

# Sustainable Construction in Developing Countries A Peruvian Perspective

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## 1. Sustainable Urbanism and Construction: the Concept

Sustainability needs to be understood in an integrated and holistic view. In this line, sustainable construction should not be viewed separately from sustainable urbanization and development. In order to conceptualize it, it is necessary to contemplate the natural, social and built up environment as manifested in the urbanization and the construction processes, and incorporating the urban and architectural design activities as spatial expressions thereof .

Sustainable urbanization is the process through which cities work towards a shared vision of the future, expressed and structured in a Sustainable Development Plan or Agenda 21. This includes an integrated management system and concerted management tools that facilitate the channeling of sustainable private investments in private buildings, public spaces, infrastructure and other urban services. These investments should allow the development of re-distributive economies directed not only at the building up of an equitable society without exclusion, but also at the preservation of the cultural and natural patrimony.

In these terms, sustainable urbanization implies growth and harmonic development with the environment where services and habitat conditions can provide the inhabitants with optimum living conditions with equal opportunities for men and women, and where pollution and destruction of water, soil, air, flora and fauna are minimal.

As part of this urbanization process, actions towards sustainable construction are required such as the generation and utilization of clean techniques and technologies for construction, and making use of existing local resources in order to cause the minimum negative impact to the environment. This implies:

- a) minimum use of non-renewable natural resources and promotion of substitutes;
- b) rationed use of renewable natural resources;
- c) minimum production of waste and pollutants that nature cannot recycle on its own;
- d) provision of appropriate spaces and quality of life required for human development.

Sustainable construction processes comprise stages from the selection of the raw materials to manufacture of construction materials, components thereof and completed building materials; and to the design of streets, highways, drainage systems, final garbage dumps for liquid and solid waste, pavements, etc. Also included is maximum preparedness for the development and agglomeration of people and vehicles to avoid or mitigate environmental contamination. A key point for sustainable construction is the consideration to minimize energy wastage, taking rational advantage of the natural conditions without altering them and allowing other living forms to live and be preserved.

Sustainable construction processes introduce within the design of the elements of urbanization (buildings, streets, transport services, public spaces, etc.), criteria for recycling, the use of energy saving technologies and interaction with nature in urbanization and socialization processes, providing the necessary spaces and landscapes for human harmony and balance.

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In Perú and Latin America there are no large scale, significant experiences of sustainable urbanization and construction. In the case of Perú there is no a national housing policy that promotes a concept that holistically integrates economic, socio-cultural and environmental dimensions. Nevertheless within the Housing, Health and Environment Network, of which Ecociudad<sup>3</sup> is a member, advancements are being made in experimenting in this direction. Here they are adding environmental dimensions to housing design and construction. Ecociudad is promoting the eco-housing concept that includes ecological and economic dimensions with the use of clean local technologies.

### 1.1 The Vision and Indicators for Cities for Life

The "Forum Cities for Life" is a national inter-institutional alliance of concerted action between local governments, NGOs and universities. Its main purpose is the institutionalization of concertation spaces to elaborate and manage Local Agenda 21 in the country. In almost five years since its establishment, the main achievement of the Forum has been to permanently place in national debates the need for concertation<sup>4</sup> efforts for the design and development processes of Local Agenda 21. Capacity development for urban environmental management, the systematization and dissemination of successful experiences and the intensive experience exchange have contributed to achieve this goal. As a result of the analysis of the real situation of cities and the reflections and proposals, a vision of future for cities has been developed. This vision is to be shared and its main features are included in the following profile:

#### Vision of the Forum Cities for Life

We want cities for life that reflect the expression of sustainable development and that offer an adequate quality of life to its inhabitants. This is to be achieved through equal opportunities for a healthy, safe, productive environment with solidarity and in harmony with nature and its rural surroundings, the cultural traditions and spiritual values, adapted to the diversity of the country.

We want cities for life in which its inhabitants identify themselves with its development, in which they are proud of their culture and natural beauty of the place they live in, where they achieve the coordination process, be competitive and demonstrate solidarity.

Source: Forum Cities for Life, National Action Plan 2000-2005

#### Indicators for a City for Life

City's reason for being	Quality of life of the people
Urban development	Planned and concerted
Habitat	Adequate, compatible with human dignity
Size of the city	Diverse, balanced relationship between number of inhabitants and resources needed and available for harmonious development
Management performance	Efficient and effective
Relationship with city surroundings	Harmonious, interdependent and complimentary
Urban economy	Diversified, profitable and competitive
Production and consumption	Capable to generate the productive base and recycle its wastes
Relationships	Based on solidarity and equity
Government	Democratic, decentralized and participative
Culture	Reaffirming identity and respect for diversity

Prepared by: FCPV

This vision is concretized in indicators which are considered necessary and which should be taken into account in order to build up a city for life, a city that is the expression of sustainable urbanization and construction processes.

<sup>3</sup> NGO based in Lima

<sup>4</sup> In this document "concertation" means to reach and agreement between different actors with different interests. It is different from the consensus concept.

Apart from the systematized experiences and case studies in the Latin American region, a series of conclusions on the characteristics of a sustainable community and/or city can be drawn. These characteristics are the practical summary of the above-mentioned indicators for sustainable cities in Perú. In order for sustainable communities to become concrete realities, appropriate scenarios, provided partly by sustainable urban development processes, are required. The intensity and different characteristics, upon which these processes are built, could reflect the innovative features of future cities.

### **Requirements to Make Headway Towards Sustainable Development of Cities**

1. Land use zoning and environmental planning of the city
2. Promotion of sustainable economies
3. Democratization of municipal management, inter-institutional co-ordination and use of concertation as the management and co-ordination mechanism
4. Strengthening of social organizations as well as youth organization and participation
5. Capacity development for the management of environmental projects
6. Problems and risks prevention
7. Give priority to environmental problems
8. Articulated problem management in order to obtain multiplying effects
9. Dissemination and sensitization of public opinion through the communication means
10. Formation of environmental promoters and promotion of environmental education at all levels.

