Information, data or knowledge?

Supporting technology transfer under the Climate Convention

Peter Noel Pembleton

The United Nations Framework Convention on Climate Change (UNFCCC) has opened up vast opportunities for the development and transfer of climate-friendly technologies. Any successful transfer between nations, however, would require a favourable and barrier-free technology transfer information service régime. This in turn would involve the assessment of technology needs, and the establishment of technology information systems and centres, technology service portfolios, and so on. This article discusses the information services required for climate-friendly technology transfer. It also looks at UNIDO's activities related to technology transfer.

Dr. Peter Noel Pembleton
Industrial Development Officer
United Nations Industrial Development Organization (UNIDO)
Vienna International Centre
P.O. Box 300
A-1400 Vienna, Austria
Tel: (+43-1) 26026 3705
Fax: (+43-1) 21346 3705
E-mail: p.pembleton@unido.org

Background

The 7th Conference of the Parties (COP7) to the United Nations Framework Convention on Climate Change (UNFCCC) adopted the 'Marrakesh Accords', that were the culmination of many years of negotiations on the components of the 'Buenos Aires Plan of Action'. The latter included the inter-related issues of capacity building, technology transfer and the Clean Development Mechanism (CDM) of the Kyoto Protocol.

With the conclusion of COP8, recently held in New Delhi, and the increased pace of ratification of the Protocol in 2002, the age of the carbon market is almost upon us. There is an increased sense of urgency in the air, especially in relation to implementation issues, and this carries with it the need for increased awareness and knowledge for those stakeholders that have been outside the negotiation process. This, in turn, points to the need for improved flows of many types of information, both to the private sector in general (in both developed and developing countries) and between private sector representatives (to and from developed and developing countries).

There are many sources of information already available on the Convention, on climate-friendly technologies and on activities related to both. An increasing amount of this information is in electronic form and accessible from Internet sites; the Internet itself is becoming more accessible in developing countries, albeit still mostly in selected institutions in capital cities. The large volume of information and information

facilities already available is no doubt necessary. The author believes, however, that the availability of information by itself is not sufficient as we move from negotiation forums to implementation of specific technological solutions, because the latter will either mitigate or help adapt to climate change or help to reduce the costs of complying with the Kyoto Protocol and its Clean Development Mechanism.

This article will take a look at some of the issues that the author feels should be addressed in order to move from an information-based to a knowledge-based approach, if we are to implement measures to achieve the objectives of the Convention and its Protocol. The focus will be upon private sector interventions, more specifically referring to industry and the types of assistance that will be required in non-Annex I host countries. Throughout the article, the reader should keep in mind that, for this target group to benefit from the CDM, the following additional issues must also be addressed, issues that are all dependent upon sufficient flows of appropriate information and well-functioning data collection, processing and management facilities:

- Identification and removal of barriers to technology transfer;
- Provision of an enabling environment for, and involvement of, the private sector;
- Assessment of technology needs and determination of appropriate solutions; and
- Provision of technical advice on all processes of technology transfer.

Technology information

The subject "technology information" (data collection, access and provision and systems of support) is frequently referred to in discussions on transfer of technology because the two issues are so closely related as to be inseparable in operational terms.

For instance, information is required for each of the various processes that constitute "technology transfer". These are:

- Identification of needs;
- Assessment of options;
- Selection of the most appropriate solution;
- Acquisition of a technology; and
- Application (and possibly adaptation and absorption) of a technology.

More importantly, this information must be accompanied by locally available expertise:

- In the specific sectors of the programmes or projects;
- On the technologies in question; and
- In the processes involved.

However, both under the Climate Convention and in other forums, "technology information" has frequently been handled as a separate issue, treated in isolation from the technical support requirements needed to move from *information* to *knowledge* and then from *knowledge* to *application* of particular solutions. Therein lies a danger, as the focus is shifted away from the subject of "technology", with all of its technical implications, to that of "information", where the accent is upon data access, data systems, clearing houses and dissemination mechanisms and, more recently, the Internet. The author feels that such information systems alone, without matching facilities and abilities to transform data and information into locally applicable knowledge, will not be sufficient when the private sector becomes fully involved in climate-relevant activities, as the focus must shift to the application of data and information to specific problems (sector-, site-, technology- and project-specific).

