This information could include technology options, sources of technology, case studies where technologies have been used, data and data processing information, and methods for evaluating different options.

- ***Market intermediaries***

Include consultants, NGOs, media, consumer groups, and trade associations. Market intermediaries usually can have significant influence on the buyer's decision by providing information about technologies. Depending on the interest of the intermediary, this information may promote certain technologies at the expense of others.

- ***Governments***

The government of the buyer's country sets the rules for transactions through regulation, incentives, and frameworks governing imports of technology/foreign capital. Where the government perceives that the private costs of technology may not reflect the true costs to society (e.g., a technology may have environmental externalities), the government may be involved in expanding or limiting the range of technologies under consideration. The government of countries whose companies sell technologies may set policies to promote technology transfer in support of the climate stabilisation, via ODA and other measures.

Agenda 21 further says in chapter 34, para. 34.4, that ”Technology cooperation involves joint efforts by enterprises and Governments, both suppliers of technology and its recipients. Therefore, such cooperation entails an iterative process involving government, the private sector, and research and development facilities to ensure the best possible results from transfer of technology. Successful long-term partnerships in technology cooperation necessarily require continuing systematic training and capacity-building at all levels over an extended period of time.”

Thus, it is possible to mine out of Agenda 21 and the extensive discussion in the preceding sections of this background paper, the basic ingredients for the proposed Flexible Framework, beginning with the approach to climate technology needs assessment. Ideally, the identification and prioritization of the technology needs of the LAC countries would follow a stepwise, albeit dynamic and iterative, approach described below, and depicted in Fig. 1. Nevertheless, the approach is dynamic and different entry points in the process are possible, recognizing previous efforts done by the countries concerned. The overall approach is to evolve from sustainable development priorities, strategies and plans all the way to the CTM:

4.1.1 National/regional sustainable development priorities, strategies and plans

Since climate technology needs are the result of prioritized climate initiatives, which derive from a climate policy, which in turn is subsidiary to the national/regional sustainable development priorities, strategies and plans, an orderly definition of needs should start with the development priorities. When such priorities are not immediately available or were developed without adequate stakeholders’ participation, the starting point would be promoting a stakeholders’ dialogue process to review or to establish a broad-based set of priorities for sustainable development.

”The degree to which sustainability has penetrated the public and private decision making process in LAC, since the 1992 UNCED conference, has varied from country to country in the region. In a few countries, sustainability, environment and natural resources became items of new or revised constitutions. Plenty of legislation and regulation were developed in support of sustainability. Nevertheless, there is a gulf between intentions as reflected in policies, plans, programmes, projects, laws and regulations, and the reality of development in the region. Within national governments, there is often lack of coordination and communication between ministerial and agency portfolios, resulting in contradictory moves. International cooperation can also be no more coordinated than national administrations. On the other hand, there are hopeful signs all over the region that sustainability is making progress, albeit slow, in academia, in business, especially large-scale business, in government and in the NGO movement. This is illustrated by the Mesoamerican Biological Corridor (MBC); changes in production processes towards better (sustainable) practices; responding to natural disasters; the Clean Air Initiative for Latin American Cities and the Forum of the LAC Ministers of Environment. If the relevant stakeholders can come to a consensus on sustainable development priorities and initiatives, there is still ample opportunity to steer development towards sustainability in

all the LAC sub-regions: the Andean Pact countries, the Caribbean, Greater Amazonia, the larger Mercosur, Mesoamerica and Mexico" (Trindade, 2000).

Once a stakeholders' process has generated or reviewed and revised the national/regional sustainable development priorities, strategies and plans, the suggested approach goes to its next step.

4.1.2 National/regional climate change policy

The Convention national focal points in LAC should be encouraged to marshal alliances gathering the public and private sectors to promote a stakeholders' dialogue process with the specific purpose of reviewing, revising or establishing a national/regional climate policy, which would be the national/regional interpretation of the Climate Convention.

(FIG.1 here – see page 59)

One of the advantages of a broad-based setting of climate policy is the awareness effect it has in the population at large, thus helping to engage a larger audience in the national/regional commitment to climate stabilization. In practice, the capacity of national focal points to mobilize national/regional stakeholders to engage in this cascaded process varies from country to country. Their relative inability to bring the climate issue to the main stream of social and economic life is one key impediment to the implementation of the Climate Convention and to the technology transfer processes associated with it.

After a national/regional climate policy has been established or an existing climate policy is validated through the consensus of the relevant stakeholders, the approach is ready for the next step.

4.1.3 Portfolio of prioritized climate initiatives

With a focus on the Convention, the government focal points in LAC could consider promoting a broad-based consensus-building stakeholders' dialogue process to agree on a prioritized portfolio of initiatives (policies, legislation, regulation, plans, programs, projects) regarding mitigation and adaptation to climate change, and the means to implement it (investment, trade and technology transfer). Such dialogues must be well prepared in terms of a data base and survey of research, development and demonstration of promising technologies; survey of opportunities for investment, trade and technology transfer; diffusion prospects; financing via the flexible mechanisms (AIJ/JI, CDM and tradable permits) and other sources; and should include consideration of the enabling environment. To allow effective participation by all relevant stakeholders with diverse backgrounds, the information for the dialogue process should be packaged in such a way as to communicate the main points in a way that is absorbable by all participating stakeholders. Given the relevance of energy technologies to climate change, issues such as energy demand management, energy efficiency and sustainable renewable energies should be given careful consideration.

The portfolio of prioritized climate initiatives would cover many climate-related markets in many fields besides energy, as exemplified by: transportation; industry; waste management; agriculture; forestry; land-use change; coastal adaptation; etc.; the required training, education and dissemination activities, etc.

4.1.4 Climate technology missions

These prioritized climate initiatives and the sets of technologies needed to implement them can be structured into veritable Climate Technology Missions (CTM). These CTM would operate in the environment defined by the existing technological innovation system, and if necessary, modify it.

The technology needs would then be derived from the prioritized portfolio of climate initiatives. Implementation could consider domestic/international public/private partnerships to overcome critical mass limitations. The criteria for effective technology transfer would be made explicit, and could constitute a useful checklist for policymakers and other relevant stakeholders.

In the experience of TCAPP the criteria countries have used to select technology transfer priorities (needs) include (Benioff, 2000):

(i) development benefits – how much will deployment of the technology help the country meet economic, social, or environmental goals?

(ii) market potential- what is the scale of investment and market growth that can be achieved if market barriers are addressed?

(iii) GHG mitigation (or adaptation) – how significant are the carbon emissions that can be avoided (or how vulnerable is this sector to climate change impacts);

(iv) some countries have also considered the suitability for international technology transfer how much opportunity is there for international cooperation to build the host countries capacity to implement the technology.

Also, countries have compiled at least the following types of information through this process:

(i) information on technology performance, costs, and benefits;

(ii) information on existing priorities and programs and opportunities to build from and support these programs;

(iii) critical market barriers to investment – including collecting information from the business community (in-country and international) on these barriers and possible actions to address these barriers.

A CTM portfolio needs to be managed in a dynamic fashion, taking into account all the constraints and opportunities offered by the policy environment, especially the technological innovation system of a given LAC country or region.