Prepared by: FCPV. Source: Survey to participants in the Seminar on Local Agenda 21 for Cities. (Lima, Nov. 25, 1998)

## **2. Issues and Challenges facing the Regions**

In Perú, the actions taken in this respect are few. Most of the initiatives have come from the private sector, mainly from universities and NGOs interested in the topic. Nevertheless and in order to place the necessary importance to the topic the main issues and challenges presently faced are listed below.

### **2.1 Making Sustainability a Priority**

Sustainability is a concept that has been recently introduced within the urban development framework in third world countries. Since the Rio Summit and through various conferences and international gatherings, its advocates are trying to convince governments and other stakeholders that a balance between development and the use of natural resources is important for the preservation of the environment and the construction of healthy cities.

The results of urban development in third world countries show that sustainable construction and sustainable development are not yet a priority. This is a concept managed by professionals in certain fields and only recently have governments begun to pay attention to it, due more to international pressure than to internal conviction.

Nevertheless, there are a series of warnings that indicate the need to change the way in which development is presently undertaken and some governments and NGOs have started to take action so that more sustainable practices are encouraged. Cities have started to show the negative implications of the lack of balance between social, economic and environmental development. The building sector is a great consumer of resources. Amongst others, the production of bricks and the lineal expansion of cities are using up the land needed for agriculture. Application of corrective measures is needed in order to stop or adjust practices that are no longer sustainable. The rational use of these resources is very important to the creation of cities where nature and people can live in harmony.

Increased involvement by governments and professionals is needed if the application of such concepts is desired. The circle of discussion and dissemination needs to be widened so that the information can reach a bigger audience. A strategic alliance between government, construction industry and universities and research



centres could work as an effective mechanism to boost the importance of the topic and to encourage coordinated action.

International cooperation can play an important role in influencing governments in developing countries to give the necessary attention to issues related to sustainable building and urbanization.

## **2.2 Sustainable vs. Profitable**

There is the pre-conceived idea that environmentally friendly practices imply extra costs. The need to make additional investments is very often the excuse not to comply with standards and practices based on principles of sustainability. The construction industry complains of a lack of resources to invest in the technological changes required for the application of this concept, and they are concerned that their level of profits will be reduced.

It is true that an initial investment is needed in order to support the development and production of appropriate technologies and building materials, but these are costs that can later be recovered. Besides, these costs can be substantially reduced if the construction sector works together and shares the responsibilities with the government, universities and other private sector related industries and institutions.

Governments are the ones to initiate changes with the development of a legal framework to encourage the application of appropriate standards and procedures. It is known that unless pressured, the construction industry will not introduce the required adjustments. A key factor is to change the way of thinking of private sector professionals and of the public in general. They need to realize the benefits and advantages of a built environment which is safe to both nature and to the people.

As in the food industry, the construction sector could use environmentally friendly and sustainable practices as a market strategy to increase the popularity and acceptability of their products. With proper information and dissemination, the public becomes more aware of the benefits that such practices represent for them and the environment. This could consequently have a positive impact in the sales of the offered products making these practices sustainable and profitable.

## **2.3 Mobilization of Resources**

One of the key challenges of sustainable construction is the mobilization of resources in order to support research, technological changes and feasibility studies for the production and marketing of new materials and technologies.

Given the present situation, the government alone is not able to guarantee the necessary financial resources to support the above-mentioned activities. The private and academic sectors represent resources that can be tapped and directed at initiatives in the sustainable construction sector. Working together, the financing of activities, as well as the responsibilities of developing the sector can be shared by the three parties.

In many cases, the issue is not the lack of resources, but the lack of co-ordination in managing them in a more efficient way. Converging resources from different public organizations could help to increase the impact of their utilization.

## **2.4 Public Awareness**

Sustainability is not only the responsibility of government and the construction industry. Citizens need to get involved and be aware of the impacts of their behavior and their use and misuse of resources. Participation by people is key to achieving decisions needed to secure changes in consumption patterns of the majority of the population. It is important to develop campaigns that on the one hand relay the benefits and opportunities with regards the use of environmentally-friendly building materials and products, and on the other, encourages the change of consumer habits towards a more sustainable use of resources.



## 2.5 Widening the Scope

Environmental construction is very often identified only with building materials and technologies for the construction of houses. The integrated concept of housing as part as the urban fabric of a city are not often contemplated by the construction industry. In the same way, when talking about sustainability, the scope of sustainable construction needs to include environmental concepts, not only for housing, but also for the design and development of our cities.

Alarming to note is the lack of consideration given by new developments to the sensible use of resources. In the name of modernity, other practices that often abuse and misuse materials and technologies have replaced environmentally conscious ones. Pavement of green areas, air-conditioning, use of bricks, asbestos, glass facades, to mention a few, are symbols related to modernity. Projects are designed and developed in isolation without thinking about the impacts of the new structure on the surroundings and on the city.

The development of new materials and technologies need to consider that the majority of the population is poor with very limited investment capacity. The housing shortage is approximately of 1 million units. The construction industry could benefit from this market only if the solutions proposed in terms of new materials and technologies are affordable to them.

## 3. The Impact of the Construction Industry in the Economy, the Environment and Society

### 3.1 Multiplying Effect on the Economy?

The construction industry in Perú experienced recovery and peak periods between 1994 and 1998. Since then, however, it has been in an economic recession with no support from the state in terms of its development through the introduction of necessary policies.

