Asia-Pacific
Economic Cooperation

APEC 21st Century Renewable Energy Development Initiative (Collaborative I):

Workshop on best practices in energy efficiency and renewable energy in buildings

Mexico City, October 16-17, 2008

Proceedings, results and proposals

APEC Energy Working Group

APEC Expert Group on New and Renewable Energy Technologies (EGNRET)

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Table of Contents

Background

The building sector has major impacts not only on economic and social life, but also on the natural and built environment. Various building activities, such as the design, construction, use, refurbishment and demolition of buildings, directly and indirectly affect the environmental performance of the sector.

In the world and particularly in the APEC economies, the building sector (including households, office and commercial buildings) accounts for around 25-40% of final energy consumption and represents an important contributor to global greenhouse gas emissions (nearly 30% of global GHG emissions). Also buildings generate close to 40% of total waste.

Moreover, buildings are one of the most fast-growing sectors, increasing its demand of energy, raw materials, services and goods.

Other attributes of the building sector is that national building industries are diversified and fragmented in a number of subsectors, which implies a number of barriers to be addressed in terms of lack of flexibility to change and decision-making to take new directions on the adoption of more sustainable, energy-efficient and environmentally sound technologies and measures.

As a general rule, building design does not include detailed assessment and analyses of the most environmentally sound or energy-efficient measures which will provide the same confort of its occupants.

Usually, the most energy-consuming measures are incorporated in building design. These conventional design and architectural decision have determined that buildings' operation costs during its entire lifecycle increases significantly over the past few decades.

However, current economic conditions, environmental and global trends demand an urgent transition to building and design technologies which incorporate new and renewable energy measures to be applied in buildings without affecting the confort buildings provide or its operation conditions.

In this sense, sustainable-driven measures for buildings are not to be seen only from the designer or operator's perspective. Sustainable buildings should be the result of a wide variety and intersection of policies, regulations, information resources, technology applications and decisions of relevant stakeholders, such as architects, engineers, designers and governmental authorities.

The APEC EGNRET-EERE Workshop on best practices in energy efficiency and renewable energy in buildings was held on October 16-17, 2008 in Mexico City.

The objective of workshop was to provide APEC decision makers with recent advances in the best practices for energy efficiency and renewable energy in buildings. Many APEC economies are experiencing a growth in construction and this will have direct implications in their energy consumptions for decades to come. The workshop underlined opportunities to reduce the consumption of energy in residential, commercial, industrial and public buildings.

It brought together experts who have been involved in developing financial and technical schemes so that APEC planners and policy makers can benefit from their experiences in learning about opportunities and challenges in the energy consumption of buildings.

The topics reviewed includes insulation and construction materials, energy efficient design, analysis of positive externalities, financial mechanisms, regulations and construction codes and the application of energy-efficient and renewable devices and technologies for buildings.

This document provides a written record of recent advances in the best practices for energy efficiency and renewable energy in buildings resulting from the discussions of the workshop.

The workshop was held in line with both EWG and APEC-wide priorities and links with many complete projects of the APEC Expert Group on New and Renewable Energy Technologies (EGNRET).

The results of the workshop and the proceedings of the discussion also are intended to provide guidance to the short-term and long-term aspects of the APEC Energy Security Initiative by supporting the development of energy efficiency and renewable energy systems across all time frames.

The workshop also supports the EWG's commitments to the WSSD under its Type II Partnership Initiative "Fostering Regional Energy Cooperation in APEC: Energy for Sustainable Development".

Workshop structure

The workshop brought together several experts from the building industry and government agencies in charge of promoting energy efficiency and renewable energy policies and measures in the buildings' sector.

The two-day workshop comprised six discussion sessions which covered issues concerning environmental impact on buildings, standards and regulations, sustainable buildings perspectives, sustainable urban planning, among others.

These sessions were developed under a roundtable structure which considered the discussion and analysis of expert participants on specific questions. Particular emphasis on some programs and experiences of the APEC economies was made in specific presentations which also highlighted and provided details on some technologies and practices developed in the Asia-Pacific region concerning energy efficiency measures and renewable energy use in buildings.

The workshop agenda included the following topics:

APEC EGNRET EERE Workshop on best practices in energy efficiency and renewable energy in buildings
Mexico City, October 16-17, 2008.
Agenda

Day 1 – October 16, 2008.

09:30-10:00	Opening session	• Jorge Wolpert, Conae, Mexico • Cary Bloyd, APEC EGNRET-EERE
Energy and buildings		
10:00-12:00	Environmental impacts of buildings	• Gloria García, Mexico's Ministry of Environment and Natural Resources • Jorge Wolpert, Mexico's National Commission for Energy Conservation (Conae) • Aurelio Ahumada, Ecored, Mexico. • Alejandro Nyssen, Mexico City's Government, Ministry of Environment • Edgar Villaseñor, ICLEI
12:15-14:15	Standards and regulations for sustainable buildings	• Felipe Vázquez, North America Commission for Environmental Cooperation • Agustín García Gallegos, Cien Consultores, S.C., Mexico • Harry Misuriello, American Council for an Energy Efficient Economy, United States • Norberto Orcullo, De La Salle University-Dasmariñas, Cavite, Philippines • José Picciotto, Architect, Mexico.

