

Sustainable Development through Architecture: A Reflection

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ABSTRACT

The current global discourse on sustainable development has necessitated the intervention of various disciplines; and previous studies have shown that sustainable development poses a challenge for pedagogy in all fields. As for its nature, therefore, sustainable development should not be treated monolithically but should be addressed holistically. The paper takes a reflection into how sustainable development has been achieved over time through architecture with consideration for its importance in the contemporary and future time in a changing environment. Employing a sustainable building developed by the Building Research Establishment in Watford, United Kingdom as a premise, the paper noted that the efficient use of sustainable planning and design, sustainable materials, and construction are the best practices by which sustainable development can be achieved. The paper recommends working with nature as the most efficient way to sustainable development through architecture.

Keywords: *Architecture, housing, sustainable building, sustainable development, multidiscipline.*

1. INTRODUCTION

Twenty years ago, a historic meeting of governments, business organisations and civil society organisations laid down an obligation to achieve sustainable development, named the Rio Declaration. This phenomenal declaration by the United Nations General Assembly (as cited in Miyazawa, 2012) brought, in its wings, a fundamental paradigm that embraced the integration of economic growth, social equality and environmental sustainability. However, there still remains a gap between this declaration and fruitful action because, according to the further findings of the United Nations General Assembly (as cited in Miyazawa, 2012), there are: lack of determining the relative importance of sustainable development, limited access to financial resources, very weak commercial viability of the required investments, inadequate and inappropriate human, financial, technical and institutional capacity dedicated to implementation and evaluation, limited public awareness and a lack of change in lifestyles. Reflecting on the expected outcome of the United Nations Conference on Sustainable Development before it took place in Rio de Janeiro, Brazil, on 20 to 22 June 2012, (also dubbed “Rio+20,”) Brito (2012) lamented that the Rio+20 agenda has “grown from two uninspiring, but essential, foci - the green economy and institutional framework for sustainable development - into a chaotic catchall for the world’s woes”. Agbola (2006), a notable scholar, averred that the blatant failure of the application of traditional economic theories to produce sustainable development is a resultant effect of the mistaken articulation and diagnosis of what development is and should be. According to him, historically, the orthodox paradigm of development economics which

traced its root to neo-classical economics caused growth without development in most third world countries.

However, Abreu (2012) in her reaction called for global sustainability where all countries commit to sustainable development and the “greening” of their economic systems with clean technology, innovation, and sound science. According to her, for the proposed sustainable development goals to be effective, there should be a call for international scientific cooperation and coordinated research on major sustainable development challenges, building on, and working with existing programs. Here, among other disciplines, architecture finds a striking relevance. The primary role of the Architect is to create places from existing spaces. In doing this, he must ensure he factors in sustainability values. The goal of sustainable development is to improve living standards and the quality of people’s lives, both now and for future generations (World Bank Institute, 2002). Since architecture relates with the environment, it is therefore important that the protection of such environment should be paramount in the conceptual developments of the architect. This study therefore looks into the concept of sustainable development with a view to examining the contribution of architecture to its goals.

2. STATEMENT OF THE PROBLEM

The specific problem of creating sustainable shelter in sustainable human habitats is visible in both rural and urban centres of developing countries. Olotuah (2009) averred that incremental construction has pervaded most urban centres in Nigeria. Many of such buildings are inhabited with the barest facilities in place. Although sustainability is fast assuming a global trend, the position

of architecture in actualizing the sustainable development goals in developing countries is not encouraging. The concept of the necessity to protect the environment through architecture is not well understood by many intending developers or house-owners. Quacks who claim to be architects most times, use corrupt means of getting architectural works done. Consequently, the environment is left unsafe and unsustainable for habitation. Furthermore, poverty seems to have clouded reasonable thoughts of what a habitable and sustainable house should be, and consequently, people find shanty and uncompleted dwellings habitable. It is obvious that the role of architecture in its theory, education and practice, in sustainable development cannot be over-emphasized.

3. AIM AND OBJECTIVES

The aim of the study is to explore the concept of sustainable development with specific reflection on how architecture has been employed to achieve some of its goals.

The specific objectives are:

1. To examine the multidisciplinary nature of sustainable development with a view to noting the challenge to pedagogy in all fields;
2. To identify the overarching need for sustainable development within a global context;
3. To explore the existing relationship between architecture and sustainable development;
4. To develop a model which better describes the functional relationship between sustainable development and architecture.

