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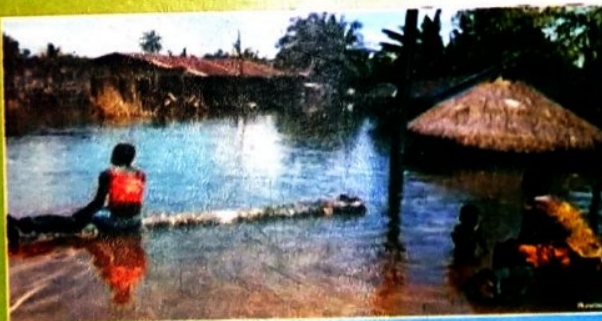
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### BOOK OF PROCEEDINGS

Theme:

# CLIMATE CHANGE, ENVIRONMENTAL CHALLENGES AND SUSTAINABLE DEVELOPMENT



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(NMetS)

## Assessment of the Integration of Climate Change and Sustainable Development in Nigerian Cities

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### Abstract

There are many links between climate change and sustainable development. Despite the relationship, there is no direct link between sustainable development and climate change. This paper examines the relationship that can exist by integrating climate change and sustainable development approaches in Nigeria. It focuses on the concepts and methods that may have some important benefits to resilient cities; it also discusses recent developments in both the climate change and sustainable development literature and method of integrating them. The data for the study was obtained mainly from secondary sources. This was arranged into scenarios that were statistically analyzed. Six scenario groups were used and organized into four scenario families. Each family was analyzed using a narrative storyline. Six scenarios were selected to illustrate the whole set of scenarios. These six illustrative scenarios include one representative scenario from each of the four families. The analysis indicated that, sustainable development and climate change interact profoundly on a number of levels. Reducing greenhouse gas emissions and increasing adaptability has contributed to a range of sustainable development goals unrelated to climate in cities. The result also indicated that there is need for an approach to scenario analysis that integrates all aspects of climate change and sustainable development and the critical importance of alternative development paths and the assumptions. The research recommends that sustainable development policies can make a major contribution to reducing greenhouse gas emissions, even in the absence of explicit climate policy. It is concluded that there is possible relevance of sustainable development to climate change.

**Keywords:** Cities; Sustainable Development; Climate Change; Integrated Assessment; Scenarios.

### 1. Introduction

Sustainable development is a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [1]. Albeit somewhat vague, this concept of sustainable development aims to maintain economic advancement and progress while protecting the long-term value of the environment; it "provides a framework for the integration of environmental policies and development strategies" [1]. The key principle of sustainable development underlying all others is the integration of environmental, social, and economic concerns into all aspects of decision making. All other principles in the Sustainable Development framework have integrated decision making at their core. It is this deeply fixed concept of integration that distinguishes

sustainability from other forms of policy. The precautionary principle establishes that "where there are threats of serious or irreversible damage; lack of full scientific certainty shall not be used as a reason for postponing cost-effective measure to prevent environmental degradation" [3]. Therefore, the proponent of an activity bears the burden of proving that this action will not cause significant harm. Explicitly stated in the Rio Declaration, the notion of common but differentiated responsibilities recognizes that each nation must play their part on the issue of sustainable development. Climate change is a long-term shift in the statistics of the weather (including its averages). For example, it could show up as a change in climate normal (expected average values for temperature and precipitation) for a given place and time of year, from one

decade to the next [4] The global climate is currently changing, the last decade of the 20th Century and the beginning of the 21st have been the warmest period in the entire global instrumental temperature record, starting in the mid-19th century. Climate change is a normal part of the Earth's natural variability, which is related to interactions among the atmosphere, ocean, and land, as well as changes in the amount of solar radiation reaching the earth. The geologic record includes significant evidence for large-scale climate changes in the Earth's past. Climate change as a phenomenon is a **Human-induced change through the release Greenhouse Gases** Certain naturally occurring gases, such as carbon dioxide (CO<sub>2</sub>) and water vapour (H<sub>2</sub>O), trap heat in the atmosphere causing a greenhouse effect. Burning of fossil fuels, like oil, coal, and natural gas is adding CO<sub>2</sub> to the atmosphere. The current level is the highest in the past 650,000 years. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change concludes, "That most of the observed increase in the globally averaged temperature since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations" [4]

There are many alternative definitions of sustainable development, and none is universally accepted. Nonetheless, they all emphasise one or more of the following critical elements: identifying what to develop, identifying what to sustain, characterising links between entities to be sustained and entities to be developed and envisioning future contexts for these links [5]. Authors have emphasised the economic, ecological and human/social dimensions that are the pillars of sustainable development [6].