"The national innovation system includes universities, R&D centers in businesses, information and extension agencies, institutions for financing, quality standards setting and control, consulting firms, technical-service laboratories, government regulatory agencies, and other institutions that interact in a broad range of activities running from the birth of an idea to its general use in society. If this system is nonexistent or very weak, a country is not capable of adequately selecting, absorbing or managing foreign technology, much less making its own efforts to adapt it or develop new products and processes. The weaknesses of such agencies and their linkages, or what has been called the national innovation system suggests that Latin America and the Caribbean have still not been able to internalize technological change sufficiently. Therefore, the core of an effective strategy will be the strengthening of systemic capabilities. This does not refer only, or even primarily, to public sector activities, but rather to public cooperation with the other sectors to unleash and support the creative forces of society, thus creating a general climate that encourages innovation." (Mayorga, 1997)

4.2 Identification, implementation and co-ordination of donors' response to identified country needs

The Flexible Framework depicted in Fig. 2, brings together the CTM processes of developing and developed countries, which are identical in structure but different in content. The Flexible Framework responds completely to the question of identification, implementation and co-ordination of donors' response to identified developing country needs.

4.2.1 Flexible Framework for climate technology transfer in LAC

The interaction of the Public and Private Partnerships from both sides of the Flexible Framework promotes the implementation of the CTM of the developing country involved and with it the transfer and diffusion of climate-related technologies. Donors' response is facilitated by the prior existence of a set of CTM from the developing country concerned. Also, donor country governments and donor organizations would have had opportunities to participate in the process that generated these CTM, both bilaterally and through the communication mechanisms of the UNFCCC. The actual implementation and intermediation agents – the Public and Private Partnerships – from both the developing and developed countries involved would also have been interacting through the CTM definition process. Altogether these processes would be defining and developing the CTM, that is, the specific actions that can be implemented to address developing country needs and attract the desired investment (e.g. policy reforms, investment solicitations and conferences, business financing programs, project development support, demonstration projects, business capacity building, technology certification, etc.)

4.2.2 A role for UNDP in coordinating donors' response

The Resident Representatives of UNDP throughout LAC are the UN Coordinators at national level. UNDP is one of the three organizations involved with the management of the Global Environment Facility (GEF). Among possible alternatives, Government FCCC focal points should consider requesting the assistance of UNDP to engage bilateral and multilateral donors, as well as the private sector, in a coordinated response to the technology transfer needs identified by their respective countries, through the CTM process previously described. Essentially, UNDP would bring the developing country and the developed country CTM frameworks to interact, by co-convening processes such as consultative conferences and the like.

(FIG. 2 here - see page 60)

Ideally, UNDP would have assisted the interested country in the stakeholders' dialogue process that generated the CTM. In this process, UNDP, in coordination with the donor community, and the private sector, could collaborate with interested Governments in reviewing the policy environment to promote technology transfer and diffusion in support of the Climate Convention. For UNDP to play an effective central role in coordinating donors' response, it has to get the buy-in from all key bilateral and multilateral donors and work closely with the business community. This has to include a real commitment to a coordinated donor response by all parties and not such another forum for donors to give lip service to coordination and commitment to responding to developing country needs.

4.2.3 Business, labor and community response to CTM demands

There are an increasing number of companies that are already involved not only in the actual transfer of specific technologies, e.g. wind turbines and solar photovoltaics (Browne, 1997), but also in undertaking broad analyses dealing with technology transfer for their own use or the use of governments (Touche Ross, 1991) and transnational organisations. Illustrations of this recent trend are the International Climate Change Partnership (ICCP), formed in 1991, and one of the largest international industry coalitions focused exclusively on climate change issues, whose members include major transnational corporations and NGOs, and the Pew Center for Climate Change established in 1998, gathering some 22 companies in its Business Environmental Leadership Council.

A few LAC countries have Business Councils for Sustainable Development (BCSDs), which could add momentum to this process. All LAC countries have industry, trade and labor associations, which should be brought into the processes of the Flexible Framework. Other possible contributors are the business environmental leadership initiatives and climate change coalitions in OECD countries, where transnational corporations and NGOs play a role.

At the community level and especially in adaptation situations, individual citizens, small-scale enterprises and NGOs are the main stakeholders, concerned with agriculture, forestry, coastal management, etc.

4.2.4 Ten key questions about CTM and the Flexible Framework

(i) What are CTM?

The process involved in achieving the CTM is depicted in Fig. 1 and can have different entry points depending on the degree of progress towards sustainability of each given country/sub-region. CTM are concentrated efforts to contribute to sustainable development in response to the challenges of climate change, as expressed in the climate policy, while meeting social and economic demands, from a given area or sector. The CTM are defined on the basis of selection criteria previously established, chosen by the consensus among the relevant stakeholders of the Society (ies) involved. Thus, the definition and implementation of the CTM require the engagement of all relevant stakeholders. The implementation of the CTM mobilizes human, material and financial resources way beyond governmental budgets.

It is important to emphasize that not all climate science and technology activities in a given country or region in a given time, will be contained within the scope of the CTM. Remember, CTM are concentrated efforts and thus limited in number and reach.

(ii) How are CTM selected in practice?

The general priorities are chosen out of the consensus emanating from the first rounds of dialogues among the stakeholders who could be organized in a variety of forms such as members of a broad-based Coordination Committee, such as the Stakeholder Function of the Flexible Framework (Fig. 2), and derive from previously defined selection criteria. The stakeholders are parties interested in sustainable development, climate policy and climate-related initiatives. The stakeholders participating in this process usually represent industry, commerce, agriculture, labor, banking, politicians, organized consumers, education, NGOs, media, and typically the government departments responsible for planning and budgeting, energy, transport, industry, agriculture and forestry, science and technology and environment.

The broad priorities are detailed through surveys, studies and analyses, to identify problems and opportunities for climate initiatives, which contribute to the sustainable development for the Society (ies).

The stakeholders' dialogues screen the information surveyed initially and eventually select a limited number of CTM according to previously agreed criteria, and following convergence methodologies (e.g. attributing weights to the criteria).

Thus, CTM constitute the portfolio of prioritized climate initiatives and the technologies, investment and trade necessary to implement them, as shown in Fig.1.

(iii) And how are the CTM implemented?

An Executive Function as part of the Flexible Framework is established to support the Stakeholders' Function and the individual CTM, as depicted in Fig. 2.

Each CTM identifies the minimum number of relevant stakeholders, national and international, and designates a Coordinator who is supported by a Secretariat, either its own or the one housed at the Executive Function of the Flexible Framework.

After the initial selection the Stakeholders' Function, shown in Fig. 2, meets 3-4 times along the year to monitor progress of the implementation of the CTM, define strategies and policies, and guide the overall process.

Each CTM develops their own portfolios of prioritized initiatives (plans, program, projects, legislation and regulation changes, etc.) and mobilizes private and public resources, national and international, to implement the CTM via investment, trade and technology transfer and diffusion.