16:15-18:15	Perspectives of sustainable buildings	• Hernando Guerrero, Ministry of Environment, Mexico • Victor Manuel Borras, Institute of the National Housing Fund for Workers (Infonavit), Mexico • Pablo Moreno, National Association of Appliance Manufacturers, Mexico

APEC EGNRET EERE Workshop on best practices in energy efficiency and renewable energy in buildings
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Agenda

Day 2 – October 17, 2008.

Best practices		
09:30-11:30	Elements of a residential household	• Evangelina Hirata, National Housing Commission, Mexico • Jorge Calvillo, private Architect, Mexico • Raul de Villafranca, Mexico • Guillermo Guzmán, Chile
11:45-13:45	Sustainable buildings	• Raúl Huitrón, BIOMAH, México • Marco A. Villanueva, ASINTELIX, México • Philip J. Paevere, CSIRO Sustainable Ecosystems, Australia • Javier Presas, HOK, Mexico.

15:45-17:45	Sustainable urban planning	• Eduardo Terrazas, Urban Architect, Mexico • Jorge Ponce, Urban Architect, Mexico • Alejandra Rangel, Centre for Sustainable Transport, Mexico • José M. Di Bella, Mexico.

Day 1: Energy and buildings

The first day of sessions of the workshop comprised three sessions devoted to the following issues:

1. Environmental impact of buildings
2. Standards and regulations for sustainable buildings
3. Perspectives on sustainable buildings

The following elements resulted from the discussion sessions:

1. Environmental impacts of buildings

The session focused on the main elements which should be considered in terms of the environmental impact buildings have in terms of its design, construction and operation, and the views different public and private organizations have on this subject.

In this sense, different opinions were presented, considering the perspective of Mexico's federal government (Conae and Mexico's Ministry of Environment), a local authority –the Mexico City government-, and the viewpoints of NGOs and developers related to sustainable buildings and architecture.

The session panel was integrated of representatives of the Mexican government, namely the Ministry of Environment and the National Commission for Energy Conservation, local authorities' representatives (Mexico City government) and non-governmental organizations operating in Mexico on issues related to the effective application of energy-efficiency and renewable measures in buildings:

- Gloria García, Mexico's Ministry of Environment and Natural Resources
- Jorge Wolpert, Mexico's National Commission for Energy Conservation (Conae)
- Aurelio Ahumada, Ecored, Mexico.
- Alejandro Nyssen, Mexico City's Government, Ministry of Environment
- Edgar Villaseñor, ICLEI

The Mexican programs to reduce environmental impacts of buildings

A presentation was made to provide some details on the programs the Mexico's Ministry of Environment is developing to minimize environmental impacts of buildings.

The main actions which are being considered by the Mexican government are:

1. Efficient lighting program
2. Methodological handbook for the use of energy-saving and water conservation technologies in low income houses.
3. Agreement to create the Sustainable house program between the ministries of Energy and Environment and the National Housing Commission.
4. Sustainable buildings promotion programs.

Other important element to be considered from the Mexican experience is the fact that building energy consumption has several environmental impacts throughout its life cycle. In this sense, a number of Mexican agencies support the development of an interdisciplinary work considering the above mentioned initiatives, which includes both public and private institutions as well as technical and financial oriented entities.

The importance of stakeholder involvement and awareness

Also, it is relevant to note the importance of the building developers in terms of environmental impacts construction processes have. That is, the design of a building greatly influences its energy performance an environmental sustainability. In the specific case of Mexico, building materials and construction processes represent high costs in terms of its environmental impacts.

Other aspect which influences building environmental impacts is the participation of the companies which are responsible of its construction and the difference it has from the impact that the design can have,

considering other variables such as raw materials used by these companies. In the specific case of the systems used in Mexico the processes to produce raw materials are highly expensive in environment terms, and most building materials have an important “carbon footprint”.

In this sense, what results to be cheap in terms of economic cost may turn out to have significant impacts to the environment. Therefore, and important element is to work at the different levels of government with relevant stakeholders to create awareness on the importance of investing in low carbon buildings and creating a number of regulations which support this process.

Identifying and quantifying building environmental impacts

An important conclusion of the workshop is that the synergies or cumulative impacts of buildings are not considered. In general the environmental impact can be mitigated from the design. Mexico is poorly developed compared to other countries in this regard. A lesson which can be learned from the Mexican experience is that there is no sufficient law and regulation enforcement.

Also, in the case of Mexico, specific climate conditions affect the construction and this element is not considered in the plans of regulations and therefore in the form in which they attend energy end-uses (lighting, air conditioning) and the impact they have in the overall environmental impact of buildings.

Other important elements which are relevant when referring to environmental impact assessment are that construction and operation can be treated like two stages which influence environmental impacts in different ways. Environmental impact assessment from building operation not only should consider energy end uses but waste management, water conservation and related emission. Therefore, relevant regulations or processes have to consider these elements as cumulative environmental impacts.

When speaking of sustainable buildings and environmental impact assessment, it has to be considered different dimensions in which building construction affects. That is to say, environmentally friendly buildings assessment should consider the carbon footprint of materials, the energy intensity of all the raw materials supply chain and building

life-cycle analysis, not only in its operation but also indirect impacts derived from the services buildings demand.