4. JUSTIFICATION OF THE STUDY

The climate as a substantial part of the environment faces drastic changes over time. Now, the serious risks of these changes – especially to global sustainable development – are indisputable; but most times, attention is mainly on the problems and not the solutions (Murdoch, 2006). Many research efforts on the necessity for a global sustainable development abound, and these research efforts were pioneered by the “1987 publication of the UN-sponsored World Commission on Environment and Development (WCED) report, *Our Common Future* (Mebratu, 1998). Despite its acclaimed vagueness and ambiguity, the WCED definition of sustainable development has been highly instrumental in developing a “global view” with respect to our planet’s future. Since then, thousands of initiatives have been taken at local, national, and global levels in an attempt to address different aspects of the environmental challenges” (Mebratu, 1998). However, most of these initiatives are yet to meet the needed and significant global goals especially in the developing nations of the world. One major reason is the overarching problem of poverty (Miyazawa, 2012). It is therefore important to explore the

ways in which architecture can contribute to meeting the goals of sustainable development by studying the methods adopted by the developed economies such as the United Kingdom. This will guide, to an extent, developing countries like Nigeria in formulating and implementing effective and efficient means of meeting this global need in their local territories.

5. SUSTAINABLE DEVELOPMENT: A GLOBAL NEED

The landmark definition of Sustainable development presents it as a development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland Commission, 1987). The necessity for sustainable development in both developed and developing countries is fast assuming an important global stance. He and Zhang (2011) corroborated this when they averred that “Sustainable development has recently become a very important theory for countries all over the world to deal with the relationship between the environment and development”. Therefore, at present, topical issues of sustainable development merit more than a passing consideration or reflection. The present social, economic and environmental statuses of countries in the world require the attention of sustainable development. The germane question posed by the World Bank Institute (WBI) (2002) was: “what are the needs of the present?” in one of its publications, the institute tried to assess the idea of the personal conflicting needs individuals seem to have. The institute goes further to state that we would realise that for instance, if we need clean air to breathe, but also need a car for transportation, then our needs conflict. “Which would we choose, and how would we make our decision? If within ourselves, we have conflicting needs, how much is that multiplied when we look at a whole community, city, country, world? For instance, what happens when a company’s need for cheap labour conflicts with workers’ needs for livable wages? Or when individual families’ needs for firewood conflict with the need to prevent erosion and conserve topsoil? Or when one country’s need for electricity results in acid rain that damages another country’s lakes and rivers?” Since we seem to have conflicting needs in our world there needs to be a viable framework depicting how efficiently we can meet our needs. Miyazawa (2012) while reviewing the Institute for Global Environmental Strategies’ (IGES) proposal for Rio + 20 posited that a set of universal Sustainable Development Goals (Table 1) would offer a more comprehensive framework to respond to these needs while also envisioning poverty eradication as an overarching goal. This is strongly in line with the position of the Governments of Colombia and Guatemala “proposing that a key outcome of the Rio + 20 process should be the definition and agreement of a suite of Sustainable Development Goals (SDGs), similar and supportive of the MDGs”.

6. THE TRIFOCALS OF SUSTAINABLE DEVELOPMENT

The creation of a sustainable future requires collaboration among professionals, academics and relevant stakeholders (Bell, 2005). Furthermore, Jabareen (2011) agreed to this multidisciplinary view by stating that the knowledge of sustainable development is multidisciplinary in its nature and it is covered by various bodies of sciences. This fact is also supported by He and Zhang (2011) when they posited that sustainable development is a highly integrated concept while its realization is a comprehensive multidisciplinary process involving coordination and

function. They also noted that the implication of sustainable development should be studied from multidisciplinary angles, including the ecology, economics, the social sciences and technology. The reason for multidisciplinary involvement is not far-fetched – over time, seasoned professionals and stakeholders concerned with sustainability suggest that meeting the needs of the future depends on how well we find equilibrium among social, economic, and environmental objectives--or needs--when making decisions today (World Bank Institute (WBI) (2002). This is illustrated in Fig. 1.