It is at these levels that the needs of non-Annex I countries need special attention. For them, "technology transfer issues are complicated and site- and technology- specific"; and therefore there is a need for instruments that provide a "sufficient level of detail that would help ... to really ascertain developing country technology needs in order to achieve concrete results."[1]

Information systems and centres

The following question must be posed when considering the application of technology and information:

Is the development and/or enhancement of technology "information centres" *per se* appropriate for technical issues, such as those that need to be dealt with by the private sector in developing countries?

Frequent reference has been made in the official documentation of the Climate Convention to existing stores of technology information and existing technology information centres (national, regional and international). However, most of the technical and economic information likely to be required is located in developed countries, while those information centres in non-Annex I countries that may have access to some of this information are not necessarily able to put it to effective use beyond their own walls.

In the author's experience, generalized environment-focused and even industrial information centres have proven unsustainable, as private sector clients need much more than what "traditional" information centres, i.e. centralized reference-services (library-type, bibliography-focussed) can supply. Such centres abound and there is an increasing number of networks of national and/or regional focal points with wide subject-coverage. In addition, many organizations have initiated Internet-based information provision facilities in the last few years in the belief that this will provide what is needed to facilitate the transfer of required technology.

Such systems, however, are, by their very nature, static. What is really required are dynamic, user-oriented, "local" systems to deliver to clients what they really need, that is, to convert data and information into knowledge of what will best solve their specific technological problems through "processed and competently assessed" technical and economic information tailored to needs specific to their country, sector, technology, project and site.

These needs can only be determined by sector/technology experts, who will require access to a range of data, information, tools and methodologies to assist with technology assessment (generic as well as process-specific) and the other components of the processes of technology transfer.

Towards a knowledge system

This means we are already shifting our paradigm and are thinking more in terms of a *knowledge* than of an *information* delivery system. The former requires a mix of technical, diagnostic, economic, legal and information skills to address problems at the root level where they occur. For the industrial sector, for

example, such a system will need to identify:

- Technological problems (needs) of a factory through audits;
- Most suitable and available technologies that may address these needs;
- Particular solution (s) that can be recommended, which may require adaptation to actual circumstances; and
- Impacts (on the environment and the economic viability of the facility).

In addition, the system will, *inter alia*, need to have:

- Information management and delivery skills to collect and store national data and to access and package the international and local data required;
- Marketing skills to promote needs assessments in the first place;
- Regulatory powers to establish the framework for, and to encourage industry to adopt, more efficient and cost-saving practices; and, not least,
- Access to financial agents to go beyond analysis and problem identification to actual implementation of solutions.

From the above, it is clear that such a system cannot be undertaken by either an information centre or even any single technology centre alone. Therefore, especially in non-Annex I countries, there is an urgent need to establish *strategic alliances of stakeholders and "knowledge centres"* (or "virtual" centres) and link these into regional and/or international "knowledge networks".

According to the International Institute for Sustainable Development (IISD) a "knowledge network" would assist not only "to create new knowledge, but also to accelerate the application of that new knowledge to economic or social development".[2]

As mentioned before, past consideration of "technology information" has mostly concentrated on traditional approaches to data management and dissemination, with little thought being given to the application of data to specific problems. The latter requires a different approach from that of a traditional information system, one that needs technically oriented institutions and experts as much as information specialists. Therefore, in the context of technology transfer for the Mechanisms of the Kyoto Protocol, the concept of national *knowledge* centres and systems is more appropriate than that of *technology information* centres and systems.

In this concept, like-minded knowledge centres (whether national, regional or international) are connected to create "virtual centres" (or otherwise interlinked "knowledge networks"). Such centres, that have similar interests in a specific aspect of the Clean Development Mechanism, could benefit from such inter-linkages that will[2]:

- "Create and disseminate new knowledge", rather than just provide access to existing sources of information (i.e. a dynamic rather than a static system). Such knowledge would be applied to assisting with development problems, preparing new policy instruments, developing new products and services, etc.;
- Distribute the knowledge widely and make it available to the global community;
- Have a "structure" to "maximize the rate at which new knowledge is discovered";
- Provide "clear, recognizable and direct benefits" to its stakeholders (i.e. the application of the results for the immediate benefit of the stakeholders). For instance, business and industry, as key stakeholders to the CDM, are unlikely to become involved if they cannot see a clear benefit;
- Be "formally" organized and managed, with well-qualified participants. All interested and affected parties, at all levels of society, should have a voice within the network;
- Have a "well-developed communications strategy"; and
- "Transcend boundaries", i.e. political, national, institutional and sectoral areas of competence.