An example was made on the Seattle City Green buildings program, which is intended to undertake measures aimed at current buildings to meet service needs while reducing impacts on future generations by integrating building materials and methods that promote environmental quality, economic vitality, and social benefit through the design, construction and operation of our built environment. Particular emphasis of the program is made to sustainable design, which encompasses the following broad topics:

- efficient management of energy and water resources
- management of material resources and waste
- restoration and protection of environmental quality
- enhancement and protection of health and indoor environmental quality
- reinforcement of natural systems
- analysis of the life cycle costs and benefits of materials and methods
- integration of the design decision-making process

Building lifecycle and sustainability

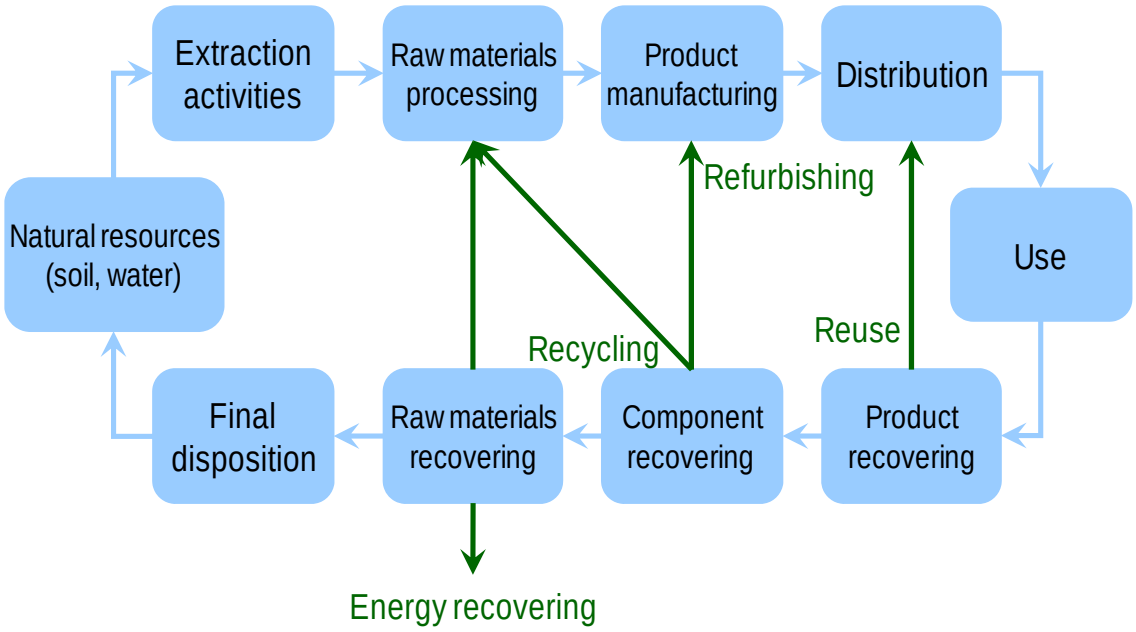
Building location and environmental impact quantification usually does not consider these indirect impacts or the impacts that are generated during the operation of the building. In this sense, impact assessment must contemplate the following elements:

- All the lifecycle' services of the building
- Energy and water consumption
- Sizing and location of green areas projected for a certain building development

- Criteria to support developments that have suitable location and a sustainable use of resources, and which maintain a balance with its surroundings.

Understanding the design, construction and operation of a building requires looking at all stages of the building's lifecycle, beginning with the initial concept. A building' lifecycle concept involves a number of factors which could influence or identify opportunities for a more efficient use of energy, raw materials recycling and/or the use of renewable energy technologies which improve the energy performance of the building without affecting the services it provides.

The following figure provides a conceptual scheme of the criteria which could be considered during building lifecycle in order to reduce environmental impacts and/or improve energy performance:



As figure shows, buildings and its environmental impacts become also an economic burden and important cost assessment issue, since these elements are very poorly quantified. Therefore, and in order to measure the operation of the buildings, it is key to identify the final energy uses and to measure its impact (energy, water) as well as in the construction and other uses associated with the development of the building.

A categorization of environmental impacts of buildings

Environmental impacts of buildings can be grouped in three different categories:

- Related to the location of the building and how it affects the building area
- Critical, referred to energy consumption, water, and wastes
- Indirect and cumulative, which are poorly quantified and there are limited legal instruments to enforce this kind of quantifying schemes. These impacts have to with
    - o the growth buildings have in certain urban areas and how building development exceeds the thresholds of certain zones that already are saturated in terms of services that are required and public roads and works for these developments
    - o Building's increasing needs for public works and the provision of services also bring, which impacts are not quantified.

Building performance regulations and government involvement

In this sense, environmental and building performance regulations are not comprehensively enforced and measuring processes demand the participation of relate stakeholders, such as regional and local authorities.

Local authorities can provide support for the enforcement of building regulations. Experiences of different cities participating in organizations such as ICLEI provided a number of elements of successful measuring of environmental impacts using several measuring instruments such as:

- Amount of waste that are generated
- GHG emissions
- Water that is being used

- Waste management and recycling of materials
- Green building areas versus deforested areas

Conclusions of the session

The following elements resulted from the conclusions speakers provided in this sessions, related to how to reduce environmental impacts of buildings:

- Individual efforts by local authorities in charge of environmental regulation compliance
- The use of energy efficiency technologies
- Recycling and refurbishing of materials and resources used during the operation of the building
- Implementation of demand-side management measures
- Application of renewable energy use
- Implementation of water saving measures
- Use of improved waste management practices
- Change behavior and energy consumption habits
- The role of governmental actions to set an example
- To find an adequate link between environmental impact measuring and economic factors in order to create market-oriented solutions.

