



Ambe J. Njoh

Nature in the Built Environment

Global Politico-Economic,
Geo-Ecologic and
Socio-Historical Perspectives

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ISBN 978-3-030-39758-6 ISBN 978-3-030-39759-3 (eBook)
<https://doi.org/10.1007/978-3-030-39759-3>

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The cover photograph is of the Martyrs' Memorial Monument in Mekelle, Ethiopia.

Photographed by the author, Ambe Njoh, while serving as a United States Ambassadors' Distinguished Scholar, under the Ambassadors' Distinguished Scholars Program (ADSP) in the School of Architecture & Urban Planning at Mekelle University, Ethiopia (Fall 2019 – Spring 2020).

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

This book is dedicated to the memory of my precious mother, Mammi Eni Diana Njoh, whose sojourn on Earth the Lord Almighty deemed necessary to halt on December 7, 2019 as I'd just scribbled the manuscript's concluding lines. Mother, while I sorely miss you, I take solace in the fact that you are savoring your eternal repose in God's tender loving arms.

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Chapter 1

Environmental Stewardship and Built Space



Abstract There has been a rapid expansion of built space leading to unprecedented levels of urbanization throughout the world in the recent past. This has been matched by the rapid shrinkage and fragmentation of natural areas and resources. However, there are many gaps in knowledge of the exact nature of these diametrically opposed phenomena and how to go about resolving the problems they engender. This book contributes to efforts to close these gaps. Defining built space broadly to include all human settlements, the book interrogates efforts to promote nature in built space in different regions of the world. This chapter lays the foundation for, and provides a thumb sketch of, the discussion in the book.

1.1 Introduction

The discourse on the relationship between the natural environment and built space has intensified during the last decade. This discourse is no longer confined to academic quarters. Rather, it is becoming increasingly commonplace in the popular media, social forums, and among policy makers. The relationship is often characterized as conflictual—very likely a function of the erroneous tendency to view the natural and built environments as mutually exclusive. Ironically, this view is also prevalent in scholarly circles. The irony is evident in characterizations of the built environment as “a static creation, in a sense ‘turned off’ for a while from the circulation of nature” (Lamprecht 2016: 68). It can also be gleaned from studies seeking to determine whether people prefer the natural environment over built space or vice versa (e.g., Beute and de Kort 2018). Such studies view the two environments as mutually exclusive rather than complementary. Yet, their complementarity is indisputable. The complementary nature of both environments is glaringly obvious when one considers their indispensability for human survival. Humans need both the natural and built environments to survive. Elements of built space, including but not limited to the pieces of physical infrastructure that house people, commercial, religious, and health care activities lend credence to this assertion. Similarly, the soothing sounds of birds, the pleasant smell of flowers, and the sense of tranquility typically associated with the natural environment can significantly improve people’s quality of life.

Advocating the harmonious co-existence of humans and nature is anything but novel. People have always shared space with the natural environment. Prior to the massive growth of human populations and the resultant urbanization trends, people were always surrounded by nature. Thus, the said coexistence is more natural than contemporary spatial organizational structures suggest. These structures are either products of modernist urban planning or seek to emulate principles of such planning. The structures have typically been oblivious to the need to protect nature. Consequently, efforts to develop built space have been cataclysmic by considering the destruction of natural features as unavoidable. Cases of such consideration are commonplace. Witness for instance, the common practice of indiscriminate tree-removal that typically precedes building and road construction projects. Also worth noting in this regard are efforts in so-called land reclamation initiatives that seek to transform swamps, lakes and other bodies of water into buildable land. The grave and disastrous environmental consequences of such initiatives are well established and need not be rehearsed here. Suffice to say that these initiatives are grossly incompatible with ongoing global efforts to promote sustainable development. This is because such development depends on the harmonious co-existence of the natural environment and built space. This dictates a need to develop built space in ways that seek to protect, not supplant or destroy, nature. This need is accentuated today, more than ever before, because of the rapid expansion of built space on the one hand and the speedy decline of the natural environment on the other.

The rationale for such co-existence is compelling; it is the need to harness the resources necessary for sustaining human life. As Fuller and Irvine (2010: 131) have observed,

“the sheer rate and scale of human appropriation of natural resources has precipitated a biodiversity crisis currently being manifested in rapid rates of species extinctions, extensive transformation of the structure and function of ecosystems, and rapid alterations to the Earth’s climate.”