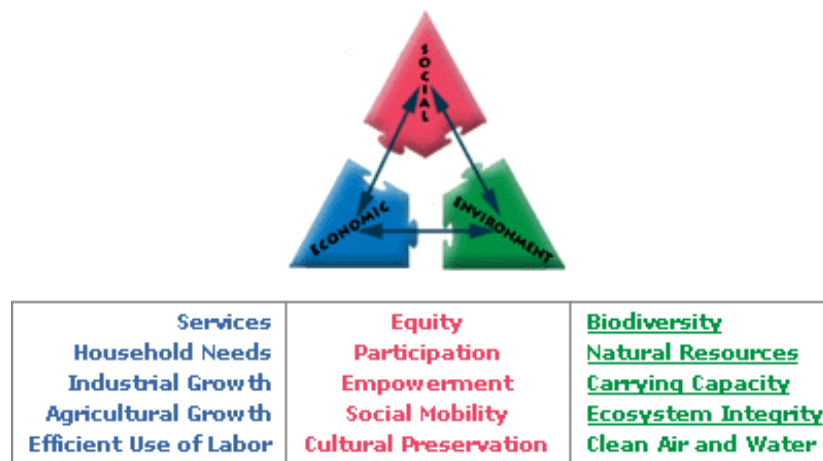


Fig 1: The trifocals of sustainable development

Source: adapted from <http://www.worldbank.org/depweb/english/sd.html>

However, it does not just end in the agglomeration of various professionals. The coming together of various professionals may be cumbered with the throes of coordination and management. Conflicts arise with the blurring of boundaries and responsibilities that can be very difficult to resolve and new ways of working are required to address the problems that arise (the study of Rogers as cited in Bell, 2005). This is because professionals tend to seek refuge in their initial professional identities which they strengthen. Furthermore, these professionals are seen as groups and not teams. Bell (2005) pointed out that teams display synergy, groups do not. According to him, the approaches taken to accountability are laden with differences such that groups tend to work together as individuals and they focus on individual accountability, whereas teams exhibit both individual and mutual accountability. To achieve the sustainable development goals (Table 1), therefore, it is imperative that professionals in the sustainability business work together as a team.

7. SUSTAINABLE DEVELOPMENT AND ARCHITECTURE

Architecture is the art and science of building. The architect as a spatial planner is saddled with the

responsibility of creating sustainable spaces through sustainable means. Furthermore, the building is the architect's creative work and it is the microcosm of the larger environment, both of which must be sustainably handled. In view of this, the duty of the architect within the environment is to do his part by ensuring sustainable architecture within a sustainable environment. Kim (1998) observed that "careful selection of environmentally sustainable building materials is the easiest way for architects to begin incorporating sustainable design principles in buildings". It is worthy of note that the erection of building structures, however small, involves several activities that have negative impact on the environment if sustainable measures are not considered. This statement is confirmed by Roux & Alexander (2007) when they revealed that the building construction and operation results in 50% of all carbon dioxide emissions worldwide. Right from the conceptual design stage to its erection, the impact of these activities on the environment should be checked. Therefore, the architect has the responsibility of ensuring sustainability in his designs. Having been aware of the adverse effects of building construction on the environment, various concepts guiding sustainable design have evolved; among these are sustainable architecture and green or sustainable construction

Table 1: Tentative blueprint for the scope of Sustainable Development Goals (SDGs)

Sustainable Development Goals (SDGs)	
Agenda 21 and JPol	<p>Overarching goal: Poverty eradication, environmental sustainability, sustainable consumption and production</p> <p>Dimensions: <ul style="list-style-type: none"> • Low-carbon economy • Social foundation • Environment sustainability </p> <p>Cross-cutting themes and approaches: <ul style="list-style-type: none"> • Protecting and managing the natural resource base of economic and social development • Sustainable development in a globalizing world • Health and sustainable development • Means of implementation • Institutional framework for sustainable development • Gender and equality etc. </p> <p>Priority areas: Food, water, sanitation, access to energy, oceans and seas, forests, desertification, health, education, shelter, etc.</p>
Broader challenges	<ul style="list-style-type: none"> • Climate change • Energy security • Rise in unemployment and food price • Inequality between the rich and the poor both at global and national levels • An increasing number of natural and man-made disasters, etc.
Emerging possibilities	<ul style="list-style-type: none"> • Green jobs and social inclusion • Resilience and disaster preparedness • Science and Technology • South-South and triangular cooperation, public-private partnerships • Innovative financial mechanisms • Strengthened institutional framework for sustainable development, etc.