Figure 1 shows potential national stakeholder groups for industry that include policy makers, industrial institutions, bodies representing public interest, academic and technical facilities, financial institutions, and business and trade. These stakeholder groups could either contribute to (as resource centres) or benefit from (as end users) the processes involved in technology transfer, and thereby function as partners in a knowledge network according to their own particular comparative advantage and to the mutual 'benefit' of the system.

There will need to be a small coordinating body or secretariat (the "virtual centre" box), into which international sources of information and business and investment contacts should flow and to which all the partners of the network relate in one fashion or another.

What type of data?

A knowledge-based system goes well beyond what traditional reference information centres can provide. However, this does not mean that there is no role for such centres. Traditional information systems could, for instance, provide access to generally available publications and reference manuals, from which sectoral experts can obtain *benchmark data*[3] - knowledge of the sector based on case studies or reports on best-available technologies (BATs) from suppliers and literature references.

This sort of data can be provided by a variety of information and/or technical service intermediaries in a variety of formats, through a variety of means. Such information requires technical knowledge for digestion and application!

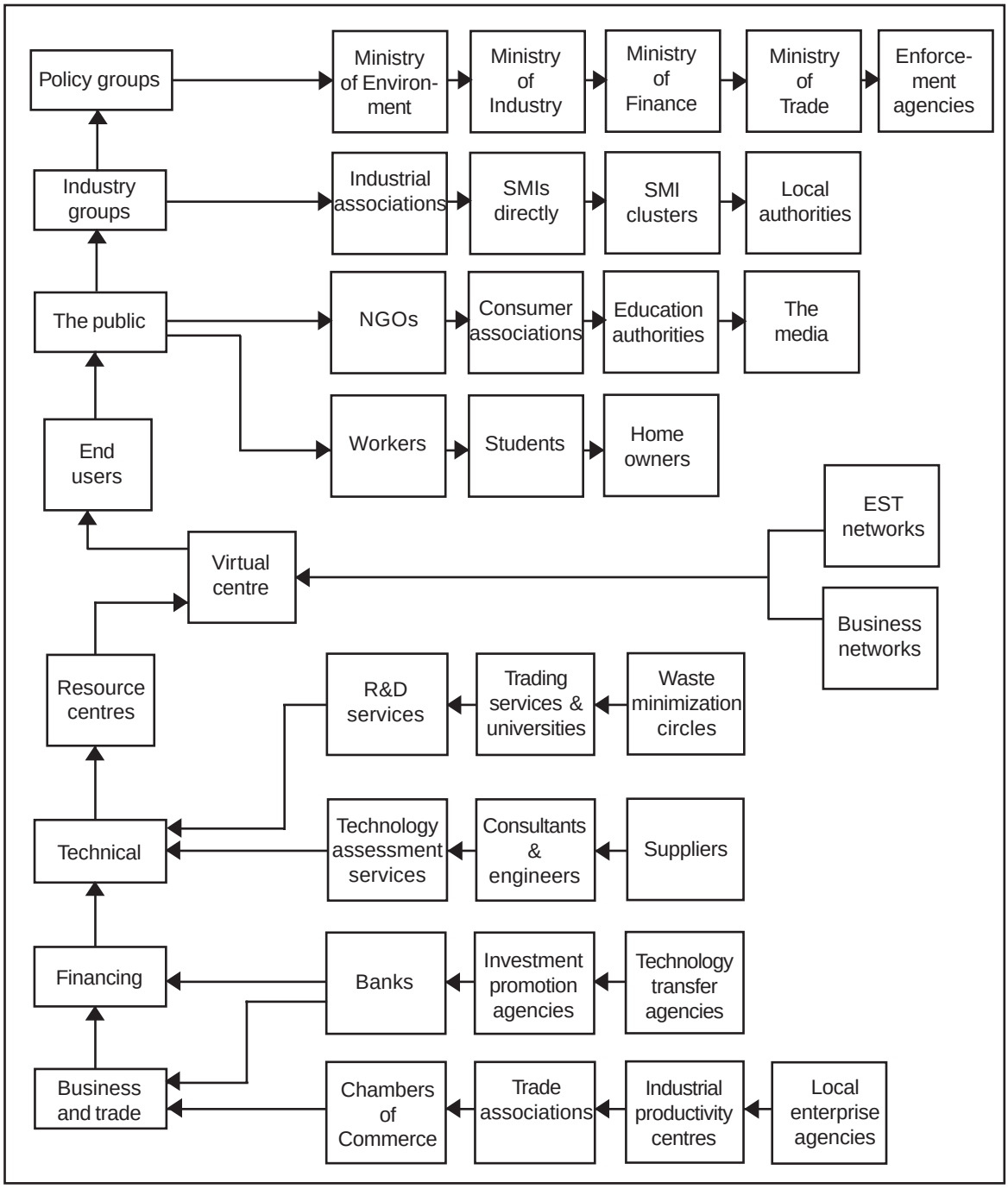
However, before utilizing any "benchmark data", sectoral experts need to obtain, from an industrial enterprise, *baseline data*[3], collected through monitoring and auditing of a plant. This will comprise essentially materials balances from unit operations and processes and a review of the technology (hardware and software) as applied in the plant. Such data can only be collected and processed by technically proficient sector specialists, as opposed to information professionals.