Globalization has allowed small and medium enterprises to compete in the market giving them preferential treatment in order to promote private investment. This has disadvantaged national enterprises that have not been able to compete with large international companies, even though the national companies are better acquainted with the system and keep financial profits within the country. In addition, the national industry has not received incentives or benefits to participate in overseas contracts and investments as a reciprocity measure.

Although the construction sector is always the first choice of government in terms of promoting employment and reactivating the economy, no priority is given to the housing sector. Emphasis has been on the construction of roads and infrastructure for the health and education sectors, for example in 1994, a total of 914 public works were tendered, in 1995 only 560; in 1996 the number was 527; in 1997 there were 479 and in 1998, 676. Of these tenders, none were directed at the housing sector. Despite the shortage of 1 million dwellings and the insufficient social and physical infrastructure, the country does not have an integrated housing policy. If conditions were conducive for the construction industry to attend to these shortages, the sector could certainly be a dynamic force for the national economy. This unfortunately, is not the case.

At the same time, the private sector was responsible for building between 3,5 and 4 million square metres annually from 1994 to 1998. The numbers of square meters built between 1999 and 2001 decreased because of the ongoing economic recession. The stabilization of the construction industry between 1994 and 1998 was possible due to the stability of inflation, the reappearing of mortgage credit, which benefited mostly medium and higher economic sectors and the arrival of new investors, especially in Lima. Without these conditions construction development would have stagnated.

On the other hand, apparently, the traditional argument about the relationship between the construction industry and employment generation does not apply to the Peruvian reality. In 1998, when the construction industry was still at its peak, only 6.05%<sup>5</sup> of the workforce belonged to the construction sector. If we add workers in the water,

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<sup>5</sup> El Comercio Newspaper.

electricity and gas sectors (1.47%) and real estate business workers (15.07%) the total within the sector could amount only to 22.9% of the workforce.

It is necessary to clarify that in Perú the majority of the population does not fall within the formal employment category. According to a survey carried out by the Lima University in the year 2000 only 56% of the interviewees declared themselves as workers, 7% stated that they both worked and studied and 35% had more than one job in order to earn an adequate income.

The rallies of the Civil Construction Workers Union are famous in Lima. This is due to their poor labor conditions, low salaries, systematic loss of acquired benefits of the workers and the scarce labor security conditions in which they work.

Equally, in terms of the GNP, the construction activity contributed an insignificant 5.2% in 1979 and 5.8% in 1994 (both can qualify as good years for the construction industry). Between January and December 1999 the contribution to the GNP from the construction sector decreased by 12.3%. The impacts from the recession have been strongly felt in this sector. In the present climate, the possibilities for technological changes and/or research on new materials, techniques and technologies supported by the construction sector are not very feasible.

The poverty level in Perú has contributed towards self-help becoming the main alternative for the majority to have access to housing. This modality gives priority to economic factors, but does not give any priority to environmental and technological considerations. For example, according to Hernando de Soto in the "Mystery of the Capital" there were 1.5 million formal houses compared to 1.7 million informal houses in Lima in 1999. The informality is the result of unplanned human settlements that grow and develop progressively. Normally, the regularization process includes only the land and not the property because of the lack of technical considerations during construction which takes place without technical assistance and government control.

### **3.2 Satisfying Requirements and Social Demands**

It can be confirmed that there are two construction processes; one formal and one informal. The formal process is developed by the state and the private sector while the informal process is developed by the owner of the house or building. The hopes for these processes to include sustainable concepts within their construction processes are limited because both are governed by the saving factor and the criteria of availability of materials that could be used in simple construction processes. The development of construction proposals with clean technologies is limited and is still in experimental stages. These initiatives, implemented mainly by NGOs and research centres, are not ready to be incorporated within these construction processes.

Technological change generally requires at least one generation to consolidate. For example in Perú, the transition from mud bricks and quincha to the wrongly-named "noble" materials was a process which took from 1930 to 1950 to gain momentum and then up to the 70's to become established and included within the national norms systems. This was done at the same time that mud construction and traditional systems were forbidden, with the prohibition ending only at the end of the 80's, by which time the technological change was already incorporated.

There are a series of curious anecdotes (not to say dramatic) in which professionals who have completed their post graduate studies overseas have returned with a more flexible approach and open-mindedness towards the use of traditional technologies than before they left. The influence of technological changes in developed countries and the cult to "modernise" (personified in consumer products and patterns from developed countries) is conducting the market to demand ecologically certified wood, products without asbestos and energy and water saving systems. These developments open a window of opportunities and possibilities that developing countries could benefit from.

It is almost redundant to insist that the construction activity is an efficient development industry as many of the problems that affect the majority of the population requires investments from the construction sector, roads, social and physical infrastructure, office space, factories and housing, in particular



For example most of the cities in the country suffer from major infrastructure deficiencies; less than 10% treat their waste and most of them do not have adequate water supplies, garbage collection systems and social, physical and recreational infrastructure.

In Lima, the richest city in the country, this deficit is still high, for instance the status of basic urban services in Lima in 1996 (Municipality of Metropolitan Lima) was that 30% of the population had no domestic water connections, 13% had no access to potable water, 32% had no sewerage, 24% no electricity, 35% no transport and public transport, 17% only transport by foot, 43% no solid waste collection and only 1.9 m<sup>2</sup> per inhabitant.

These shortages require urgent attention from the government and the intervention of the construction sector with clean and sustainable technology solutions.

### 3.3 Irrational Consumption of Natural Resources (see also point 4.3)

In the environmental arena, the situation is more complex as natural resources (gravel, inorganic raw materials, forest, etc.), territories (agricultural land, urban space, etc.) and landscapes are affected. For each of these, a list of impacts needs to be considered and quantified in preparation to the growth and expansion of the construction activity.