The practical implementation of the CTM is undertaken by Public and Private Partnerships, which operate under the constraints and opportunities offered by the technological innovation system, especially the laws, rules and regulations of various levels of government in a given country/sub-region

In order to implement certain CTM, in-country and international technology transfer may be required. The Flexible Framework suggests that, conceptually speaking the CTM framework is the same for all countries, developed and developing. In actual practice the specific features and content of the framework will vary from country to country. When international technology transfer is required to implement a CTM in a given country, the Flexible Framework indicates that the interaction between the Public and Private Partnerships from both sides is the implementation tool that is required. It is possible that the same or related private or public entity might be involved in both frameworks, which are interacting, one in a developing country and the other in a developed country, for instance (Fig. 2).

(iv) Is it possible to discontinue a CTM?

Yes, as long as the Stakeholders' Function so decides. On the negative side, there are situations where the performance of a given CTM remains unsatisfactory, even after repeated efforts to launch it effectively. On the positive side, there are situations where the CTM advances quickly and reach its objectives and does not require any longer the concentrated support, which characterizes the CTM process, and can thus be discontinued.

(v) Is it possible to add CTM over time?

Yes, as long as the Stakeholders' Function so decides, once the proposed new CTM meet the same criteria applied to the other CTM, and the total number of CTM is not significantly increased.

(vi) Where does the concept of CTM originate?

The concept of CTM results, inter alia, from the work of the former United Nations Centre for Science and Technology for Development (CSTD) during 1986-1991. In its attempt to respond to the mandate of the UN Conference on Science and Technology for Development (1979), and implement the Vienna Programme of Action, CSTD carried out a set of pilot experiments of stakeholders' dialogues, to define portfolios of prioritized development initiatives founded on science and technology – the Technology Missions – in a diverse array of countries such as Cape Verde, China (oil-producing region of Daqing), Jamaica, Jordan, Nepal, Pakistan, Thailand, Tanzania, Togo, Uganda and Vietnam. The results, although incomplete, were encouraging.

Later, the Development Assistance Committee (DAC) of (OECD) organized a discussion on technology for development in Paris, in 1990. The event led to the publication "Managing Technological Change in the Less-Advanced Developing Countries", in October 1991, where the concept of Missions is extensively articulated.

More recently, Agenda 21, the action program of the UNCED conference in Rio de Janeiro (1992), absorbed the concept of Missions in its chapters 37 and 28, which encourage the signatory countries to prepare national and local Agendas 21 respectively, based on dialogues among relevant stakeholders. The national, regional and local Agendas 21 select sustainable development priorities and generate portfolios of prioritized initiatives, that is to say Missions.

During 1995-98, the State of Minas Gerais, Brazil (16 million inhabitants and the second economy in Brazil) adopted the Mission approach and launched a set of Technology Missions, including the Agenda 21 of the State, and had a measure of success in implementing them.

Getting a consensus, through stakeholder's dialogues, on the choice and implementation of development priorities has a strong, formal and informal, historical basis, especially in democratic societies. Examples include regulatory negotiations, public hearings, etc.

A word of caution coming from the experience of many countries is that in the hierarchy of decision-making processes, the sovereignty of the stakeholders should prevail over the tyranny of the experts. The experts have a lot to contribute to building up sustainable development, but should not monopolize decision-making. It is up to the consensus among stakeholders to define the priorities of sustainable development.

Finally, it important to retain that once consensus is achieved on priorities, it is necessary

review it and renegotiate it, from time to time. That is why Missions can be discontinued and new Missions initiated along the time.

(vii) What is the amount of governmental budget necessary to implement the CTM?

CTM constitute a new paradigm, a new way of facing the challenges of the climate-related components of sustainable development, of choosing priorities and implementing the prioritized initiatives. The concept of CTM implies the capacity to mobilize private and public resources to implement the climate priority agenda. Normally, the resources from private savings, national and international, should prevail over public funds. Furthermore, public funds engaged in the implementation of Missions do not need necessarily to come from additional budgets of developing countries, because the priorities established by the CTM should influence public budget allocations at all levels.

(viii) Why are the CTM called technological since technology may not be the strategic element in the process?

In the competitive and globalized world where we live, every sustainable development initiative must have a technological component. The CTM originate a demand for new technologies, coming, without any discrimination, from the developed and developing countries.

(ix) Are CTM a governmental or a private program?

The CTM are a government-induced program, managed by Society. Society leads the process through the stakeholders and the Public and Private Partnerships, and government keeps the residual power of intervention.

(x) How long does it take for CTM to yield results?

The CTM process, building up a consensus among stakeholders on climate priorities and initiatives, requires time. But when implementation begins, the probability of success is greater due to the support of the stakeholders, committed to the priorities chosen by them.

4.3 Monitoring, measuring and reporting technology transfer activities

The question of reporting and monitoring of technology transfer activities of Annex I governments has been raised in Convention discussions. This is a key question that needs to be resolved in any framework. There is an ongoing debate where developing countries claim that not enough is being done by Annex I governments to meet commitments of article 4.5 and developed countries continue to present long lists of projects which they believe meet these criteria. The approaches described here in the context of the CTM and the Flexible Framework might offer a resolution of this issue through the definition of prioritized climate initiatives and the interactions built-in the working of the Flexible Framework.

The technologies of interest for reporting purposes are those, which are necessary to implement the CTM**.** The SRTT paper, presently under elaboration, could inspire the development of criteria, in the LAC context, for determining eligible or qualifying technology transfer activities and suggest the metrics to verify whether the intended goals are being met. This would be part and parcel of the responsibilities of the Executive Function of the Flexible Framework. For illustrative purposes the SRTT criteria are listed below and presented in full in Annex II to this paper:

(i) GHG and Other Environmental Criteria: *GHG reduction potential, Other environmental considerations*

(ii) Economic and Social Criteria: *Cost effectiveness; Adequate financing; Project-level considerations; Macroeconomic considerations; Equity considerations;*

(iii) Administrative, Institutional and Political Criteria: *Information about technology; Access to technology; Administrative burden; Political considerations; Replicability;*

(iv) Process-related Criteria: *Market penetration; Long term institutional capacity building; Monitoring and evaluation of continuous delivery of services provided by technology and adequate financial performance; Leakages that reduce the impact of programme or measure.*

Thus, one of the important tasks of the Executive Function of the CTM framework would be to report bilaterally and multilaterally, through the communication mechanisms of the Convention, including national communications, on the implementation of the CTM and the technology transfer and diffusion that accompanies it. A strong reporting system can help provide the assurance of effective donor responses.

In addition to the criteria specified in the SRTT, ongoing work on sustainability indicators, at national and international levels, public and private, must be drawn upon to devise specific indicators of technology transfer in support of the Climate Convention in the LAC region. On the basis of such work, LAC countries may wish to consider enacting provisions (legal, regulatory and otherwise) to set up reporting for recording and sharing information to be matched by the other Parties to the Convention.

4.4 Overseeing the exchange of information on the transfer of technology among Parties

Formally at least, the Convention process has established a reporting mechanism on development and transfer of technologies for projects and programmes incorporating cooperative approaches to the transfer of technologies and responses on how the issues and questions listed in the Annex to Decision 4/CP.4 should be addressed, as well as suggestions for additional issues and questions. In Fig. 2, the governments communicate with each other, inter alia, through the FCCC.