Discussions also resulted in several remarks which would serve to provide guidance on how to reduce environmental impacts of buildings:

- Alternatives directed toward reducing buildings' environmental impacts are already available and have proven to be cost-effective, but it is necessary to count on the economic instruments which allow the implementation of such measures.
- There are available financial instruments to implement the measures. There most be sufficiently strong regulatory instruments to help develop this process.

- The construction should be seen as a sustainable development project considering environmental impacts throughout the building lifecycle. Currently, environmental impact assessment only considers the construction stages.

- There is increased interest in green buildings by the developers but ignorance of the instruments of financial promotion and even of the benefits that can be obtained in economic terms.

- Increase of the environmental awareness of those stakeholders who influence the future of construction.

- Create regulatory schemes to increase the quality and amount of saving water systems in great urban centers.

- To create social participation mechanisms in the environmental schemes related to the impacts of the construction and how end-consumer habits impact on environment.

- At the national level several groups are working in the subject. It is important to include other actors from different governmental levels (municipalities and state governments)

    - A the local level to create the local Agenda 21 instruments of citizen participation

    - At local level administration

        - Internal procedures for government buildings

        - Policies of purchases

        - Regulations which influences the community's habits

        - International cooperation on best practices and improved measures.

2. Standards and regulations for sustainable buildings

The session focused its discussions in on the standards and regulations which are considered in the APEC region in order to mandate sustainable performance of buildings.

The session panel was integrated of representatives of two Mexican private consultants and architects organizations, as well as representatives of the United States, the Phillippines and the North American Commission for Environmental Cooperation:

- Felipe Vázquez, North America Commission for Environmental Cooperation
- Agustín García Gallegos, Cien Consultores, S.C., Mexico
- Harry Misuriello, American Council for an Energy Efficient Economy, United States
- Norberto Orcullo, De La Salle University-Dasmariñas, Cavite, Philippines
- José Picciotto, Architect, Mexico.

The session included the following topics:

Energy efficiency practices in commercial buildings and renewable energy concerns in the Philippines

A particular presentation was made on the experience of the Philippines on energy efficiency practices in commercial buildings and renewable energy concerns.

When the Department of Energy (DOE) was established in late 1970s, one of the core undertakings was the energy conservation program which initiated the energy conservation movement. One unit/division in the Department of Energy was fully staffed for this purpose.

In 1986, DOE was downgraded into Office of Energy Affairs but eventually reorganized/revived as DOE thru RA 7638 enacted in1992. The Department of Energy was reverted back to its cabinet-level status. The energy conservation efforts was expanded and enhanced to cover energy efficiency and conservation – that eventually gave rise to the National Energy Efficiency and Conservation program (NEECP).

As it is now, the energy efficiency and conservation program was then dovetailed with the widespread call for environmental management and climate change initiatives.

The National Energy Efficiency and Conservation Program (NEECP) was launched in August 25, 2005 by the Department of Energy (DOE) which aims to address the following:

a) Help mitigate the impact of rising oil prices

b) Reduce expenditures on fuel and power

c) Contribute to environmental protection program including climate change mitigation

In terms of standards and regulations, the NEECP comprises the following elements:

1. Fuel Efficiency Guide Labels in Motor Vehicle Dealer Showroom
2. Energy labeling and Standards for Appliances and Equipment
3. Government Enercon Program
4. Energy Management Programs
5. Energy Audit conservation program
6. Partnership for Energy Responsive Companies (PERCs) and Partnership for Energy Responsive Ecozones (PEREZ) Program
7. Heat Rate Improvement of Power Plants

The Philippine Efficient Lighting Market Transformation Project (PELMATP) is a project funded by the Global Environment Facility (GEF) and United Nations Development Programme (UNDP) and executed by the Department of Energy, because of the desire of the Philippine government to use efficient energy systems from lighting to other systems, low-efficiency lighting products (e. g., incandescent lamps) will be phased out in the Philippine market by the year 2011.

- PELMATP aims to address the barriers to widespread utilization of energy efficient lighting systems in the Philippines.
- PELMATP is behind the massive promotion in using EELs all over the country in tandem with various private and government organizations.

Concerning building design, the Philippines government developed the Guidelines on Energy Conserving Building Designs, which is directed towards to the following main objectives:

- To encourage and promote the energy conserving design of buildings and their services to reduce the use of energy with due regard to the cost effectiveness, building function, and comfort, health, safety, and productivity of the operations.
- To prescribe guidelines and minimum requirements for the energy conserving design of new buildings and provide methods for determining compliance with the same to make them always energy-efficient.

The Philippine Green Building Council (PGBC)

An offshoot of the US-Asia Environment Partnership (US-AEP), the PGBC was organized to serve as the unified organization in promoting green building practices. PGBC was formally registered with the Securities and Exchange Commission in March 2007.

PGBC is composed of organizations, institutions and individuals with different interests and expertise joined together to promote one common goal: Protecting the environment. PGB's program will focus on:

a) Sustainable site development

b) Improving of indoor air quality

c) Water management, energy management, solid waste management, green materials and promote heritage conservation.

Well know practitioners and members of the United Architects of the Philippines (UAP) are behind the PGBC hence can expect that environmentalism, use of efficient energy systems and NRET options will form part of the design considerations for new buildings in the Philippines.