The concept of sustainable development has permeated mainstream thinking over the past two decades. Agenda 21 that is integral part of the World Conference corroborated with the 2002 World Summit on Sustainable Development [7] which made it clear that sustainable development had become a widely-held social and political goal. Climate change, however, adds to the list of stressors that challenge our ability to achieve the ecologic, economic and social objectives that define sustainable development.

This paper examines the relationship that exists and can exist by integrating climate change and sustainable development approaches in Nigeria. It focuses on the concepts and methods that may have some important benefits to resilient cities; it also discusses recent developments in both the climate change and sustainable development literature.

## 2. Discussions and analyses of Scenarios

The scenarios for this study were selected from six situations that are analysed statistically. These scenarios are grouped into four scenario families [6]. For each family of the scenario, a descriptive study was analysed; numerous demonstration clusters distinguished to justify the scenario [8]. The selected six scenarios were combined to discuss what happened in the event of integrating climate change to sustainable development. These six illustrative scenarios include one representative scenario for each of the four families as well as two additional scenarios. The four families are grouped into homogeneous and heterogeneous family scenarios. The homogeneous scenarios are the Global Family Scenario and Environmental Family Scenario that explore alternative energy development and its attributes are shown in Table 1.

The Environmental Family Scenario harmonizes the driving forces; for each family (Energy, Technology, Economy, Social and Environmental forces). The heterogeneous family includes: Regional Family Scenario which present a future that indicated regional identifies that can be strengthened as shown in Table 1. The two additional scenarios are sustainability and climate change with attributes shown in Table 1.

The analysis of the integration of climate change and sustainable development by SRES [9] indicated that, emission of green house gas (GHG) is contentious and its localization in Nigeria has proven that the four family's emission is extremely large (The GHG in 1990 has increased by 5 folds in 2014)

It is important to remember that these are all reference scenarios that assume no climate policy, just different assumptions about driving forces.

On the other hand, the SRES analysis also shows that alternative combinations of the driving

forces in the Environmental Family can lead to similar levels of GHG emissions by the end of the next century [10]. The implications of these findings for sustainable development issues are profound. They suggest that development path decisions may be more important than climate policy decisions, even in determining climate impacts, risk, costs and benefits.

However, there is no easy linkage between such development path decisions and emissions. In other words, climate change and sustainable development are profoundly linked, but in complex ways. The definition of sustainable development is to be considered

**Table 1:** Family and Scenarios of integrating Climate Change and sustainable Development

Families	Scenario	Characteristics	Attribute
Global	Global	Homogeneous	<ul style="list-style-type: none"> <li>• High Rate of Change in Technology</li> <li>• High economic Growth</li> <li>• Low Population</li> </ul>
	Sustainability	Homogeneous	<ul style="list-style-type: none"> <li>• High Rate of Change in Technology</li> <li>• Low Population</li> <li>• Strong Sustainability</li> </ul>
Environmental	Environmental	Homogeneous	<ul style="list-style-type: none"> <li>• High Population</li> <li>• High Economic Growth</li> <li>• High Technological Advancement</li> <li>• High Energy Consumption</li> <li>• Intervening Land uses</li> <li>• Urban Agriculture</li> </ul>
Regional	Regional	Heterogeneous	<ul style="list-style-type: none"> <li>• High Population Growth</li> <li>• Medium Economy</li> </ul>
Economic	Economic	Heterogeneous	<ul style="list-style-type: none"> <li>• High Economic Growth</li> <li>• Cultural convergence</li> </ul>
	Climate change	Heterogeneous	<ul style="list-style-type: none"> <li>•</li> </ul>

from three necessities: the ecological necessity to remain within biophysical carrying capacity, the economic necessity to provide an adequate material standard of living for all people, and the social necessity to provide systems of governance that propagate the values by which people want to live as shown in Table 2. Because of the many interconnections among the three necessities, it is impossible to address any one of three in isolation. In fact, they need simultaneous reconciliation.