Figure 2 presents a schematic diagram of the concept "data to knowledge", concentrating on the main sources of benchmark and baseline data for technology needs assessments.

The concept requires both benchmark and baseline data to be channelled through a "decision-support" system[3] (this can be an expert, a consultancy or research body, or a more advanced expert system), which will result in a set of options to be presented to the decision-maker for action.

As the types of support required for these processes will not be available for all relevant sectors in any one institution, a network of extension and other

Figure 1: Potential stakeholders



technology-related services is again called for.

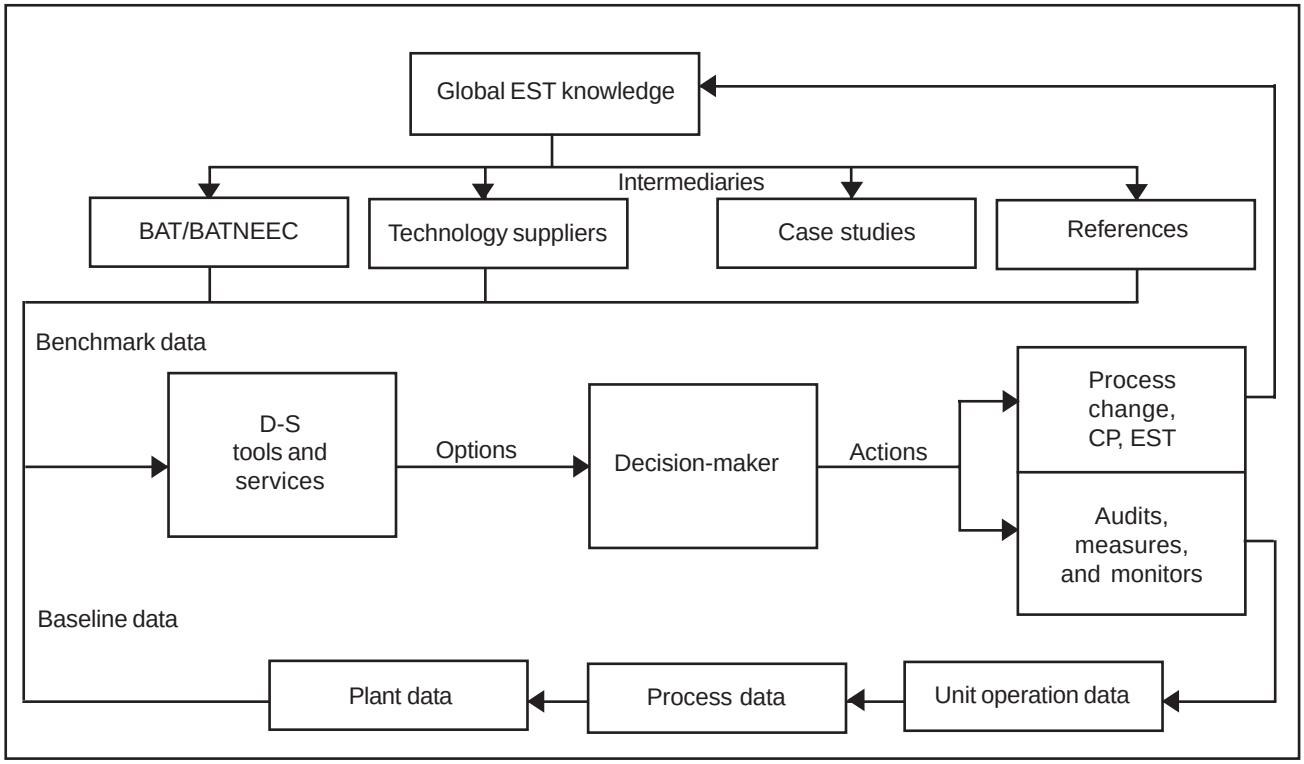
Technology services

As mentioned previously, there are a number of technology-related services required for the successful transfer of technology to UNFCCC non-Annex I countries, and each of these requires information system support. Figure 3 shows some of the other types of data and information related to such services that should be provided by different intermediaries, such as:

- Contacts with technology suppliers (technology and reference services);
- Training opportunities (reference services);
- Means of financing or obtaining investment (investment and business services); and
- R&D (academia and industrial research bodies), etc.

Such services are best available nationally, not regionally or internationally, although regional or international centres may provide input to the processes.

Figure 2: Data flows for decision-making



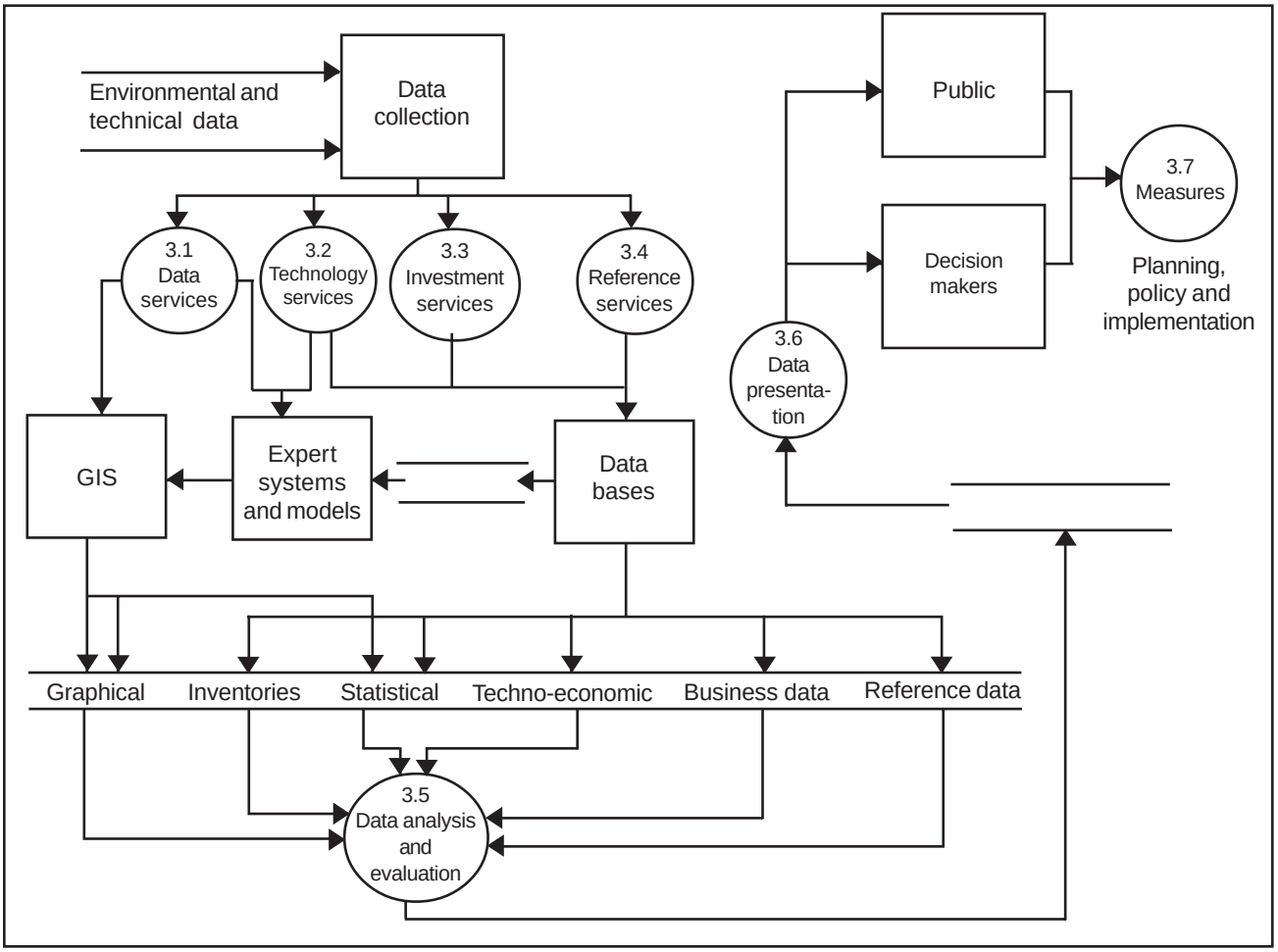
UNIDO experience

UNIDO has supported the creation of national industrial technology centres, national and regional energy and environmental information systems, and regional and international technology networks. The experience gained through those activities would be useful to assist non-Annex I countries in building their capacity and implementing projects that will "enable" the transfer of technology under the Clean Development Mechanism.

The list below presents an outline of UNIDO's services relevant to technology transfer, the UNFCCC and the Kyoto Protocol:

- Technology centres established:
  - International Centre for Science and High Technology (ICS) in Trieste, Italy;
  - Centre for the Application of Solar Energy (CASE) in Perth, Australia;
  - International Centre for Small Hydro Power, in Hangzhou, China;
  - International Centre for Hydrogen Energy Technology in Turkey; and
  - International Centre for Genetic Engineering and Biotechnology (ICGEB) in New Delhi, India.
- Energy and environmental networks established:
  - National Cleaner Production Centres (NCPC) programme in cooperation with UNEP (currently 14 countries worldwide);
  - Environmental Technology Advisory Centre and Network (ETAC) in the Philippines; and
  - Industrial Energy Conservation Network in Eastern Europe (9 sectors and 14 countries).
- Technology assessment services:
  - Preliminary inventory of industrial technology options;
  - Links between technology centres and industry;
  - Providing advice on the management of technology and innovation; and
  - Helping industry choose the right options to increase competitiveness.
- Investment promotion network and services:
  - International network of Investment Promotion Offices (IPOs);
  - Assistance in identifying and brokering international partnership opportunities;
  - Assessing co-operation options;
  - Evaluating offers;
  - Formulating agreements;
  - Facilitating negotiations;
  - Constructing financial proposals; and