According to FCCC/SBSTA/1999/MISC.5, eleven submissions were received, none directly from a LAC country. Nevertheless, the submissions of countries, international organizations and agencies do include reference to technology transfer projects in a few LAC countries.

A website (or a subsite within the UNFCCC website) specific to technology transfer among Parties could be considered for implementation, heavily linked with relevant sites in LAC. Through the Executive Function of the CTM and the interactive Flexible Framework, both LAC countries and Annex II countries, should be stimulated and, if necessary assisted, to prepare submissions on the progress of implementation of the CTM**,** and the in-country and international transfer of technologies that accompanies the process, following a commonly agreed format. Special effort to detect and report on technology transfer between LAC countries should be made. Existing regional networks and mechanisms (e.g. electronic workshops) should be considered for promoting information exchange on intellectual property rights; understanding publicly held and privately held technologies; identifying model cases for improving technology transfer under the Convention; etc. Perhaps existing information resources could be organized in a LAC CTM Information Network, to test these ideas and diffuse them to other regions of the world, in case of success.

5. CASE EXAMPLES

Experiences from LAC, driven or not by climate change concerns, but with climate impact, and similar non-climate related experiences, are presented in this section to elucidate and illustrate points made in the discussion of the CTM and the Flexible Framework**.**

5.1 Caribbean Planning for Adaptation to Global Climate Change (CPACC)

CPACC is a CTM of a subregional nature. It may not fit all the requirements of a true CTM, since there is no information about the participation of stakeholders' processes in the genesis of CPACC. It must be assumed that CPACC derives from an explicit climate policy of the Caricom member states in response to their sustainable development priorities, strategies and plans. This is an example of soft technology transfer vis-à-vis adaptation and capacity building. One of the components of this project, that is, the establishment of a network of meteorology and sea level monitoring stations, is presented as Case Study # 20 in the SRTT IPCC report. Such an information network corresponds to the Information and Dissemination Function of the CTM.

CPACC's overall objective is to support twelve Caribbean countries, members of CARICOM, to cope with potential impacts of global climate change, particularly sea-level rise, through vulnerability assessment, adaptation planning and capacity building. The Organization of American States (OAS) is CPACC's executing agency and recipient of the US$6.7 million grant from the Global Environment Facility (GEF) through the World Bank. Funds are transferred to the Regional Project Implementing Unit (RPIU) established at the University of the West Indies Centre for Environment and Development (UWICED), in Barbados, to coordinate and manage project activities at the

national and regional levels. The RPIU provides the sub-regional Executive Function of the CTM. All participating countries have established national implementing units (the equivalent to the national Executive Function of the CTM) that facilitate project implementation at the national level. Although there is a Partnership in place, including CARICOM, GEF, OAS, the University of West Indies, and the interested countries is in place, it is not immediately evident where is the technology coming from. It must be assumed that the project is being implemented within the legal and regulatory framework of the countries concerned (the area surrounding the CTM in the Flexible Framework diagram).

Specific objectives of the project (that is, the CPACC CTM) include:

(i) strengthen the regional capability for monitoring and analyzing climate and sea level dynamics and trends, seeking to determine the immediate and potential impacts of climate change;

ii) identify areas particularly vulnerable to the adverse effects of climate change and sea level rise;

(iii) develop an integrated management and planning framework for cost-effective response and adaptation to the impacts of climate change on coastal and marine areas;

(iv) enhance regional and national capabilities for preparing for the advent of climate change through institutional strengthening and human resource development; and

(v) identify and assess policy options and instruments that may help initiate the implementation of a long-term program of adaptation to climate change in vulnerable coastal areas.

More information on the project and its implementation can be found at http://www.cpacc.org/ (Volonte and Lambrides, 2000), (OAS, 1999d).

5.2 Participatory Environmental Management for the Restoration of Ferrol Bay, Chimbote, Peru.

Although not directly connected with adaptation or mitigation, this example illustrates that the kinds of processes the Flexible Framework proposes are not alien to LAC. This example comes from the OAS program on public participation in decision-making for sustainable evelopment (ISP) (OAS, 1999b). The nature of the project makes it similar to a climate adaptation situation.

“The Comisión Nacional del Ambiente (CONAM), the local co-executing organization, created the Comisión Ambiental Regional de la Zona Costera de Ancash (CAR), one of he stated functions of which is to create a plan for the restoration of Ferrol Bay. The work plan devised for the CAR may be summarized as follows:

(i) formulation of an environmentgal status report to assess and decribe the baseline situation of the pollution levels of the Bay and an analysis of successful experiences from other countries in bay restoration" (equivalent to the Information and Technological support function of the CTM).

(ii) "development of a technical and institutional proposal for Bay restoration" (part of the Information and Technological Function of the CTM);

(iii) "development of consensus points for action" (corresponding to the portfolio of prioritized initiatives and related investment, technology and trade that constitutes the CTM);

(iv) "dissemination campaigns at every stage of the process" (an activity of the Information and Dissemination Function of the CTM framework).

"The first of these activities, conducted in Partnership with the local University del Santa, has been completed. This activity entailed the production of a baseline report on the status of of the environment in thje Ferrol Bay area" (similar to setting up baselines for emissions in the case of FCCC), "which includes an assessment of natural and physical problems and causes, alterations of the oceanographic processes, socioeconomica and cultural causes, principal stakeholders in polluting the Bay, a summary of actions taken in the past to restore the Bay, and the citation of other studies conducted on the state of the Bay.

The second activity, the development of a technical proposal, involved extensive consultations between government at the national and local levels, private-sector stakeholders in the area, and the community at large" (this illustrates the stakeholders' processes of Fig.1 on the way to define CTM).

"The third activity was completed in the form of na Environmental Action Plan for Ferrol Bay" (the equivalent to the CTM), "developed through wide consultations.

The final activity, which involves the dissemination of the plan" (Information and Dissemination Function of the CTM) "and the garnering of support and participation of the key community stakeholders" (the setting up of the Private and Public Partnerships of CTM), "is still underway. This activity includes a planned series of meetings with fisheries and financial institutions to discuss financing mechanisms to encourage the adoption of clean technologies, and the development and dissemination of an environmental education plan. An additional programmed activity that is also currently underway is the documentation" (Information and Dissemination Function of the CTM) of the lessons learned and experiences from throughout the project."

5.3 The Prodeem programme of sustainable renewable energy services to off-grid communities in Brazil.

Brazil has established on 7 July 1999 an Inter-Ministerial Commission on Global Climate Change composed of 9 ministries, under the chairmanship of the Minister of Science and Technology and the deputy-chairmanship of the Minister of the Environment. For the moment civil society is not represented, although a forum of civil society within the Commission is being contemplated. Although lacking in civil society stakeholders, this Commission is a first approximation of the Stakeholders' Function in Fig. 2.

Prior to establishing the Commission, "environmental criteria have begun to be incorporated into the management and concession of official credits and fiscal incentives (tools of environmental policy). The Green Protocol established in Brazil is an example of these activities. The Protocol, composed of federal financial institutions, requires that the participating banks promote the protection and recovery of the environment through specific credit lines.