Source: Agenda 21 and Johannesburg Plan of Implementation, as cited in Miyazawa (2012).

8. SUSTAINABLE DEVELOPMENT AND HOUSING NEED IN DEVELOPING NATIONS

Meeting the needs of man is challenging. Of importance among the dire needs of man is the challenge of housing provision. Essentially, meeting this specific need requires the expertise of building professionals among which the architect is, in many occasions, the prime consultant. However, this housing need translates to problems in most developing countries and many people are plagued by housing problem both in the rural and urban centres. Arayela (2010) noted that housing shortage is a worldwide phenomenon among developing and developed countries. He went further to affirm that “it was in recognition of the magnitude of housing needs in African countries that made the United Nations estimate an annual construction rate of between 8 and 10 dwelling units per a thousand population for African and other developing countries as against the low level annual production of housing, estimated at between 2 and 4 dwelling units per a thousand population in 1985” (UNDP, 1990 as cited in Arayela, 2010). Olotuah (2009) posited that housing transcends the physical dimension of shelter but includes the general environment within which the structure is located and the availability of essential services; therefore the quality of human habitat is the central issue in

architecture. The need for housing is a critical phenomenon in Nigeria. Studies of Olotuah (2000, 2003, and 2006 as cited in Olotuah 2009) have shown that 75% of the dwellings in urban centres in Nigeria are substandard and the dwellings are sited in slums. These buildings are unsafe and insecure and their environments are in squalid conditions, work places inclusive. Within the context of housing poverty sustainable development might be difficult to achieve.



Plate 1: A squalid mechanic work-place at FUTA junction, Akure Nigeria

Source: Researcher’s field survey, 2012



Plate 2: A squalid condition in Ilesha Garage, Akure Nigeria
Source: Researcher's field survey, 2012

9. SUSTAINABLE DEVELOPMENT THROUGH ARCHITECTURE: THE UNITED KINGDOM EXPERIENCE

The process of building design, construction and maintenance in the United Kingdom is highly organized. Building codes are strictly adhered to and maintenance of structures is given top priority and concern. The reason for this development is not far-fetched: the Department for Environment, Food and Rural Affairs (DEFRA) report (2008) spells out that the United Kingdom Government has set targets to reduce emissions by 80% (from 1990 baseline) by 2050. This was on the premise that domestic dwellings in 2007 accounted for 25 to 27% of CO₂ emissions and 87% of the buildings that will be standing in 2050 already exist (Boardman, 2007 as cited in Suffolk, 2011). Most buildings in the United Kingdom were constructed with brick on account of its thermal mass and efficiency. Today, attention is shifting away from mere consideration of singular property of a building material to its sustainable value. Focus is on the use of recyclable, environmentally-friendly materials with low embodied energy and zero carbon. A significant progress was made by Johnson and Hussain (2011) when they developed a carbon assessment tool which makes it easier to assess the carbon performance of commercial property based on the kind of limited information available. They also performed the integration of the information for multiple buildings into an overall graphic to compare buildings in a portfolio so that actions can be prioritised. The ultimate desire is to achieve one of the goals of sustainable development which aspires to protect the environment from further hampering by human activities.

10. THE EXPERIENCE OF BUILDING RESEARCH ESTABLISHMENT (BRE) INNOVATION PARK, WATFORD, UNITED KINGDOM

Created in 2005, The Building Research Establishment (BRE) Innovation Park has some of the world's most sustainable buildings, landscape designs and many innovative low carbon products, materials and technology. It is an independent research-based consultancy, testing, certification and training organisation, offering expertise in every aspect of the built environment.

10.1 The Case Study of Willmott Dixon Community HealthCare Campus

This building was originally constructed as a sustainable school in 2007, using a laminated solid timber building system. It was converted to health care building in 2009. The building provides an evolving showcase for the latest innovations in construction and healthcare. Its main objective is to demonstrate the importance of retrofit in improving the sustainability and energy efficiency of hospitals and health centres, with the aim of helping the National health Scheme (NHS) to reduce operational costs.