On the other hand, consumption patterns in cities, and consequently construction materials, need to change. Most of them come indirectly from industrial and mining activities that generate dangerous levels of contamination, which threaten human lives and the ecosystems. In the city of Cerro de Pasco, the entire population has lead particles in their lungs due to mining activities<sup>6</sup>, while in the city of Ilo, the second major cause of death is cancer produced by the sulfur dioxide emissions from the copper processing by the Southern Copper Corporation of Perú (SCCP).

## 4. Barriers to Sustainable Construction

### 4.1 Poverty and Low Urban Investment

It is estimated that 70% of the population lives in cities and during the following decades, this will increase to 90%. This urbanization process has been accompanied by

- a) the impoverishment of the population,
- b) a remarkable environmental deterioration, and
- c) centralism and exclusion.

In this way, poverty generates environmental deterioration, which at the same time increases the vulnerability of the poorest people. Both the impoverishment and the environmental deterioration of Peruvian cities are in most cases the consequence of the prevailing centralized government that systematically excludes the poor from the decision-making processes directed at solving their problems.

According to the World Bank, approximately 75% of poor people live in cities<sup>7</sup>. Since 1996, due to the ongoing recession, the sector E (families who can not even buy one "family basket") has been introduced into the system. 27% of the population fall into this category, while only **3.4%<sup>8</sup> of the total population earn over 3 300 dollars per month.**

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<sup>6</sup> Recent studies done by the Health Ministry of Peru had concluded that 75% cases of respiratory illnesses are affecting children from 29 days to 5 years old; as WHO has demonstrated, these illnesses are closely related to the presence of lead, manganese, cadmio and cromo in Cerro de Pasco air (all of them above WHO standards), see web page: [www.digesa.gob.pe](http://www.digesa.gob.pe)

<sup>7</sup> Banco Mundial, documento de trabajo "Issues in Urban Management, 1995"

<sup>8</sup> *Ibid.*

Urban poverty is a structural and strategic problem for national development, and it is important to recognize that urban development goes hand in hand with national development. Urban productivity and efficiency are topics that cannot override equity and social justice. To continue with this situation could serve to further widen the already significant gap between rich and poor, demonstrating that current macro-economic indicators are a result of the application of the present economic model.

As a result of this situation, popular urban areas in Lima, like Efraín Gonzalez<sup>9</sup> stated, reflect the result of a low rate of urban investment against a high rate of demographic growth. This has evolved into an accelerated degradation process of the urban quality of life. This process affects not only the urban poor and their surrounding environment but also has a negative impact in the city as a whole. Even with the efforts by the national government and the private sector to promote urban investment and reduce environmental degradation, the impacts have not been able to reach either the lowest income population or the city as a whole.

Within this generalized shortage of resources, not only in terms of people but also of institutions, construction alternatives with new and clean technologies do not find the necessary space to develop.

#### **4.2 Lack of Urban and Construction Policy**

The Ministry of Housing and Construction does not have a policy to support the construction and housing sectors. Legislation, norms and urban planning structures are very weak. In addition, there is a lack of norms and specific legislation that promotes sustainable construction. For example, the system does not have instruments that regulate the application of Environmental Impact Assessments in the construction of large infrastructure projects and urban investments in the city, while other industrial sectors such as mining, fishery and forestry have long since had these instruments in place.

The urban management policy of Perú during the last decade has been characterized by the absence of responsibility of the central government in improving living and housing conditions of the urban poor. The real policy was the absence of a policy. The advancements in this respect were not made with habitat improvements as the main goal. The real aim was the improvement of economic indicators of employment generation through the construction activities and the reactivation of the construction index and its impact in the macro-economy<sup>10</sup>.

The private sector was given the responsibility of the production of housing and related services. Except for water services, electricity and telephone services were quickly privatized. Shelter was assumed as a product to be manufactured and this is why the government program "My House" (Mi Vivienda) was placed under the Ministry of Industry. The logic behind this move was to promote housing acquisition through the reactivation of the mortgage credit system promoted by the financial sector and the real estate industry. This practice has only benefited medium and higher income groups of the society. "Market separates" is what employees in the sector used to say, assuming that housing being one more product of the consumer market, buyers capacity would know how to promote the adequate housing product for the poor, which obviously did not work.

In another front, ex - President Fujimori, during the 1990's, assumed direct control of the few government housing-related organizations and transferred them to the Ministry of the Presidency. He disintegrated the institutional bases of the housing sector and established a "triangular without base" policy in which all the threads were directed to his office. The scheme allowed no horizontal inter-institutional coordination and or control without his involvement, paving the way for corruption and clientism.

The sector does not rely on tax incentives or opportunities to attract investments or capital to promote research and promote alternative clean technologies. The protection of government policies in developed countries contributes to maintain this situation.

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<sup>9</sup> Efraín Gonzáles Olarte, IIEP, various articles

<sup>10</sup> Most of the opinions in this part of the document are from the interview with Mr. Armando García Campos, Advisor to the Housing Vice-Minister and ex-Executive Secretary of the Habitat II National Commission in Perú.

Local governments in charge of the provision of construction permits, regularization of informal buildings, provision of good quality public spaces and controlled urbanization are not equipped with the necessary financial and technical resources to provide these services adequately, least of all to include criteria for sustainability.

A series of sustainable environmental management instruments whose application is the responsibility of local governments can be enumerated, but they are not accompanied by the necessary capacities and the financials resources for their application <sup>11</sup>.

Finally, the absence of articulation and concertation among the authorities, businessmen, professionals and civic organizations around a national policy of investment plans for the cities is one of the great barriers for the development of new alternatives for the transition to sustainability.