Pillars of Sustainable Development	Characteristics
Ecological Imperative	To stay within biophysical carrying capacity
Economic Imperative	To provide an adequate material standard of living for all
Social Imperative	To provide systems of governance that propagate the values that people want to live by

### 3 Integrating Sustainable Development and Climate Change

The concept of sustainable development has been closely associated with an attempt to integrate social and economic issues into the environmental agenda. Arguably, this was the central message of the Brundtland report which argued, among other things, that at the global level, environmental issues could simply not be successfully addressed in isolation from human problems of poverty and development. The ambit of sustainable development is much broader than the old

agenda of environmental concern, bringing to the fore such issues as poverty, income distribution, trade, investment, wealth creation, competitiveness, and jobs, as well as the more familiar issues of resource depletion, pollution, biodiversity loss and protection, species conservation, maintenance of essential life support systems, and environmental ethics. An attempt to integrate social, economic and environmental issues at any spatial scale

speedily confronted by the existence of a huge array of public policy, institutional/organizational, and behavioural issues of almost bewildering complexity. In a world where environmental conditions are deteriorating rapidly in many regions, where economic conditions are grim or worse in others, and where systems of governance are breaking down into chaos, a belief in the possibility of some kind of integrated response that simultaneously addresses the three dimensions of sustainable development may seem somewhat naive.

Yet it is also becoming increasingly apparent that the linkages among these various issues are not just rhetorical. Poverty is often closely linked, as both cause and consequence, with environmental degradation, and economic growth is tied in complex ways with social development and environmental conditions. In this connection, sustainable development offers a new way to conceptualize, and analyse such options, and a new way to organize our thinking about future possibilities. It is no accident, for example, that the global scenario analyses of the World Business Council on Sustainable Development [11], the Global Scenarios Group and the IPCC SRES [9], use sustainable development or sustainability as an organizing principle for some of their scenarios. A key characteristic of most sustainable development analysis and policy is the attempt to provide some framework in terms of which ecological, social, and economic dimensions can be integrated. The diversity of ways in which this is done, and the ambiguity and vagueness inherent in the concept of sustainable development, mean that there is no single approach to integration [12]. We have therefore chosen to outline briefly one such framework, as an example of how such integration may be approached.

#### 4. Linkages between Climate Change and Sustainable Development

One legacy of the science-driven nature of the climate change research process has been a kind of sequential view of the climate change from driving forces to emissions, atmospheric concentrations, changes in the physical climate system, impacts, and adaptation. While, this view has a certain elegance to it, it grossly oversimplifies a complex process of

feedbacks and inter-relationships and also relegates crucial aspects of the human dimensions of climate change to the status of exogenous variables, as either 'drivers' or responses [7].

Adaptation to climate change has an impact on the environment that is consistent with a complex adaptive systems approach [13]. The general idea is that flora and fauna continuously adapt to a range of changes in the biophysical, economic, and socio-cultural environment. Some of these adaptations have direct connection with climate change; many more occur for non-climate related reasons but have significant effects on greenhouse gas emissions or climate change impacts.

Given the inter-relatedness of ecological, social, and economic systems, it was discovered that holistic view has to be taken, including some awareness of trade-offs among competing goals. It also permits issues like climate change to be contextualized in terms of sustainable development issues.

#### 5. Recommendations

There is a proposal of twin strategy that intended to contribute to simultaneous reconciliation of the three imperatives: dematerialization and re-socialization. Dematerialization involves uncoupling economic activity from the throughput of matter and energy to an economy by significantly reducing the material and energy inputs to production (Figure 1). In other words, it involves vastly improving the efficiency by which natural resources are used.

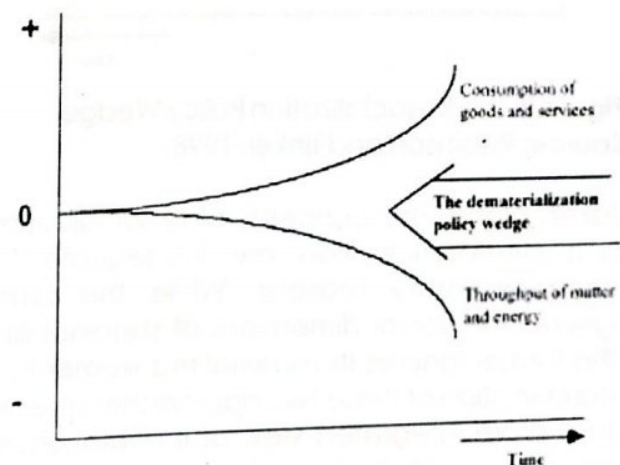
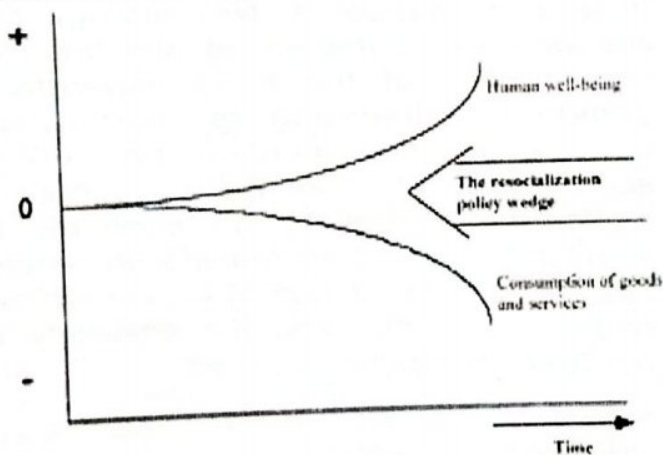