Small-scale pilot demonstration programmes that aim to disseminate information and reduce high initial costs through rebates and promotions can encourage electrical energy conservation.

Information clearing houses can play a role in promoting renewable energy by disseminating information on solar, wind, biomass and small hydro technologies. The Brazilian renewable programme case study draws attention to the successful use of reference centres." (FCCC/TP/1998/1)

The government of Brazil recently mandated that 1% of electric utility revenue be set aside for clean energy projects (renewable and efficiency). One of the mechanisms for deploying these funds will involve the creation of a sustainable energy equity fund. This fund will make direct investments in renewable energy and efficiency projects. This financing mechanism is part of the Public and Private Partnerships that implement the CTM, in this case renewable energy and energy efficiency missions.

One programme in Brazil, which could be about to launch a new scale in renewable energy markets is the energy development programme for states and municipalities (Prodeem). It qualifies as a CTM**.** It is an initiative of the Brazilian Ministry of Energy and Mines, to promote the provision of energy services to meet the total demand of about 20 million Brazilians currently off-grid. FCCC was not a motivating factor of Prodeem, but since the incremental power supply in Brazil is likely to come from thermal generation, the implementation of Prodeem would mitigate emissions. Also there has been no stakeholders' process to set out priorities for the program.

This off-grid demand is highly fragmented in very small potential consumers spread throughout Brazil and overall is estimated to reach at least 1,500 MW, requiring a total investiment of the order of US$ 10 billion, on the basis of photovoltaic supply alone. Prodeem is meant to be a programme in transition towards the market presently. When it

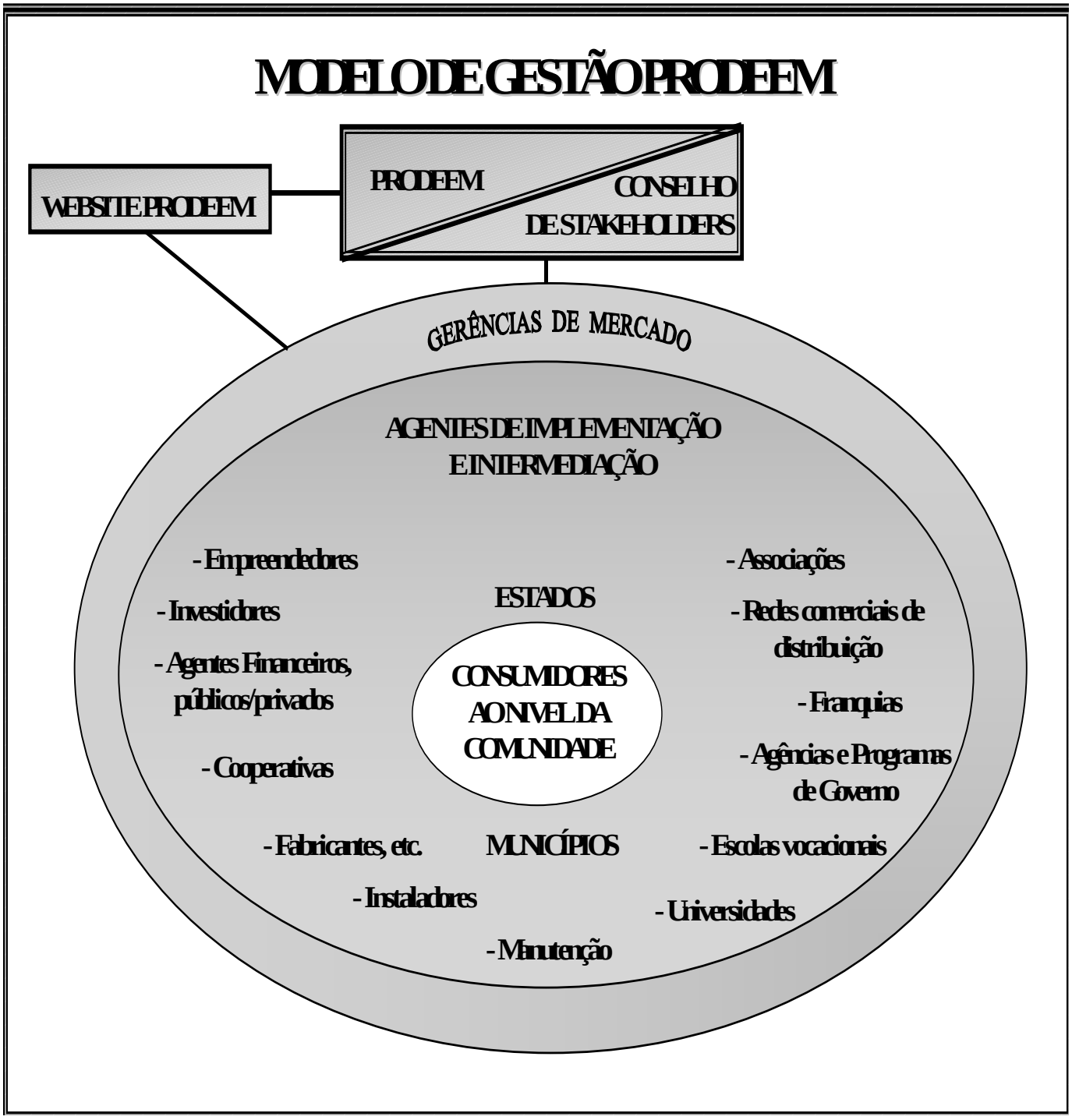
was formally launched in December 1994, at the very end of the Franco Administration, Prodeem was entirely dedicated to meeting the social demand (rural schools, health posts, community centers, churches, etc.) of off-grid communities. However, the sustainability of the Programme depends on it being adopted by the totality of the market (social and economic) in an integrated fashion. This can be accomplished through the engagement of the Implementation and Intermediation Agents (e.g. commercial distribution networks, such as beverages anf liquefied petroleum gas and kerosene; small local businesses, NGOs, electricity concessionnaires and permissionnnaires, energy equipement manufacturers, banks, universities, vocational schools, etc.), which would organized themselves in a variety of business models (the Public and Private Partnerships of the CTM). The Regional Market Management Organizations or Consortia (equivalente to the Executive Function of the CTM framework) would play a crucial role to stimulate the Partnerships to get organized as a number of business models, by surveying information and analyses about the market demand, potential supply of renewable energy, financial schemes, etc. The diagram below, nicknamed the "eye" diagram, illustrates the management framework of Prodeem, which resembles the Flexible Framework of the CTM.

The transition of Prodeem towards the market will require a number of initiatives to mitigate the risks inherent to a programme of the scale of Prodeem and to implement it effectively and at a fast pace: assessment and evaluation of past projects; regional market studies; implementation of regional market management entities; survey of the supply potential of renewable energies in the markets of interest; information, promotion and marketing; Partnerships, especially with other governmental programmes; pilot projects of business models; access to technology, demonstration, research and development, diffusion; broad mobilization of resources and financing, etc; training activities for building human capacity in the many domains of Prodeem.