#### **4.3 Lack of Knowledge on Risks and Effects of Unsustainable Construction and Urbanization practices**

Data and information on the health effects and risks of unsustainable construction activities are unreliable and insufficient. To date it is very difficult to prove the connection between certain illnesses and environmental pollution. For example:

- a) Frequency of respiratory illnesses like asthma, pneumonia and bronchitis has been connected to air pollution and turgurization;
- b) The use of asbestos has an incidence in pulmonary cancer; and
- c) Diarrhea and skin infections have a connection with water quality, drains and drainage.

Limited knowledge concerning the exact connections makes the definition of interventions very difficult. Alternatives are needed.

Physical occupation of agricultural and natural landscapes takes place at a high rate because of the low densities in the peripheral areas of the cities in the region. Additional land is lost to roads, waste dumpsites, recreational space etc. Forests, wetlands and other valuable ecosystems are affected by water extraction, air-, water- and soil pollution, and by physical disturbances due to increasing tourism activity. Although at first sight, many of these problems do not seem to be urban problems, the 'inefficient engine of the cities' creates most of this damage.

Building activities constitute a large share of the total environmental pressure. Building materials (cement, sand, gravel, clay, wood etc.) are often extracted from the rural hinterlands, where they cause degradation of land and ecosystems. The production of cement, lime, bricks etc. that often takes place in or close to the city, produces air pollution, dust and consumes a large amount of energy. One problem is that traditional rural construction methods, which are often more environmentally friendly, are mostly abandoned in the cities, because of a false idea of 'modernity'. Typical is the expression 'material noble' (noble material), which is being used in Peru for stone, bricks and concrete. Potentially more environmentally friendly materials, like adobe and wood, are considered as the 'poor man's materials'. Ideas about sustainable building, as they are currently being developed in the industrialized countries are not yet popular in the region.

*Small and Medium Size Cities and the Environment in Latin America and the Caribbean, IHS – IADB, 2000*

Statistics show that civil engineering and construction are some of the economic activities that produce the most waste material. Subsequently, there is a need to formulate ways of using the waste material produced in the construction site as construction material in the site that has produced it.

In Perú there is SENCICO (National Training Service for the Construction Industry), which is sustained by contributions made by the construction sector. Despite their efforts, there is a shortage of qualified workers and insufficient specialized workers, especially in alternative and clean technologies. Within the curricula of this centre there are no courses that include problems and requirements of sustainable construction. In universities also, there is a lack of resources and capacities to develop research on new technologies, but especially there is

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<sup>11</sup> "Instrumentos de gestão para uma cidade de porte médio ambientalmente sustentável" Sanches, Maria Cristina p. M.; Salvador, Nemésio

a lack of dissemination mechanisms to promote their use by the sector and the market. Post-graduate courses in the fields of architecture and engineering rarely include these aspects. For instance, criteria like quality evaluation of environmental comfort and sustainable development for the buildings and the analysis of architectural environmental patterns and pathologies are rarely considered in any of the course contents. They are also not found in architecture and/or infrastructure decision making for investments.

Ignorance and lack of information and education on environmental topics and especially those related to sustainable construction are present at all levels. This helps only to perpetuate the current situation.

#### **4.4 Lack of Efficiency to Manage Growing Demands for Public Services**

The Peruvian State has not been able to establish re-distributive policies of the national or local surplus and this has contributed to increasing the differences of wealth between the different social groups. Due to the inability of the state to cope with the ever-increasing demands of housing and social services, the population, particularly the poor, find their own ways to solve their urgent need with respect to shelter, services and employment. Nevertheless, this has not contributed to sustainable growth of the city.

##### **Drinking water in Chimbote, Peru**

Only 65% of the population of Chimbote is served with piped water. The rest of the people are served by informal systems like water trucks, 'aguateros' (donkeys with water cans), community water taps and self-made wells without any sanitary control. On average the houses with domestic water connections receive water 6 to 7 hours per day. In the poorer neighborhoods the situation is worse, as the water often does not reach them, because of low pressure. In 1991, because of the contaminated drinking water, a large cholera outbreak started in Chimbote, expanding later to the rest of Peru and neighboring countries.

*Source: Forum Cities for Life - Natura, Peru*

It is also very difficult to imagine that the demands can be satisfied with alternative clean technologies due to the resistance from consumers and the companies providing the services. The self-help tradition of the poor families does not guarantee the use of these technologies because they tend to copy medium and high-class construction concepts with a misunderstood perception of progress and modernity.

There is no space for criteria such as:

- a) rational calculation of the size of minimal functional spaces according to user's necessities and aspirations,
- b) climate interaction of dwelling's design through using bio-climatic strategies,
- c) the use of materials and building techniques with energy low costs and contents originated from sources near the site, taking advantage of the energy in closed cycles, and
- d) the re-use, reduction and recycling of building components etc.

#### **4.5 Lack of Interest by Construction Companies concerning the Issue of Sustainability**

The construction industry, traditionally strong and economically powerful, is very difficult to reorientate in order for it to change its methods of utilization of building materials and construction systems. These companies follow the consumption preferences of the clients who normally worship modernity and the patterns followed by developed countries, with the vices and problems already mentioned in this document. Companies that are not interested in technology changes that involve risks and extra costs dominate this sector.

In Perú there are not many enterprises that have complied with ISO 9000 or 14000 norms and standards and of these few, none belong to the construction sector.

One of the reasons for the lack of interest by the private sector in developing sustainable products accessible to the various income groups of the population, is the lack of alternative financial and credit mechanisms that encourage changes in present practices.



#### **4.6 Reconciling the Brown and the Green Agenda**

The “brown” environmental problems can be grouped in a few broader issues, roughly in the following order of importance (based on the perception of Latin American experts who filled out a questionnaire for IHS)<sup>12</sup>. Solid waste pollution; waste water, excreta and water pollution; bad quality and insufficient quantity of drinking water, as the most important ones, followed by risks from ‘natural’ disasters, air pollution, bad housing conditions, soil pollution, presence of disease vectors, traffic congestion, food contamination, traffic accidents and indoor air pollution. They include all environmental interventions which produce or promote good health.