  - Applying for credit from national and international funding bodies and capital providers.
- Technology negotiation services:
  - Guidelines and assistance on build-operate-transfer (BOT) mechanisms;
  - Support to international business partnerships;
  - Training in negotiating skills;
  - Training on the preparation, negotiation and operation of industrial partnerships such as joint ventures and strategic alliances; and
  - Support to drafting appropriate contracts.
- Tools:
  - Computer model ('Identify') for assessing the costs and benefits of industrial greenhouse-gas mitigation strategies;
  - Computer model (COMFAR) for Feasibility Analysis and Reporting;

Figure 3: Other possible information services



- Manuals for the preparation of industrial feasibility studies and the evaluation of industrial projects;
- Manual on Technology Transfer Negotiations, a training kit for practitioners and the training of trainers; and
- Manuals and guides on joint ventures and strategic business alliances.

Several of the foregoing initiatives are directly relevant to issues under consideration in the Convention, the Protocol and the Clean Development Mechanism and could readily be brought into that context. Some have already become involved. Other aspects of UNIDO's programmes require some additions or modifications to take into account the climate perspective.

The Parties to the Convention, especially those that realize that industrial issues need to be addressed would do well to consider involving UNIDO in future debates and activities, as the organization has much to recommend it to the climate community.

References

1. FCCC/CP/1998/Misc. 5, Development and transfer of technologies, submission by Parties.
2. *Formal Knowledge Networks, A Study of the Canadian Experiences*, IISD, 1998.
3. *Working Paper on Information Networking for SMIs*, input to the Environmental Technology Assessment System (ETAS) project for the Philippines, Pembleton, P., UNIDO, August 1997. ❑

Note: *The views expressed in this article are those of the author and do not reflect an official position of UNIDO.*

Energy Technology Data Exchange (ETDE) Databases

Energy Technology Data Exchange (ETDE), a programme of the International Energy Agency (IEA) has developed ETDE World Energy Base (ETDEWEB), a tool for disseminating the energy research and technology information.

For more information, contact:
ETDE Operating Agent, P. O. Box 1000, Oak Ridge, Tennessee 37831, USA
Tel: (+1- 865) 576 1272; Telefax: (+1- 865) 576 2865; E-mail: info@etde.org; Web: http://www.etde.org