The Renewable Energy Bill

The Renewable Energy Act of 2008 is now on its final stage of becoming a law when the Bicameral Conference Committee of Congress approved

the recent version of the bill last October 8, 2008. The bill a lot of opportunities and incentives for renewable energy technologies such as the following:

- Income tax holiday for 7 years to renewable energy projects
    - Carbon credits generated from renewable energy projects will be exempted from all taxes
    - A 10 percent corporate income tax, against the regular 30 percent is provided once the income tax holiday expires
    - Renewable energy facilities are also given a 1.5 percent realty tax cap on original cost of equipment and facilities used to produce renewable energy.
    - It puts a priority on purchase, grid connection and transmission of electricity generated by companies' renewable energy sources.
    - From consumers, purchase of electricity generated from renewable energy sources is free from value added tax.
    - A net metering scheme is provided giving capable consumers the option to generate their own power.
    - The renewable energy division at DOE has been enhanced to a bureau level.

Green Buildings in North America: A perspective

A presentation was made in this session to highlight the results of a study recently developed by the North American Commission for Environmental Cooperation (CEC), which recommends that North American leaders make green building a foundational driver for environmental, social, and economic improvement in Canada, Mexico, and the United States.

In Canada, Mexico, and the United States, commercial and residential building operations account for about 20, 30, and 40 percent of the primary energy consumption, respectively. They typically also account for 20 to 25 percent of the landfill waste and 5 to 12 percent of the water consumption.

The United States Green Building Council estimates that green building, on average, currently reduces energy use by 30 percent, carbon emissions by 35 percent, water use by 30 to 50 percent, and generates waste cost savings of 50 to 90 percent.

The report also mentioned that despite this potential for transformation, green building represents only a small percentage of building in North America. By some estimates, green building currently accounts for about two percent of the new non-residential building market in the United States and 0.3 percent of the residential market.

In Canada, green building trends are generally thought to be similar to those in the United States.

In Mexico, there are no reliable figures showing the extent to which green building exists in the marketplace. Although the green building market is expected to grow rapidly in all three countries in the coming years, a substantial shift from the status quo is needed to make these high-performance buildings the norm in North America.

As part of the development of this report, the CEC Secretariat's Green Building Advisory Group issued a Statement and Advice on Recommendations for the Secretariat. This advice sets forth a specific path for how North America can accelerate the market uptake of green building and make it the standard practice for all new and existing buildings.

The report established a set of recommendations for the development of green buildings which includes:

1) a common vision for green building in North America,

2) targets for enhancing building performance, and

3) Strategies for helping to drive profound change in the North American building sector.

Application and enforcement of building standards

The session served to establish a discussion on a number of issues associated with application and enforcement elements which will lead to achieve sustainable performance values in buildings, and particular

examples were made on these lighting and envelope standards in Mexico and the United States.

The session discussions raised the importance of considering the experiences of the buildings where sustainable criterion has been applied and how to encourage building standards compliance, particularly at the local level, since most of these regulations are federal.

Also, the discussion was conducted in order to identify what is possible to be done so that the relevant stakeholder have an accredited participation in building standards enforcement and the processes which can be undertaken with the participation of the diversity of actors in order to comply with sustainable building standards.

Conclusions of the session

In this sense, the different perspectives resulting from this discussion included the following issues:

- Establishment of concrete goals and horizons. To apply to resources in terms of a binding intervention
- Responsibility of those who design the buildings, considering that they are those who finally influence the application of the regulations and the criteria to reduce to the consumption of natural resources and GHG emissions.
- National leadership and National Policy. Set the tone for National efforts and compliance of building
- Markets not set policies, they respond to them.
- Realize that energy codes should be part of all energy related policies. The building energy code describes the least efficient building that is legally permitted to build.
- To design programs of incentives to differentiate companies that are responsible or sustainable. The central point is to grant incentives to those who construct under sustainable criteria.
- Consider the problems to apply to the regulations in the local level and the great diversity of instruments that exist and the disparity

between different levels from government when different instruments are applied.

- Harmonizing building standards in the same way product standards at the international level.

- To rescue basic architectonic principles, from the design, in order to fit to the new technologies a scheme of criteria that allow overcoming the confusion arising from the indiscriminate use of the technology. The new technology comes to replace the deficiencies of the original design.

- The true energy efficiency buildings go through an integrated design process. This process cannot be regulated in a specific standard. Therefore, the different standards can be integrated in a single, neutral performance standard which measures overall energy consumption established minimum energy performance levels.

Another important element associated with energy standards and policies has to do with the effective application and development of building policies in the most important growing sectors (such as residential and commercial buildings).

Relevant policies must consider the local conditions in which buildings are developed and urban planning should consider specific use of materials adapted for the construction and climate conditions.

3. Perspectives of sustainable buildings

This session focused on different perspectives stakeholders in Mexico have on sustainable buildings, considering both the financial instruments available in the Mexican market as well as the view point of the appliance and building equipment and systems manufacturers.

The session panel included the participation of the Mexican government through the Ministry of Environment, as well as the institution in charge of providing financing for households, and the Mexican association of appliance manufacturers:

- Hernando Guerrero, Ministry of Environment, Mexico
- Victor Manuel Borras, Institute of the National Housing Fund for Workers (Infonavit), Mexico
- Pablo Moreno, National Association of Appliance Manufacturers, Mexico

The session focused on the following issues on sustainable buildings:

A definition of sustainable buildings

A presentation was made to provide an overall context on sustainable buildings, considering the following elements:

Benefits of sustainable buildings

- Minimizes waste generation by using recyclable products and materials
- Preserves community welfare by employing raw materials which are not toxic nor affect human health and ecosystems.
- Improves human coexistence since it induces a better environment in sustainable buildings.
- Favor savings through the reduction of maintenance, operation and waste disposal costs.