Plate 3: The Building Research Establishment (BRE) Innovation Park, Watford, United Kingdom

Source: Researcher's field survey, 2012



Plate 4: The green environment of the BRE
Source: Researcher's field survey, 2012



Plate 6: Green roof of the Willmott Dixon Community HealthCare Campus Building
Source: Researcher's field survey, 2012



Plate 5: Willmott Dixon Community HealthCare campus Building
Source: Researcher's field survey, 2012

10.2 Key Features of the Building

1. Transparent building integrated photovoltaic, delivering around 3000kWh of electricity each year.
2. Low energy, natural ventilation e-stack system.
3. A modular hospital room which mimics changes in daylight to support the human circadian rhythm.
4. An Ecophon hanging sound absorbing baffle.
5. Innovative solar wall which preheats ventilation air.
6. Wood fibre insulation.
7. Green Roof.

Table 2: Technical Specification of Willmott Dixon Community HealthCare campus Building

Year of construction	Design standards	Fabric U-Values (W/m ² K)				Air tightness m ³ /h/m ²
		Walls	Glazing	Floor	Roof	
2007	Excellent rating	0.25	1.80	0.20	0.18	1.80

Source: Adapted from the Building Research Establishment (BRE) Innovation Park Guide, 2012

Table 3: Technical Specification of Willmott Dixon Community HealthCare campus Building

Construction type	Window type	Building services strategy		Renewable energy		Rain water harvesting	Grey water recycling
		Heating	Ventilation	PV	Solar thermal		
Solid timber panel system	Double glazed argon filled, some windows with safe vents	ASHP (Air Source Heat Pump)	Predominantly natural with some MVHR (Mechanical Ventilation and Heat Recovery)	Yes	Yes	Yes	Yes

Source: Adapted from the Building Research Establishment (BRE) Innovation Park Guide, 2012

11. RECOMMENDATIONS

On account of the global call for environmental consciousness and the knowledge of building construction impact on the natural fabric, research into the performance in the practice of sustainability ideas should be encouraged in developing countries. Focus should be on sustainable and innovative construction materials, low-carbon design techniques, renewable energy, waste and grey water recycling and other sustainable measures.

The concept of sustainable development should be more prioritised at all levels of education (under-graduate and post graduate) in the Schools of Architecture in developing countries. This will strengthen the proper mentorship of environmentally-responsive architects. Consequently, the sustainable impact of architectural education will be reflected in the human habitat through the design and construction of sustainable buildings.

Professional bodies especially in Nigeria should be more positive in the encouragement of the registration of qualified architects. At present, there is a dearth of registered architects in Nigeria. The registration of more architects will strengthen the professional body and help the building industry in its sustainability pursuits.

Sustainability in social, economic or architectural concepts should be seen within the environmental purview. This is because they all operate within the environment and not outside. The model depicting their interconnectivity reduces the mother-nature of the environment. All disciplines should work together with nature and within the context of the environment and not outside it. This is illustrated in the model in Fig 3.

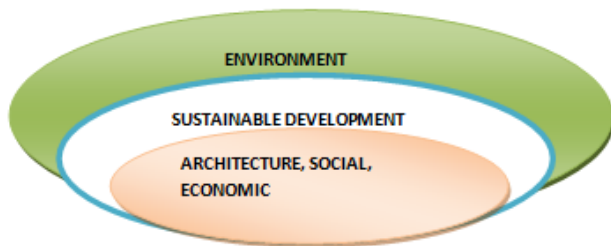


Fig 3: A model which better describes the functional relationship among environment, sustainable development and architecture

Source: Researcher's conceptual development, 2012

12. CONCLUSION

This paper has been able to supply information about the present status of sustainable development through architecture. It has been able to note the multidisciplinary nature of sustainable development and the role of

architecture in this regard. The paper revealed that if building construction and operation results in 50% of all carbon dioxide emissions worldwide according to Roux, P. & Alexander, A. (2007), then architecture can also help in minimizing this through the use of innovative construction materials, low-carbon design techniques, renewable energy and other sustainable design means. Indisputably, it is evident from the study that sustainable architecture is a veritable practice through which the goals of sustainable development can be realised.