Crucial for the success of the transition of Prodeem towards the market will be the allocation of the resources of the government fiscal budget that support the programme to leverage meeting the integrated demand from the various business models; to provide counterpart resources to international cooperation (there is much international interest in collaborating with Prodeem, from lending, bilaterals and multilateral organizations); to finance the essential activities required by the transition in the management areas of the programme, technology, information and marketing, Partnerships and training. Government, that is, the Ministry of Mines and Energy, should gradually move away from direct Prodeem operational activities, such as purchase and installation of equipment to meet the social demand, thus stimulating the market to assume the responsibility for the mobilization of the resources necessary to meet the integrated demand of the communities and other off-grid consumers. This would further stimulate the Partnerships, which actually implement energy services for the total market. The resources freed from the fiscal budget and the future fiscal budget proposals would then concentrated on the activities mentioned above, which support the building up of a sustainable market for sustainable energies (photovoltaic, minihydro, wind and biomass) in Brazil. To manage the programme and its accelerated transition towards the market, it is crucial to support the programme management unit (the central Executive Function),

and establish, formally or informally, the Stakeholders' Council of the programme (the Stakeholders' Function). These same structures would transit along the coming 2-3 years towards definitive structures, which would reflect the future institutional organization of Prodeem. However, the biggest risk Prodeem faces is the lack of political will to fully implement the program in the face of competing demands of other markets and programmes, and administrative discontinuities.

PRODEEM/ Energia Para Todos



5.4 The TCAPP Framework in Mexico (TCAPP, 1998)

The Technology Cooperation Agreement Pilot Project (TCAPP) project employs a strategic and collaborative approach (conceptually similar to the Flexible Framework) to facilitate large-scale international investment in clean energy technologies (a set of CTM) consistent with sustainable development needs of developing countries. The countries participating in TCAPP have made significant progress in developing strategies for building sustainable technology markets and have begun to implement actions aimed at mobilizing private investment and donor support to address country-specific technology cooperation needs. TCAPP is currently facilitating voluntary partnerships between the governments of Brazil, China, Egypt, Kazakhstan, Korea, Mexico, and the Philippines. TCAPP's major goals are to foster private investment in clean energy technologies that meet development needs and reduce greenhouse gas (GHG) emissions, engage host country and international donor support for actions to build sustainable markets for clean energy technologies and to establish a model for international technology transfer under the FCCC (such as the Flexible Framework).

The TCAPP Mexico team is led by the equivalent of the Executive Function in the Flexible Framework, in this case, the National Commission for Energy Conservation (CONAE) of Mexico, the leading energy-efficiency implementing agency under the Secretary of Energy, with very active participation of the National Ecology Institute (INE), the Trust Fund for Electric Energy Savings (FIDE), and others (as in the Public and Private Partnerships of the Flexible Framework). CONAE led the prioritization process which resulted in the selection of three technology priority areas (equivalent to energy CTM) that build on current CONAE programs: efficient lighting in public buildings, solar water heating for residential and commercial uses, and improved steam generation and distribution systems. CONAE, in collaboration with other agencies in Mexico, is now initiating implementation of investment actions for these three areas. These investment actions include: developing model Energy Service Company (ESCO) performance contracts and applying these contracts to help develop new public and private sector ESCO projects in collaboration with international and Mexican business partners (the Public and Private Partnerships of the Flexible Framework); expanding the solar water heating pilot program by identifying potential joint ventures or partnerships between Mexican and international solar companies; and assisting in attracting increased investment in steam generation and distribution projects.

5.5 The value and pitfalls of stakeholders' dialogue processes: the case of Soufriere, St. Lucia (adapted from Caribbean Natural Resources Institute, 1997)

Among a plethora of cases that illustrate the recent trend towards participation in decision making and management of implementation of priorities selected, there is the case of devolution of authority over the management of natural resources with reference to the Soufriere marine management area in St. Lucia. "The lessons from Soufriere point to the complexity of processes of devolution and power sharing. They also reinforce the difference between participatory planning processes on one hand and devolution and shared authority on the other. The principal stakeholders (government and civil society)

in Soufriere have gone through the motions of devolving authority over the management of the region's natural resources, notably coastal and marine resources. A close examination of the situation in Soufriere reveals however, that no true transfer of authority and power has occurred and that arrangements are insecure and tenuous at best. The evidence suggests that decision-making and power structures in Soufriere remain concentrated in the hands of government and selected individuals as before. Experience over the past eighteen months has pointed to the need for participatory and transparent decision-making and problem-solving processes." But the experience has been useful to open up the system to allow for input and contributions by all relevant stakeholders. The Soufriere case has yielded lessons that are of broader interest and application. These lessons are:

i) "Devolution can be locally empowering, but it can also create or reinforce local centres of authority or power to the detriment of effective and more equitable power-sharing at the community level;

ii) Effective sharing of authority requires a formal legal basis. However, in the context of a culture of and policy orientation towards centralized authority, arrangements for the devolution of authority are never secure and require continuous adjustment, renegotiation and safeguards;

iii) Processes of community empowerment require more than a legal and institutional basis for sharing authority. The social, cultural, and historic aspects of empowerment are also critical."

6. CONCLUSIONS

- The Convention as a global forum may be too far from the local scene at national/sub-regional levels. Thus, the Flexible Framework appears to be better suited to capture the LAC country/sub-region specific peculiarities and disseminate information about the progress of implementation of the Climate Convention via the national/sub-regional CTM**.**

- It seems that, although the CTM concept may not be entirely new in LAC or elsewhere, its consistent application to the Climate Convention has the obvious advantages of focusing efforts; increasing visibility and transparency; allowing for more interaction among LAC countries and countries from other regions; promoting direct investment, trade, technology transfer and diffusion; measuring the progress achieved and communicating results to Parties and to the world.

- The successful implementation of the CTM in the context of the Flexible Framework requires political will and continuity of climate policies built upon the consensus of the relevant stakeholders, irrespective of the administration in power at any time.

7. SUGGESTIONS

- LAC Parties to the Convention should consider the CTM as an explicit and transparent approach to focus on practical responses to climate change challenges and opportunities. The Flexible Framework could serve the Parties as a means of managing domestic CTM and promoting technology transfer and diffusion through the interaction between the CTM frameworks of developed and developing countries, respectively.

- The LAC Parties should discuss the testing out the CTM and the Flexible Framework approaches on a pilot scale, including the roles of the national climate focal points and a coordinating/stimulating function for UNDP.

- The Parties of LAC could ponder the prospects of organizing existing information resources, in their respective countries/sub-regions, as a LAC CTM Information Network, to test these ideas and diffuse them to other regions of the world, in case of success.

- The Parties, developed and developing, within and outside LAC, could consider doing more with respect to public domain or publicly owned technologies, especially in cases where adaptation technologies and the required capacity building are involved.

- The Parties of LAC could publicize their CTM by reporting on the progress of implementing them via the national communications to the Convention.

- The LAC Parties could explore in depth the possibilities offered by the Flexible Framework approach in generating creative financing mechanisms to support the implementation of their respective CTM, including a specific role for the Global Environment Facility in technology transfer and diffusion. This exploration would combine social, economic and environmental benefits, at local and global levels, with climate related projects, such as, for instance, the international trade of renewable fuels and technologies for transportation.