The “green” agenda issues include how to keep and protect the natural capital - or in other words, how to preserve the biological patrimony of humankind, and are related to the direct resource base of the city. In order of importance are the following: regional water pollution (river, coast) and ecosystem degradation as the two most important followed by physical occupation of agriculture / natural land, degradation of agricultural / natural land soil erosion, regional / global air pollution (CO<sub>2</sub>, CFCs), regional soil pollution (e.g. from waste dumps), water table depletion and depletion of raw materials for industry.

All these problems are in fact interrelated with social and economic issues. It is also clear that urban and rural environmental problems are closely inter-linked. The brown agenda needs short term interventions while the green agenda requires a longer term. Both, however, need each other to succeed. There is an imperative need to analyze and measure the environmental impact related to the urbanization process, highlighting the need to reform the urban management model.

It is noticeable that none of the experts mentioned problems with either the construction process itself or with the use of building materials and their characteristics. Due to the absence of minimum knowledge of the sustainable construction concept, the opportunities to initiate the reconciliation process between the green and brown agendas are very remote. Particularly, this is included neither in the political, research or intervention agendas of the construction companies, nor by the people belonging to the self-help construction sector.

### **5. Strengths and Opportunities Presented by the Cultures and Traditional Practices of the Region**

#### **5.1 Strengths**

One of the strengths of our country is that it is characterized by a strong culture of solidarity, mutual aid and peoples’ capacity to work together, particularly at a local level. This comes in part from the Andean tradition. Fortunately, these values are now also part of the life of the population, especially the urban population. It can be identified in the illegal or informal settlements in urban areas where the population must work together in order to improve their living conditions. It is also practiced among poor municipalities, which depend on such strategies to achieve results.

#### **5.2 Weaknesses**

There is a lack of political will to deal with environmental issues. Although this situation could improve in the near future after the national election in April 2001, to presently initiate any activity related to environmental protection or recuperation in relation to construction, will not be favourably regarded.

The result is the permanent deterioration of the environment in the country. For example the irrigation system by filtering presents a 70% water loss, 60% of the coastal land is undergoing an accelerated erosion process with the same problems affecting 42% of rainforests. Five million hectares of forest have been lost and the actual destruction rate is 380 000 hectares per year (43 hectares/hour = one football field per hour).

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<sup>12</sup> IHS-IADB Small and Medium-size Cities and Environment in Latin America and the Caribbean, 2000

### 5.3 Opportunities

Perú is a country with a very strong ecological vocation with diverse climatic zones and topography, abundant flora and fauna and with 84 life zones of the 114 that exist worldwide. They all deserve to be protected and preserved and developed.

Designing and constructing urban areas in harmony with the environment and the climate may help to mitigate the negative impacts of global warming. Establishing alarm systems and through preparation and prevention of risk, the impacts of flooding and landslides can be minimized.

Other opportunities lie in the amount of innovative research already done by local experts with regards to appropriate building materials and technologies. This includes experimenting with the use of traditional practices and materials which include mud bricks, quincha and sillar. Others, which are not very traditional but important to mention are the experiments with sugar cane straw panels and others that seek to find a balance between tradition and modernity using resources in a sensible manner.

For example there are innovative construction waste recycling studies in Salvador de Bahia that have provided interesting results for the generation of different construction aggregates to be used in new constructive processes. Its characterizations, the study of possibilities to reduce them, its reuse and recycling benefit construction companies, protect natural resources and may influence decrease of cost for the benefit of society.

As we can see in the following examples, there are a series of local organizations working on urban environmental issues, generally set up by the municipal authorities. Some municipalities have developed the functions and responsibilities of environmental management using the Law of Municipalities, within which these responsibilities fall principally upon local governments. Despite the limitation and confusions within the law, these have permitted or facilitated some processes or actions for environmental protection and conservation.

#### 5.3.1 Innovative Mechanisms and Public Community Partnerships

##### **The La Mita system**

Due to the scarce financial resources from the State, the city of Ilo has developed a co-financing system for the implementation of community infrastructure that has a great social impact. This system makes use of an ancient tradition of community work called "la mita"<sup>13</sup>. Through this system, an investment of approximately 10 million dollars was generated in communal works<sup>14</sup>, between 1990 and 1997.

Additionally, with the introduction of the "tributary compensation program" neighbors with economic difficulties are allowed to pay the municipal service fees and taxes to the municipality through "days of communal work".

*Doris Balvín, Ilo Report, IHS-BID*

#### 5.3.2 Public Community-NGO Partnership for Service Provision

##### **APPJ Program from European Union – SEDAPAL - ECOCIUDAD, Lima, Peru.**

In 1992, the European Union, together with the Peruvian government, developed a support project for supplying quality water to areas on the outskirts of cities. The project was developed by the NGO Ecociudad. The design consisted of building reservoirs of 50 m<sup>3</sup> and a network of main pipelines that supply 10 to 12 public water tabs which provide the water to 120 families (each water tab serves 8 to 10 families). Ecociudad staff together with PNUD obtained the San Luis prize for this project whose model was "Pro conservation of Nature, Water Resources".

The APPJ program's (drinking water for Shanty Towns in Lima) main objective was to provide drinking water with intermediate networks in shanty towns with no access to the service provided by the water company in Lima (SEDAPAL).

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<sup>13</sup> The responsibility of the citizen is to give one day's work a week to the community.

<sup>14</sup> José Luis López, Agenda 21 para las ciudades, FCPV, 1998

Local Government, SEDAPAL, APJ Program and the neighborhood organizations signed an agreement to execute each project with the support of a local NGO. Local Governments advised the selection of shantytowns and were responsible for ensuring quality drinking water provision through water trucks.