Elements of a sustainable building

Location

- Site analysis, which comprises location assessment and local conditions and resources
- Benefits from public transportation facilities
- Preserves the landscape
- Uses low consumption plants

Energy

- Architectural design, which incorporates energy-saving measures or renewable energy technologies to improve energy performance of the building
- Benefits from passive advantages:
  - Orientation and form
  - Daylighting
- Efficient lighting systems
  - Efficient systems and devices (sensors, interrupters, etc.)
- Uses renewable energy sources

Materials and wastes

- Uses sustainable materials and products
  - Recycled and non toxic
  - Low carbon and environmentally certified materials
- It is based on dimensional design (according to materials measures in order to reduce wastes)
- Recycled Construction and demolition wastes

Water

- Uses recycled water

- Recovers rainwater and Uses efficient water use devices

Conclusions of the session

After this presentation which also included a number of activities and programs carried out by the Mexican government to foster sustainable buildings, the conclusions of the session focused on the financial instruments and economic elements which are necessary to promote sustainable buildings technologies. The following elements were considered:

- The building sector will demand an increased number of energy efficient technologies in the next 50 years. Therefore, it is important to consider the grade of response of related industry manufacturers and sustainable technology providers.
- There is a need to build sustainable buildings according to the need of a fast growing sector. In this sense, not only building construction should be an important element to consider, but also urban planning strategies which are coincident with sustainable building criterion.
- It is important to consider and integral sustainable building vision. It is relevant not only to invest in energy efficiency and renewable energy technologies, but to undertake water saving measures, particularly in large urban areas.

Day 2: Best practices

The second day of sessions of the workshop comprised three different perspectives on the elements buildings should incorporate in order to be considered sustainable. Also, the sessions were intended to provide some conceptual remarks on particular issues currently in discussion among stakeholders related to building design, construction and operation, such a the definition of a sustainable building. The three sessions were devoted to the following issues:

1. Elements of a residential household
2. Sustainable buildings
3. Sustainable urban planning

The following elements resulted from the discussion sessions:

4. Elements of a individual residential household

This session was devoted to analyze and discuss the elements single residential households should consider in order to be sustainable. Also, the session served to present some point of view of different participants, particularly from the architecture perspective, concerning those elements which are needed to raise awareness among the general population and relevant stakeholders (house developers, financial institutions and government) on the benefits of sustainable households.

The session panel included the participation of the Mexican government through the Mexican Housing Commission and three perspectives of private stakeholders involved with architectural design:

- Evangelina Hirata, National Housing Commission, Mexico
- Jorge Calvillo, private Architect, Mexico
- Raul de Villafranca, Mexico
- Guillermo Guzmán, Chile

A sustainable household: Is it possible?

A one-family household can be sustainable, but it all depends on the energy and resources consumption patterns of the occupants. Sustainability of a household can also be influenced by construction materials and house appliances and other equipments.

Households affect the environment through their day-to-day decisions on what goods and services to buy and how they use them, through their decisions on where to live and work, what kind of dwelling to have, how to manage their waste and other factors such as location.

Local economic factors also influence household development and it carbon footprint. An important element which has to be considered in order to build sustainable households is the participation of specific stakeholders such as architects and household developers, since they are directly involved with the selection of sustainable elements to be included in a household.

The key issue concerning the development of sustainable households has to do with changing unsustainable household consumption patterns.

Household consumption patterns, and the drivers behind them, are part of a social status quo in which sustainability is poorly understood.

The development of a sustainable household is closely related to the change of these consumption patterns and it also linked to a cultural and behavioral change in the way end-user and household owners perceive sustainability and environment protection.

Definition of a sustainable household

Understanding the urban structure system is another important element to be considered in any strategy to promote sustainable households and its related technologies. There is no single definition of what a sustainable household is. A sustainable household depends on the different elements related to its services, energy-end uses and the perspectives general population has.

Notwithstanding, current economic and technological conditions favor the development of sustainable households. However, and in the same

way as other building segments, urban planning plays a key role as a decisive factor to complement the effective application of sustainable criteria in individual households.

Urban planning considering new and improved technology components should be an important part of related policies and regulations. Specific attention should be put in establishing clear and strict regulations which prevent the construction of large household developments that do not incorporate minimum energy and environmental performance criteria.

These regulations should be applied both at the federal and local levels. Also, particular reference should be made to include key sustainable criteria and definitions in building rules and raw materials use parameters.

Conclusions of the session

The discussions of the sessions provided three main elements which are consider being key in order to build sustainable households in a regular basis. These three elements resulted also from the exchange of points of view of the participants considering the following elements:

- Effective development of sustainable households can only be achieved once several stakeholders are involved in the process:
    - o The occupant, which considers a change in its behavior, so the application of sustainable measures is effective.
    - o Planners, designer and technical staff, which have to be open to the incorporation of new and renewable energy technologies as well as sustainable criteria in the design, construction and installation of the services the household will include.
    - o Private and public institutions which provide the information, promotion and financing mechanisms for sustainable households.
- A sustainable household results from the adequate selection, depending on the specific local conditions, of a mix of technologies and measures to improve energy performance, as well as the raw materials and systems.