ACKNOWLEDGEMENTS

Thanks are due by the author, who is solely responsible for this paper, to the following, who contributed information and analysis in varying degrees: Walter Arensberg (Chief, Environment Division, Inter-American Development Bank), Ron Benioff (TCAPP/NREL), Patrick Karani (formerly at the World Bank), Howard Klee (formerly at AMOCO), Carlos Mancilla (Director Nacional, Proyecto Cambio Climático Guatemala), Paul de Mandeville and Annie Roncerel (UNDP), Luis R. Paz Castro (Director, Ministry of Science, Technology and Environment, Cuba), Richard Meganck, Claudio Volonte and Mark Lambrides (OAS), José Domingos Gonzalez Miguez (MCT, Brazil) and Haiyan Qian (UNDESA).

Fig. 1 FROM SUSTAINABLE DEVELOPMENT TO CLIMATE TECHNOLOGY MISSIONS

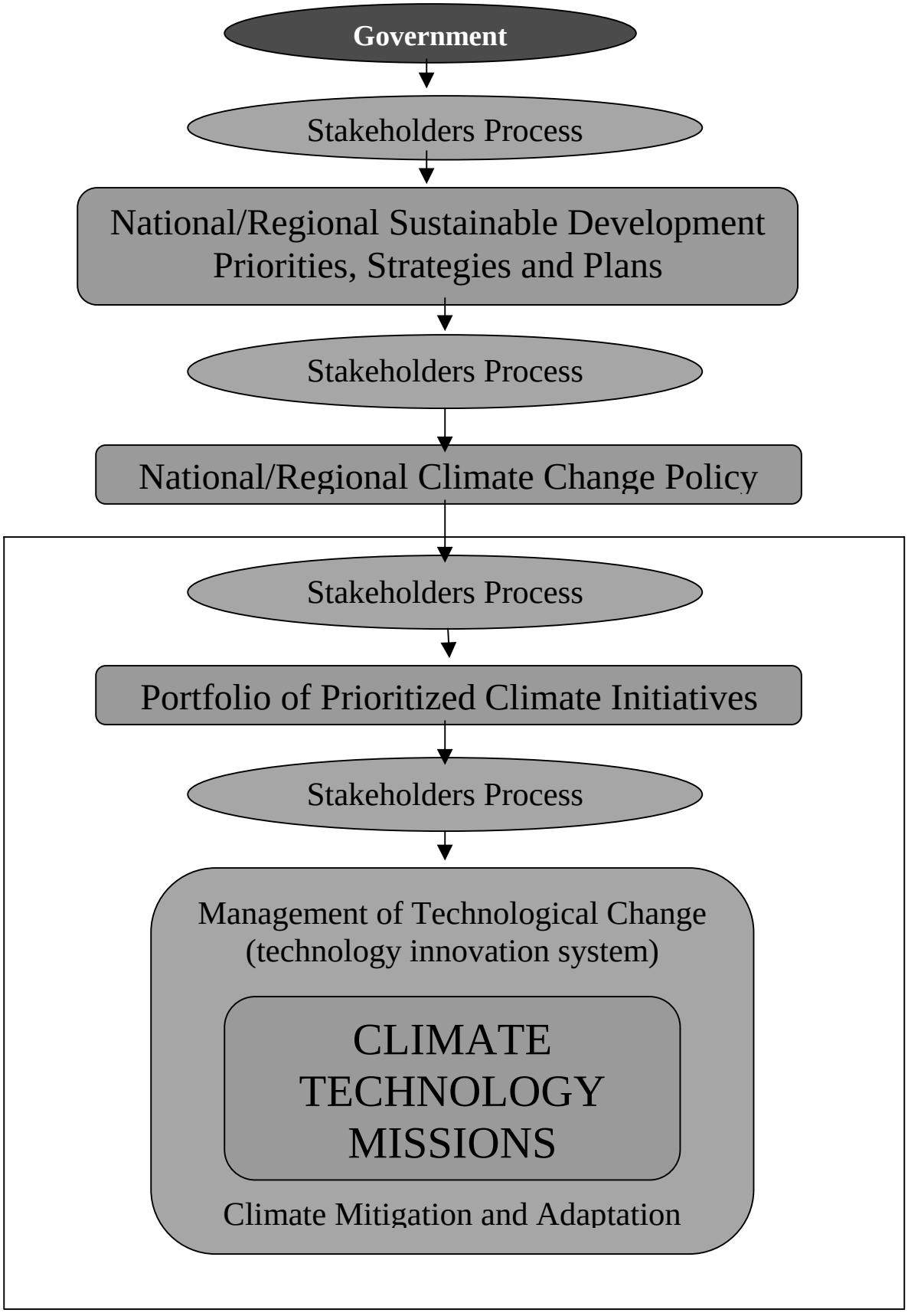
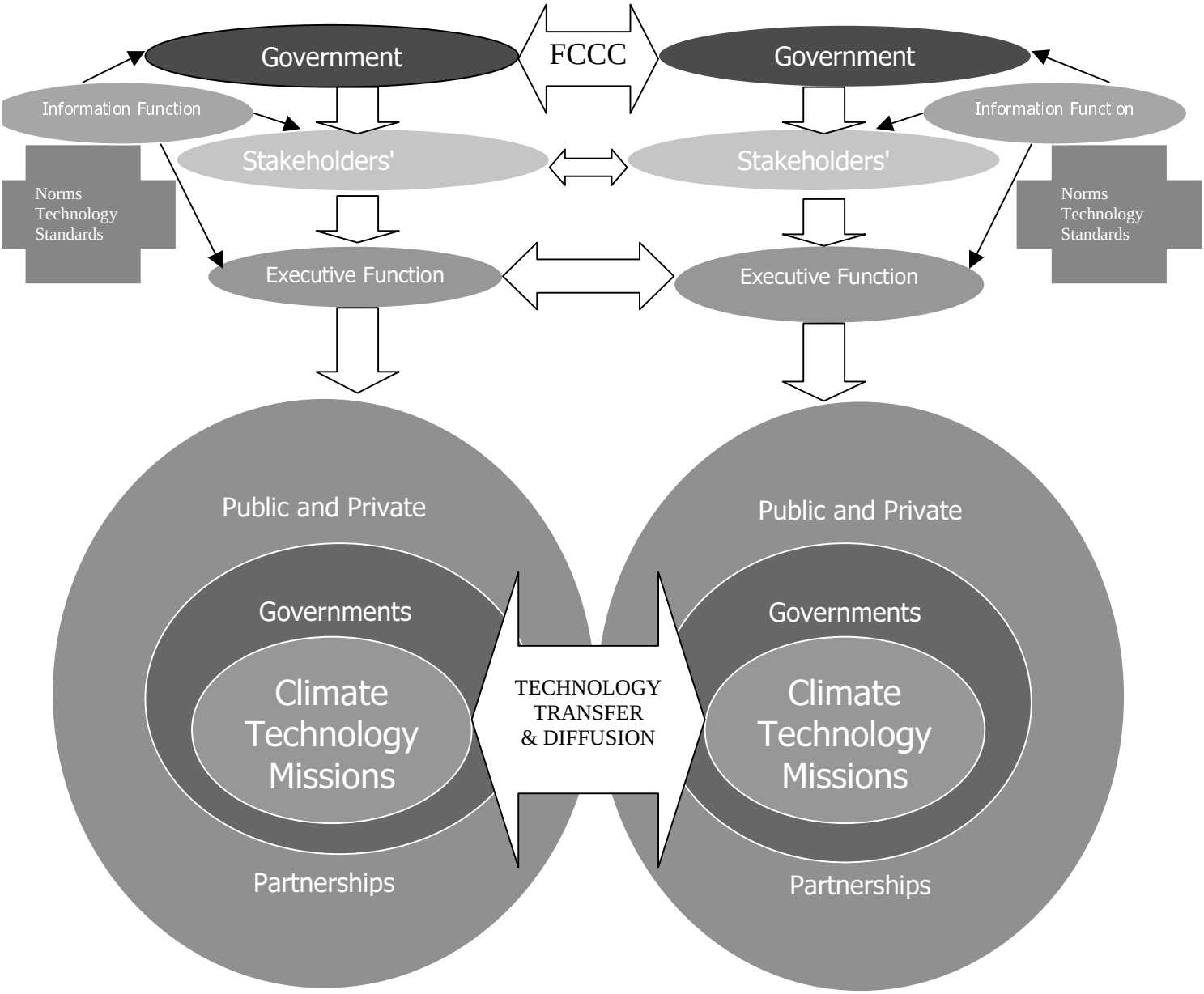