Figure 1: The Dematerialization Policy Wedge  
Source: Robinson and Tinker, 1998.

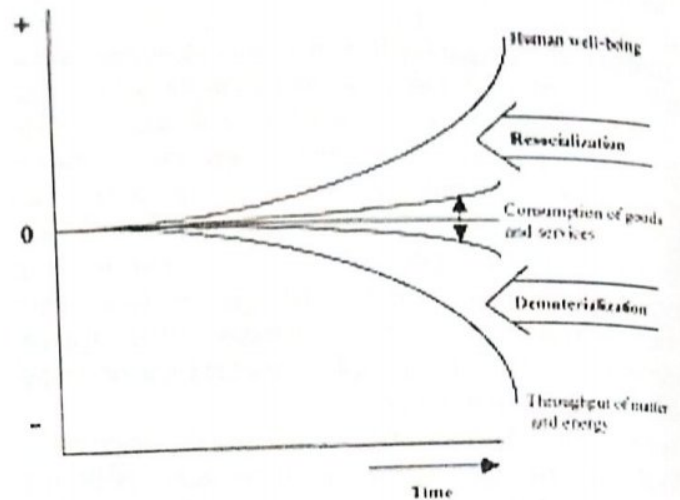
Dematerialization If successful, holds the promise of significantly improving our ability to provide for growing material needs without increasing, and perhaps reducing, environmental impacts. However, it addresses only the environmental efficiency of the production system. It is a technical fix and, as such, ignores the social dimensions of sustainability.

To address these issues, it is proposed that the strategy of re-socialization, which involves uncoupling human well-being from economic activity through the building up of social capital and its substitution for formal economy consumption. Re-socialization focuses on the demand-side, on consumption and also governance issues (Figure 2). It involves the recognition that many forms of social activity and behaviour that people value are not measured in terms of economic output. Indeed, the development and maintenance of many forms of social capital take place entirely outside the formal economy and are simply not measured by traditional indicators of economic activity.



**Figure 2:** The Resocialization Policy Wedge  
**Source:** Robinson and Tinker, 1998.

Taken alone, the concepts of re-socialization and dematerialization are inadequate for complementary reasons. While the latter ignores the social dimensions of sustainability, the former ignores its material requirements. A combination of these two approaches give rise to a more integrated view of the relationship among ecological, social and economic systems as shown in Figure 3.



**Figure 3:** The integration Policy Wedge  
**Source:** Robinson and Tinker, 1998.

Second, recognition of this interconnectedness suggests the desirability of going beyond a narrow treatment of climate change issues. It is important not to sub-optimize on climate change issues, but to instead consider linkage with other types of policy, since these may prove to have more significant effects on emissions and impacts.

Third, the emergence of 'development, equity and sustainability' as a cross-cutting issue in the work of the IPCC offers a major new opportunity to contextualize climate change issues in a sustainable development framework [2]. This would have the advantage of making climate change more relevant to policy by grounding climate change in real world sustainable development issues.

Fourth, a central insight emerging from both the sustainable development and climate change fields is the critical importance of alternative development paths and the assumptions about the reference case or baseline that underlie any analysis.

Fifth, this in turn suggests the need for an approach to scenario analysis that integrates across all aspects of climate change and sustainable development research. On the climate side, given the sequential process of developing emission scenarios, climate scenarios, and impact scenarios, much can be learned about how to link environmental issues with social and economic ones from the very detailed scenario and modeling work in the climate field.

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