- Sustainable households development must consider a set of basic performance standards:
    - In terms of energy performance and environmental protection.
    - Integrate sustainable criteria in mandatory regulations.
    - Link sustainable household criteria with global or National GHG emission reduction goal or related policy instruments.
- Sustainable households must serve as a market driver to incentive the dissemination of energy-efficiency and renewable energy technologies.

5. Sustainable buildings

This session served to summarize and analyze the main issues already considered on sustainable buildings in the previous sessions.

It also provided an important discussion framework on what is needed to effectively apply sustainable criteria in new buildings.

The session panel included the participation of the Australian government through CSIRO and three perspectives of private stakeholders involved with architectural design:

- Raúl Huitrón, BIOMAH, México
- Marco A. Villanueva, ASINTELIX, México
- Philip J. Paevere, CSIRO Sustainable Ecosystems, Australia
- Javier Presas, HOK, Mexico.

Australia's perspective on sustainable buildings: the CSIRO programs

The main issues discussed included a specific presentation on Australia's CSIRO experience on this issue.

In particular, CSIRO's multi-disciplinary teams are researching to understand buildings and urban systems and how their performance can be improved for better environmental, economic and community outcomes.

A key element of CSIRO's research activities is undertaking a comprehensive job in several issues:

- Urban systems and high performance buildings
- Development of policy proposals
- Work closely with relevant stakeholders (industry and building developers)
- Building life-cycle analysis

- Breakthrough technologies research

CSIRO researchers are developing a software platform to integrate sustainability assessment across urban domains including health, water, transport and energy.

This integrated sustainability assessment platform:

- focuses on early stages of urban planning such as structure and concept planning, to explore the flow-on consequences of decisions
- looks at multiple scales of influence (precinct, lot, building) and links between these scales
- Adopts a performance-based approach to sustainability assessment, grounded in science that leaves the subjectivity of sustainability rating and benchmarking to others.

Sustainable buildings in the APEC region

Specific issues concerning sustainable buildings analysis were also discussed in the workshop. The exchange of points of view among the participants included the following topics:

- Issues associated with the increased energy demand and increased needs of the building sector in the APEC region.
- The importance of the geographical context (including urban arrangements) in which large buildings are being developed.
- The importance stakeholders (material and equipment manufactures, architects, building developers, local governments) have in the effective application of sustainable building policies and regulations.
- The relevance of incorporating sustainable building technologies without affecting comfort and the services provided by the building.

There is a strong need to have a common language among the different actors when referring to sustainability issues in general and buildings in particular. Therefore, both the overall framework and the process to

promote sustainable buildings most be a result of the development of a harmonized guideline.

Also, global o regional performance targets should be established, considering the services to be provided by the building.

Education and general population awareness are key elements to achieve the effective application of sustainable practices in buildings.

Conclusions of the session:

Long-term and effective application of sustainable criteria in buildings can be achieved mainly through effective, wide-range regulations and standards, which include specific technology performance parameters.

However, it is important to note that the effective application and acceptance of such regulations have to be coincident with a set of economic incentives for those who build, manufacture and provide services for buildings.

Also, the session's discussions raised the need to generate an integrated sustainable building definition, which includes all the aspects of sustainable criteria, not only energy performance and environmental protection measures, but also elements related to urban planning, create awareness among related stakeholders and the general public, and the effective implementation of related regulations and building codes.

6. Sustainable urban planning

This session focused on an exchange of points of view with regards to the importance sustainable urban planning has in developing long-term strategies to promote sustainable buildings and new and renewable energy technologies.

The session panel was integrated by representatives of the Mexican private sector and non-governmental organizations operating in Mexico on issues related to the effective application of energy-efficiency and renewable measures in buildings:

- Eduardo Terrazas, Urban Architect, Mexico
- Jorge Ponce, Urban Architect, Mexico
- Alejandra Rangel, Centre for Sustainable Transport, Mexico
- José M. Di Bella, Mexico.

Urban planning and sustainable buildings

A general overview and some experiences of urban planning were presented, mentioning that sustainable development and sustainability have become important concepts in today's urban planning field, with the recognition that current consumption and living habits may be leading to problems of natural resources' shortage, ecosystem affectation, pollution. Many urban planners have, as a result, begun to advocate for the development of sustainable cities.

The traditional definition of a city and the services it requires has changed over time. Urban sustainability has to consider also the increasing need of resources urban centers require.

A particular emphasis was made on examples of sustainable cities where mobility criteria have been considered, along with sustainability criteria in buildings, and the close relation that there is among these factors as part of a wider spectrum within the general system of urban planning.

Also, some issues concerning efficient use of urban areas resources were made, considering the following elements:

- Efficient water use
- Criteria to build housing and office buildings developments
- Efficient street lighting
- Improved building design, operation and maintenance
- Efficient lighting in buildings
- Efficient waste management

Understanding urban centers concentration and the way economic growth determines the increased need of services required by buildings plays a key role to undertake long-term planning strategies.

Also, the concept of economic unit applied to a specific urban centre has to be considered in the elaboration of management and planning scenarios.

An important reflection resulting from this session has to do with the suitable scale of the urban centers, based on the economic activities that a city develops, the resources that it requires and the way in which sustainable use of resources derives in environmentally sound and energy-efficiency advantages.

Conclusions of the session:

There was a general agreement among the participants in the session that sustainable urban planning involves not only the participation of relevant authorities in charge of urban planning, but other related market stakeholders (including builders, architects, NGOs and business associations).