In some cases, local government involvement went beyond their initial commitments. For instance, in Villa María del Triunfo and Ate Vitarte, the local government have assumed the role of promoter of these micro projects, incorporating promotion and facilitation policies for the shantytowns willing to have access to this type of installation; they also support COVAAP's sustainability.

The maintenance costs and the management of the system remain under the control of Vigilance Committee of Drinking Water – COVAAP- which have become micro enterprises. The COVAAPs commercialize and manage the water; they have different management models depending whether they are run by neighbor leaders or by groups of organized women, or when they use a completely private model.

Truck drivers are also part of the system. They sell water to fill the reservoirs. These are private small entrepreneurs who own cistern trucks. They usually sell water individually to each home. One of the identified problems was the poor quality of the water offered by them, in most cases taken directly from rivers, with no previous treatment. When they become part of this program, they were allowed to take the water from the waterspouts of SEDAPAL to ensure the quality of the water source.

Ecociudad promotes the organization and participation of the beneficiary population. Assistance in the organization of community tasks groups for the building of certain components of the system can be given by unskilled labor and hiring skilled personnel from the community. The promotion activities, the social organization, as well as the organization of training courses in environmental topics, especially environmental settling and optimal use of water carried out by the NGO, which also promotes campaigns regarding the improvement of the environmental quality of the village, for which environmental committees are organized in conjunction with the Municipality. Until now, the project has reached 200 000 poor and extremely poor people, improving their quality life considerably.

An extension of the project is being proposed due to the great demand from the population. The complete transferring of the program responsibilities to the local governments is expected for an extension to be feasible and for sustainability purposes. This approach is important within the framework of promotion of operation and management of basic services by micro enterprises.

*Elaborated by Carlos Grey and Liliana Miranda, Ecociudad*

### 5.3.3 Action-oriented concertation

#### **San Marcos, Cajamarca in the northern Andean Perú**

Seven local district local governments together with the provincial government, private and civic society organizations undertook an inter-institutional consensus finding and consultation process against the cholera epidemic of 1993. Together they formed the CINDESAM and without relying on predetermined, formally approved plans or budgets, they established an agreement and a co-ordination plan and investment program. The lack of plans and formally approved budgets was not a hindrance or obstacle to obtaining good results. Their actions were perfectly legal and contributed to empower the capacities of the population. The CINDESAM is not formalized by any specific norm or rule but remains the most influential inter-institutional space in the province.

It is important to note that neither the contradictory legal framework, nor the lack of political will have been obstacles for local governments, institutions and citizens to work together, “concertate” and find consensus for successful environmental management actions in their cities. This is due to the **concertation process, and to the capacity and the perseverance** of their institutions, community leaders, professionals and local authorities. No central or regional government or organization from the public or private sector has had the capacity to contradict or ignore the actions, which developed from consensus mechanisms such as the one described above.

	Legal instruments	Economic instruments	Voluntary instruments	Assessment/ investigation	Capacity Building	Environmental Education	Direct Investments	Planning
Chimbote	X	x				x		x
Chulucanas								x
Cusco	X			x				x
Ilo	X	x	x	X		x		X
Paita	X	x						X
San Marcos							x	X
Tarapoto								X
Arequipa	X	x	x	x	x	x	x	X
Trujillo	X	x			X			X
Villa el Salvador	X		X	X		X	X	X
Total:	7	5	3	4	2	4	3	10

**Use of environmental instruments, based on identified from questionnaire results**

*Actualized by Liliana Miranda, Ecociudad, (source: questionnaire filled by Cities for Life Forum-Ecociudad to IADB-IHS study in Small and Medium-size Cities and the Environment in Latin America and the Caribbean)*

As can be observed in this table, there are 10 cities in the country that are developing processes towards sustainable development through the formulation of Agenda 21 for their respective cities. Three of them are already carrying out concrete investments decided through concerted strategies. Based on these experiences, new urban investments could be oriented to follow sustainable urban constructions and urbanization concepts presented in this document.

Universities and research centres are also a great potential for the development and promotion of appropriate technologies and materials. Not only by carrying out research and studies but by educating and preparing professionals with the knowledge and skills to apply and use sustainable construction concepts and techniques.

What is needed is the support to further develop existing experiences in order to develop new sustainable technologies and materials that can be industrially produced so that they can be affordable to the majority of the population. Affordability and mass production are key factors to influence their adoption by the construction industry.

In Perú, the Forum Cities for Life through PEGUP has identified and trained professionals with good technical capacities. They are committed professionals equipped with skills to work coherently in the formulation and application of proposals for urban environmental management in various cities in the country. They work through the generation of inter-institutional alliances and consensus processes to push forward the Local Agenda 21 with local governments, civic society organizations and universities.

It is valuable and interesting to note the promotion of exchange of experiences among Peruvian cities and with others at international level to strengthen institutions and capacities. This network is an exceptional area for innovation, dissemination, transfer of cleaner construction technologies and the generation and development of local capacities for their application.

### **Urban Management and Education Program in Peru (PEGUP)**

This program is based on a previous project on good practices in urban environmental management by the Peruvian urban network 'Foro Ciudades para la Vida' (Forum Cities for Life- FCPV) and is being implemented together with the Institute for Housing and Urban Development Studies (IHS) and the ITC<sup>15</sup> since 1998. It aims at improving local capacities for urban environmental management. The core element of the project is the three master degree programs, which are executed in three Peruvian cities (Lima, Trujillo and Arequipa) together with local universities. Local professionals from the neighboring cities can follow the courses, obtaining their masters degree in two years.