At the root of the current biodiversity crisis are human activities. Therefore, resolving the problem calls for human initiatives such as the aggressive re-introduction and preservation of nature in built space. In making an identical point, Fuller and Irvine (2010) contended that, people have the responsibility to ensure the growth and sustenance of nature in towns and cities because this is where most daily human-nature interaction occurs. The increasing expansion of built space has been matched by the rapid shrinkage and fragmentation of natural areas and resources. However, little is known on how to go about promoting sustainable economic growth, conserving biological diversity and maintaining ecological integrity in an increasingly urbanizing world (Mazzotti and Morgenstern 2014). To be sure, built space is not limited to urban areas; rather, it includes human settlements of all varieties.

The notion of nature co-existing with built space possesses both a logical and intuitive appeal. Trees and other plants add to, rather than subtract from, the quality of built space. They are sources of edible roots, fruits, and vegetables; in addition, they have direct health benefits as some contain medicinal ingredients. Also, they serve as avenues for recreational activities such as walking, jogging, and gardening.

Economically, surpluses from tree and plant products can be sold to generate income for communities, families and individuals. Also, public parks with well-maintained grass and trees serve as important avenues for socialization. Such facilities can provide an opportunity to preserve and conserve endangered species of plants and trees thereby serving a heritage function. Finally, nature in built space serves a crucial role in efforts to promote biodiversity, improve air quality and reduce CO₂ emissions.

The importance of trees and other natural elements in built space is magnified once we consider the rapid rate of urbanization that has been taking place throughout the world since the turn of the century. Presently, urban areas alone occupy about 2% of the planet's land area; and by 2030, they are projected to cover as much as 10% (Lamprecht 2016, para. 1; Vince 2014, 2015). In other words, by 2030 1.2 million square kilometers of additional biodiversity-rich landscapes would have been lost to urban construction alone (Lamprecht 2016, para. 1; Vince 2014, 2015). The accelerated urbanization trend observed since 2007 when, for the first time in human history, more than 50% of humanity lived in urban areas, shows no sign of slowing down. Most of the growth has resulted from rural to urban migration as opposed to human fertility. Thus, it is safe to focus meaningful efforts to ensure the survival of humans, other species and ecosystems in the Anthropocene on built areas. The main objective of such efforts should be to promote nature in built space. In other words, creating, maintaining and preserving natural resources in the built environment. However, there are vast gaps in knowledge on how to go about attaining this objective.

The main aim of this book is to contribute to efforts to close these gaps. It is premised on the belief that a good understanding of the status quo is necessary for the success of any effort to fill the gaps. Accordingly, the book scans the proximate and remote environments of global initiatives to create and protect nature in built space. Thus, the book conducts an environmental scan of the context of efforts to promote nature in built space in global perspectives. This necessitated the use of an analytical tool from the extant family of environmental scanning models (ESMs). The best-known of these is the "Strengths, Weaknesses, Opportunities, and Threats" (SWOT) matrix. This matrix, as its name implies, focuses on the strengths, weaknesses, opportunities and threats within the proximate and remote environments of an entity of interest. The matrix was initially designed for use in the business world by researchers at the Stanford Research Institute, California, USA in the 1960s (Humphrey 2005). Since then, it has been employed in a number of disparate fields. A few recent works, including Njoh (2017), Bas (2013) and Catron et al. (2013) have employed the matrix in the energy field. Yet, as an analytical tool, SWOT appears inadequate to the task of analyzing the political economy of nature in the built environment. In this regard, SWOT has been criticized on a number of grounds (Njoh 2017). Prominent in this regard has been the charge that SWOT lacks the versatility to handle multi-faceted contexts. Recognition of this shortcoming dictated the need to undertake a few modifications leading to what we herein label, PESTECH, which is an acronym encapsulating the political, economic, social, technological, ecological, cultural and historical context of an entity of interest. The modified model is employed in this book. The model shares many tenets with

STEEPLE, which is the acronym for the socio-cultural, technological, economic, ecological, political and ethical contexts of the entity being evaluated. As an analytical tool, it has been employed in evaluating the impact of a product on its users. PESTECH is a vastly improved variant of SWOT, STEEPLE and other existing environmental scanning models especially because of its sensitivity to context-specific factors such as ecology, culture and history. It is in order to examine each of the seven specific dimensions of the model—political, economic, social, technological, ecological, cultural, and historical—in turn.