Sustainable urban planning also considers elements which imply the inclusions of other strategies that are directed to the development of conditions which affect standards of living in cities and other services, such as public transportation, land-use and raise awareness among the population.

Therefore, any urban planning strategy should consider that new and improved urban infrastructure systems are applied without collapsing existing services structure and without affecting the cities' productivity.

Conclusions and proposals

The implementation of measures and policies to achieve buildings sustainability criteria in the APEC regions is an increasing interest topic not only for governmental agencies but for other related stakeholders, including professionals, systems and equipment manufacturers and non-governmental associations.

The APEC EGNRET-EERE Workshop on best practices in energy efficiency and renewable energy in buildings provided a good opportunity for these stakeholders to share their viewpoints and perspectives on how to innovate on building design, operation and maintenance, by applying energy efficiency and renewable energy technologies.

Below we summarize the main proposal resulting from the workshop:

Sustainable building regulations and standards

An important role in terms of effective application of sustainable buildings programs and strategies is regulation. There is a strong need throughout the APEC region to undertake comprehensive performance standards and regulations on building design and raw materials, appliances and equipments. The conclusions of the workshop provided the following proposals:

- Building codes and standards should be part of all energy related policies.
- To overcome the barriers resulting from applying regulations at the local level and the great diversity of legal instruments that are related to building performance. It is also important to recognize the disparity between different levels of government agencies when different regulations are enforced.
- Harmonizing building standards in the same way product standards at the international level.
- The importance of considering the experiences of those economies where sustainable parameters (both mandatory and voluntary) have been applied in buildings, and how to encourage building standards compliance, particularly at the local level, since most of these regulations are federal.

- Create regulatory schemes to increase the quality and amount of saving water systems in great urban centers.

- Develop specific regulations which influence the community's habits and apply to particular conditions and existing construction rules.

Stakeholder involvement and awareness

- Individual efforts by local authorities in charge of environmental regulation compliance should be complemented with the participation of manufacturers, architects and building developers.

- To established stakeholder awareness campaigns and programs. There is increased interest in green buildings by the developers but ignorance of the instruments of financial promotion and even of the benefits that can be obtained in economic terms. Increase the environmental culture of those stakeholders who influence the future of construction.

- In many APEC economies a number of agencies are involved in national scale programs. It is important to include other actors from different governmental levels (municipalities and state governments)

An integrated view on sustainable buildings

Sustainable buildings should be considered as part of a larger system, which not only integrates building design, operation and resources end-use, but a set of related issues including urban planning and sustainable cities approaches.

The following proposals resulted from the workshop:

- Sustainable building strategies should include analysis and project integration of early stages of urban planning such as structure and concept planning, to explore the flow-on consequences of decisions.

- It is important to consider an integral sustainable building vision. It is relevant not only to invest in energy efficiency and renewable energy technologies, but to undertake water saving measures,

waste management and other low carbon measures related to building performance, particularly in large urban areas.

- Urban planning considering new and improved technology components should be an important part of related energy policies and regulations.

- Understanding urban centers concentration and the way economic growth determines the increased need of services required by buildings plays a key role to undertake long-term planning strategies.

- The construction as a sustainable development project should contemplate a system approach on the environmental and energy related impacts throughout the building development chain and other related elements, such as urban planning, transportation and mobility. Currently, building environmental impact assessment only considers the construction stages.

Information to end-user and building owners

A key element to undertake any sustainable building strategy and/or policy has to do with the information end-users and building owners have on the benefits of applying sustainable, energy efficiency and renewable energy measures in a household, building or commercial installation.

Awareness campaigns should reach all segments of the general population, and influence a change of habits in terms of energy consumption and sustainable use of resources by individuals, families and organizations.

The need for an integrated definition of a sustainable building

An important issue which was discussed throughout the sessions was the establishment of a clear definition of a sustainable builiding. Sessions discussion provided elements that referred to the existence of a wide variety of definitions and criteria to

Therefore, there is a lack of an effective approach for designers, architects and/or engineers on how to design and build households and other type of buildings to comply with certain sustainable criteria.

Moreover, the definition aimed at considering a sustainable building as such does not include exclusively energy performance or certain environmental protection measures. There is an additional number of social, economic, design and even political elements that would be part of this definition.

Finally and for the purposes of the workshop, a sustainable building could be a result of a number of building and design decisions which lead to increasing the efficiency of resource use — energy, water, and materials — by incorporating new and renewable energy technologies and other state-of-the-art technologies, while reducing building impacts on human health and the environment during the entire building's lifecycle.

Acronyms and abbreviations

CONAE / CONUEE	Mexico's National Commission for Energy Conservation. As of 28 November 2008, CONUEE – National Commission for Energy Efficiency.
CEC	North American Commission for Environmental Cooperation
CSIRO	Australia's Commonwealth Scientific and Industrial Research Organization
DOE	Phillippines Department of Energy
GEF	Global Environmental Facility
GHG	Greenhouse gas emissions
ICLEI	International Council for Local Environmental Initiatives
Infonavit	Mexico's Institute of the National Housing Fund for Workers
NEECP	Phillippines National Energy Efficiency and Conservation Program
PELMATP	Philippine Efficient Lighting Market Transformation Project
PERCs	Phillippines Partnership for Energy Responsive Companies
PEREZ	Phillippines Partnership for Energy Responsive Ecozones
PGBC	Philippine Green Building Council
UAP	United Architects of the Philippines
UNDP	United Nations Development Programme
US-AEP	US-Asia Environment Partnership