REFERENCES

- [1] Abreu, A. (2012). Harnessing New Scientific Capacity. In Rio +20 Science for sustainable development. Retrieved from <http://www.sciencemag.org/content/336/6087/1397.2.full.pdf>
- [2] Adegun O.B. (2011). Shelter and the future African city. *The Built and Human Environment Review*, 4(2), 33-40.
- [3] Agbola, S.B. and Adegoke S.A. (2006). Housing sector reforms and sustainable development in Nigeria. In *Environ-link, A Journal of Physical Development*, 1(1), 1-12.
- [4] Arayela, O., and Taiwo, A.A. (2010). Stabilised laterite bricks as an appropriate walling material Technology for increasing housing stock in some selected African Countries. In L. Villegas, O. Ural, V. Abrantes, I. Lombillo, C. Liaño (Eds.), *Design, technology, refurbishment and management of buildings: Proceedings of the 37th IAHS World Housing Congress, Oct. 26-28, 2010, Santander (Cantabria), Spain*.
- [5] Bell, M. (2005). Learning to tango: sustainable development and the multidisciplinary dream.
- [6] In_the conference proceedings of The 2005 World Sustainable Building Conference, Tokyo, 27-29 September 2005. Retrieved from <http://www.leedsmet.ac.uk/as/cebe/projects/tango.pdf>
- [7] Building Research Establishment (BRE) Innovation Park Guide (2012).
- [8] Brito, L. (2012). Analyzing Sustainable Development Goals. In Rio +20 Science for sustainable development. Retrieved from <http://www.sciencemag.org/content/336/6087/1397.2.full.pdf>

- [9] Brundtland Commission (1987). Retrieved from http://en.wikipedia.org/wiki/Brundtland_Commission
- [10] Department for Environment, Food and Rural Affairs (DEFRA) Report (2008). A framework for pro-environmental behaviours. Retrieved from www.defra.gov.uk/publications/files/pb13574-behaviours-report-080110.pdf.
- [11] He X., and Zhang, K. (2011). Multidisciplinary approaches to new pathways to sustainable development. *Environment and development*, 1(1), 1-7.
- [12] Jabareen, Y. (2011). Teaching Sustainability: A Multidisciplinary Approach. *In creative education*, 2(4), 388-392. DOI:10.4236/ce.2011.24055
- [13] Johson, T. and Hussain, S. (2011). A carbon assessment tool for commercial property portfolios. BRE Trust Review 2011, United Kingdom: BRE Press.
- [14] Mebratu, D. (1998). Sustainability and sustainable development: historical and conceptual review.
- [15] Environ Impact Asses Review 1998:18, 493–520. Retrieved from http://www.is.cnpm.embrapa.br/bibliografia/1998_Sustainability_and_sustainable_development_Historical_and_conceptual_review.pdf
- [16] Murdoch, J. (2006). The rough guide to saving energy and reducing your carbon footprint. London: Rough Guides
- [17] Miyazawa, I. (2012). What are sustainable development goals? *Institute for Global Environmental Strategies (IGES) Rio +20 issue brief, Vol 1*. Retrieved from <http://www.stakeholderforum.org/fileadmin/files/IGES%20rio%20issue%20brief.pdf>
- [18] Olotuah, A.O. (2009). Demystifying the Nigerian Urban Housing Question. Inaugural Lecture Series 53 Delivered at The Federal University of Technology, Akure, 35-36.
- [19] RIO + 20: Sustainable Development Goals (SDGs) (2012). A Proposal from the Governments of Colombia and Guatemala. Retrieved from <http://www.uncsd2012.org/content/documents/colombiasdgs.pdf>
- [20] Roux, P. & Alexander, A. (2007). Sustainable Building Materials. Retrieved from <http://www.sustainabledevelopmentnetwork.com/manual1/Chapter%203.pdf>
- [21] Suffolk, C. (2011). Rebound and spillover effects: Occupant behaviour after efficiency improvements are carried out. In BRE Trust Review, First-Year Ph.D project, BRE Centre of Excellence in Sustainable Design of the Built environment, Cardiff University.
- [22] United Nations (2002). “Plan of Implementation of the World Summit on Sustainable Development.” Resulting plan from the World Summit on Sustainable Development.
- [23] United Nations General Assembly (1992). “Rio Declaration on Environment and Development.” Report of the United Nations Conference on Environment and Development. A/CONF.151/26 (Vol. I).
- [24] World Bank Institute (WBI) (2002). What is sustainable development? Retrieved from <http://www.worldbank.org/depweb/english/sd.html>