The lectures are given by a mixture of international and local experts, gradually increasing the share of the latter. Theoretical components are combined with practical exercises for developing management skills, exchange of the participant's own experiences, field visits, and completion of a written assignment. The practical exercises and assignments are directly linked to the local context. Agreements have been signed with local municipalities for mutual co-operation in this respect.

Thus, the education program at the same time addresses locally important issues. The international experts from IHS and ITC, apart from teaching, also perform consultancy work for the municipality, during their mission time. Examples: a Local Agenda 21 process in Trujillo, environmental atlas in Arequipa and the environmental plan of Villa El Salvador. Additionally, several national level activities are organized, as an outreach to other Peruvian cities, like training manuals and a national campaign for implementing Local Agenda 21. The first phase of PEGUP ends in 2002, a second phase is currently being formulated.

*Source: PEGUP, Peru.*

## **6. Suggested Action**

Throughout this document we have seen that sustainable construction and urbanization are the tasks of various stakeholders who need to join forces in order to generate the attention that this concept deserves. This requires the generation and strengthening of strategic alliances that allow concerted action between the different stakeholders that play a role in developing positive synergies with their joint actions. Use of existing networks and alliances is recommended.

Among others, the actions recommended for the various role players are:

### **6.1 Research Community**

- There is an imperative need to analyse and measure environmental impacts related to the urbanization process, highlighting the need to reform the urban management models.
- To register the results of research that has been conducted in the past and use these results to further develop these techniques and technologies. The research needs to incorporate materials and techniques that are earthquake resistant and respond to the different geographical and climatic conditions in the country.
- To complement research on appropriate techniques and materials based on existing experiences and their lessons learned with feasibility studies on how to industrialize their production and what could be the marketing strategies for the promotion and selling of the products.
- To seek the incorporation of sustainable construction and urbanization issues and concepts within university curricula so their application can become part of the routine performance of professionals.
- It is important to recognize, analyze and disseminate the effect of building activities on the environment, changing the training and construction concept of engineers, architects, construction producers and workers.
- Before drawing conclusions and developing solutions, problems and barriers for sustainable construction should be analyzed in an integrated and holistic manner, within the specific local context. An environmental profile focused in sustainable construction could be a useful tool for this purpose.

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International Institute for Aerospace Survey and Earth Sciences, Enschede, The Netherlands

## 6.2 Governments

- To form a regional alliance in order to lobby against the production and the selling of harmful building materials from developed to developing countries.
- To include issues and concepts related to sustainable practices within government development policies. Depending on the commitment and the will of the government, sustainable development will receive more or less attention.
- To develop and enforce legislation for the application of government standards on sustainable practices related to planning and implementation of actions concerning aspects such as water, transport and traffic, energy, building materials, waste and natural resources.
- To encourage sustainable housing practices with the development of incentives and penalties so that more environmentally friendly standards are applied by the construction industry. In the near future, this could lead to the creation and introduction of the Environmental Quality Certificate as a requirement for construction approval.
- To support financial alternatives that give priority to credit to industrial sectors that promote sustainable housing and sustainable development.
- To assist and support research institutions with funds and equipment and to facilitate the creation of spaces for discussions and debate between the various actors.
- To create support and technical assistance projects with local governments, sharing provision of human and financial resources to further develop sustainable techniques and technologies for the self-help construction process with traditional systems.

## 6.3 Local Governments

- To establish in the cities, environmental management instruments that allow the construction, maintenance, re-establishment and protection of the built environment, the natural environment and the surroundings.
- To promote elaboration of Local Agenda 21 that includes sustainable construction topics within investment priorities.
- To promote the elaboration of urban and zoning plans that are based on sustainability principles and include the indicators for cities for life (see Box 2). To adapt and modify the National Construction Bylaws so that the inclusion of sustainable construction and urbanization in local investments is allowed.
- To develop and promote sustainable construction and urbanization through the use of local resources, capacities and traditional techniques.
- To establish a control and technical assistance system in order to improve the quality of self help housing. This could be done through the buildings permit offices.
- To develop institutional capacities in order to establish an evaluation system of environmental impacts, generating information, monitoring and the follow up of the construction activity in the cities.

## 6.4 Construction Industry

- Due to the new environmental conditions, building companies should implement quality norms, and ISO 14000 standards in order to promote changes that should result in the improvement of management and production.
- To encourage sustainable housing construction and urbanization by promoting the use of appropriate materials. Environmentally friendly construction could be used by the industry as a marketing trademark to promote selling of products.
- To reduce, re-use and recycle materials consumption based on the knowledge of present performance, thereby protecting the natural resources and increasing the company profits.

- To support technological schools such as SENCICO in the various regions of the country to train construction workers in the skills required for the use of the new materials and techniques.
- To support the dissemination and promotion of appropriate building materials and technologies, so that the public becomes aware of the advantages of sustainable construction.
- To invest in the technological transformation needed for the use of cleaner construction technologies.

#### **6.5 Non-governmental Organizations (NGOs)**

- To develop a directory of experiences that makes use of clean construction systems to be disseminated and shared with the society.
- To promote the creation of alternative construction micro-enterprises for the placement and promotion of clean and sustainable construction activities in the cities.
- Systematization and dissemination of lessons learned from experiences developing practical guides and catalogues for their promotion in the construction market.

#### **6.6 The population (users)**

- To seek information and to participate in the processes for the formulation of Local Agenda 21, urban development plans and the investment plan of their neighborhoods and their cities.
- To promote the acceptance of alternative technologies that contributes to sustainable development.
- To participate in auditing of government and private sector actions so that demands are accompanied by sustainable investments.
- To participate in a responsible manner in decisions pertaining to the environment and environmental development.
- To develop leadership and concertation capacities of the most active members of the community.

All these actions are valid only if community attitudes and positive values towards environment are taken into consideration and the success depends on the incorporation of these recommendations by urban/environmental policies.