Fig. 2 FLEXIBLE FRAMEWORK FOR CLIMATE TECHNOLOGY TRANSFER IN LATIN AMERICA AND THE CARIBBEAN



LAC Country or Sub-Region

Developed Country or Group of Countries

ANNEX I

TECHNOLOGY TRANSFER AND AGENDA 21

Agenda 21, adopted in June 1992, offers one of the first recommendations on public policies to promote technology transfer aiming at environmental objectives. These recommendations reflect not only the need for hardware but also the importance of developing local capacity and providing market intermediation.

The strategies sketched include:

a) National, sub-regional, regional and international information networks and clearinghouses to disseminate information, provide consulting and training;
b) governmental policies building up conditions favorable to access to and transfers of technology in the public and private sectors;
c) institutional support and training to build capacity to assess, develop and manage new environmentally sounder technologies;
d) collaborative networks among technology research and demonstration centres;
e) international cooperation and assistance in research and development and capacity building;
f) build technology assessment capabilities in developing countries through international and private sector organizations;
g) long-term collaborative arrangements between private enterprises, including partnerships, foreign direct investment and joint ventures.

ANNEX II

CRITERIA FOR EFFECTIVE TECHNOLOGY TRANSFER

For technology transfer to be considered effective, several pre-conditions must first be met. The following criteria and categorisation emanate from box 2 of the IPCC Technical Paper I (IPCC, 1996), and from the preparatory process of this special report. The sectoral chapters and the case studies have by and large adopted these criteria as indicated in section 6.2, in their respective analyses of the material presented. The criteria can be grouped into four categories, namely, (1) GHG and environmentally-related; (ii) economic and socially-related; (iii) administrative, institutional and politically-related; and (iv) process-related:

1. GHG and Other Environmental Criteria

GHG reduction potential

Tons of carbon equivalent; percent of IS92a baseline and range (IS92c-e).

Other environmental considerations

Percentage change in emissions of other gases/particulates; biodiversity, soil conservation, watershed management, indoor air quality, etc.

2. Economic and Social Criteria

Cost effectiveness

- average and marginal costs must be estimated and compared to alternative options
- benefits of technology transfer must exceed its costs

From the buyer's perspective, especially for enterprises in the private sector with incentives to maximise profits or increase shareholder value, the benefits of a technology must exceed its acquisition costs. The perceived risk of the technology may play an important part in the benefit-cost calculation. For example, companies usually employ risk weighting to adjust the discount rate that they use for calculating costs and benefits associated with specific projects.

- price and conditions must provide incentives to seller

Suppliers of technology will only be willing to sell their technology if they perceive that the price received for it exceeds the costs of supply. For sellers of proprietary technology, the lack of patent protection may make this condition difficult to meet. In these situations, the suppliers of technology may believe that there is a risk of their technology being copied without payment, resulting in an inability of the supplier to recoup the costs incurred in research, development, commercialisation and profit. Suppliers must perceive

the conditions associated with the terms of transfer to provide them with sufficient incentive to sell the technology.

Adequate financing

There must be adequate financing available to ensure the transfer of technology. The financing can be in the form of commercial bank loans, capital provided through the equity markets, or any one of a number of new and innovative financing schemes. In addition, financing could be provided by public sector organisations such as countries' ODA, the GEF, or the IFC.

Once the terms of transfer have been agreed upon and financing has been identified, the success of the transfer can be measured using a series of performance indicators. Factors that could be evaluated include:

Project-level considerations

Capital and operating costs, opportunity costs, incremental costs must be estimated and compared to alternative options.

Macroeconomic considerations

GDP change, jobs created or lost, effects on inflation or interest rates, implications for long-term development, foreign exchange and trade, other economic benefits or drawbacks.

Equity considerations

Differential impacts on countries, income groups or future generations.

3. Administrative, Institutional and Political Criteria

Information about technology

Buyers require accurate, balanced, and comprehensive information about the technologies they are considering acquiring. Information costs money. The costs to generate useful and useable information about technologies can be costly but, once developed and in the public domain, helps to reduce the buyer's costs. While difficult to measure its effectiveness, the wider dissemination of information about technologies can assist in the more rapid transfer of technology. Dissemination about the various pathways for transfer could also help reduce the costs of negotiating terms of transfer.

Access to technology

Buyers must have access to technology. There are various impediments that sometimes limit the buyers' access. In some instances, the obstacles may involve patent restrictions,

whereas in others it could be the high level of technical know-how and costs that limit the diffusion of the technology. While in others market restrictions can be important barriers.

Administrative burden

Institutional capabilities to undertake necessary information collection, monitoring, enforcement, permitting, etc.

Political considerations

Capacity to pass through political and bureaucratic processes and sustain political support; consistency with other public policies.

Replicability

Adaptability to different geographical and socio-economic-cultural settings.

4. Process-related Criteria

Market penetration

Rate of indigenisation; geographic extent of penetration and impacts on other technologies and ancillary benefits

Long term institutional capacity building

- flexibility and capacity to adapt technology to changing circumstances and to sell back to original provider with improvements
- capacity of local staff and long-term financing
- improvements in training and management practices

Monitoring and evaluation of continuous delivery of services provided by technology and adequate financial performance

- continuous delivery of services provided by technology
- comparison of actual and intended benefits
- performance of technology
- quality of benefits
- satisfaction of beneficiaries
- distribution of benefits (equity)
- maintenance and service of equipment
- adequate financial performance
- payback period
- financial rate of return
- net present value

Leakages that reduce the impact of programme or measure

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