Political factors include the political system and structure (e.g., totalitarian versus democratic), power structure, regional governments powers vis-à-vis the central administration, ratio of government to private ownership and control of business/utility companies, presence of state monopolies, government interference, level of influence from pressure groups on governments extent of political stability, level of government spending, safety, security, public protection, role/place of the military, state interference in the market, market regulations, trade agreements, tariffs or restrictions on imported commodities, taxes, clarity of procedures and laws governing imported goods' trade, institutional framework and governance structures, procedural formalities for obtaining permits for relevant activities, level of bureaucratic corruption, and government stability. An important subset of the political context comprises legal factors. These include all regulatory measures and laws that affect the functioning of the entity of concern. Basic questions that must be addressed when examining legal factors include but are limited to the following. To what extent are the rules, regulations, and laws implemented in a fair, just and equitable manner? Are the laws, rules and regulations standard throughout the country? Factors under the rubric of ethics include the ethical dimensions of the context in which the entity under consideration operates. The specific factors in question, must at a minimum, include morality, integrity, behavior, duties of citizens to themselves and others. What is considered 'good' or 'bad'? Economic factors include economic growth, employment policy and levels, inflation and interest rates, business climate, monetary policies, and consumer confidence, GDP, currency fluctuation, rate of inflation. Ecological factors include factors such as natural resource availability and accessibility, actions aimed at promoting sustainability, consumer appreciation, support of eco-friendly policies, fees and fines for natural resource use and exploitation as well as regulations affecting waste disposal. Technological factors include new inventions, development, rate of technology transfer, life cycle and speed of technological obsolescence, changes in information technology, and changes in mobile technology. The socio-cultural dimension includes factors such as indigenous cultural norms and values, income distribution/levels, demographic changes, labour, and social mobility, lifestyle changes, and educational levels. Historical factors are especially important because they constitute the foundation for all elements that affect any entity. This is particularly true when the entities of concern are polities. All polities, including countries and nation states have a history of some sort. This history, especially for formerly colonized states, have far-reaching implications for development policies and outcomes. Therefore, it can be exceedingly illuminating to consider this history in efforts to understand their current development

profile. Appreciating a country's history is also necessary to understand its natural environmental policies especially as they relate to built space.

1.2 Main Questions

Three important questions are of centrality in this book. They include, for each major region, the following.

1. What is the institutional context of policies affecting nature in built space?
2. What are the implications of PESTECH factors for initiatives affecting nature in built space?
3. What specific steps have been taken to promote nature in built space?

These questions are tackled within the context of nature in built space as an element of commonly shared resources. Thus, it is necessary to summarize natural resources as a commons good.

1.3 Natural Resources and the Commons Question

Central to the concept of public goods is a seldom-acknowledged phenomenon, the 'self-governance of commons' (Ostrom 1990). Natural resources such as trees and other green areas, parks, and wetlands are by definition, public goods that require collective actions to manage. The 'collective actions' typically discussed in the literature are limited to those of members of the beneficiary communities. However, it is more instructive to broaden the scope of collective actions to encompass the actions of all stakeholders in the context of any commonly shared resource. These include the actions of suppliers, managers, regulatory agencies and consumers or users of the resource. Ostrom (1990) identified three problems likely to thwart such actions, namely the tragedy of the commons, the prisoner's dilemma, and the logic of collective action. The notion of 'tragedy of the commons' connotes the tendency of consumers or users of any resource to 'overexploit,' neglect the upkeep, and even behave opportunistically—that is, act as free-riders—of the resource (Hardin 1968). Critics of this concept, with Elinor Ostrom (e.g., 1990) at the forefront, have marshalled evidence to prove that this tendency is not as commonplace as previously believed. Instead, within many human communities, one is likely to find rules and institutions of the non-market variant that work to ensure the sustainable management and use of common pool resources. As a concept, the prisoner's dilemma holds that individuals are likely to seek to serve their own self-interest in any given situation (Poundstone 1993). Essentially, this assumes that individuals are wont to be suspicious of, and to avoid cooperating with, others. 'The logic of collective action,' which is the title of Mancur Olson's 1965 classic, essentially holds that concentrated minor interests will tend to be overrepresented while trumping diffuse

majority interest because of the free-rider problem aforementioned. This problem tends to be intensified as groups grow larger. For Olson, individuals within any community summoned to undertake collective action towards achieving any given objective are likely to opt to 'free-ride.' This is contrary to Ostrom's position, which holds that members of common interest groups or communities, regardless of their size, are likely to act collectively to achieve their shared goals (Ostrom 1990). There are many reasons to believe that this holds true in the context of natural resources in built space.

One of these reasons is tied to the concept of stewardship. This concept has roots that are traceable to ancient civilizations, which assigned to humans the role of caretaker over natural resources. The concept is therefore of centrality in this book; the book acknowledges the fact that nature in built space involves multiple, and sometimes, disparate stakeholders. In this regard, the book deviates from conventional thinking in resource management and control. In contrast to this thinking, the book views the success of efforts to promote nature in built space as a function of multiple factors, including but not limited to, the political, economic, social, technological, ecological, cultural and historical contexts. Analyzing these contexts in global perspectives would prove to be invariably revelatory. It would reveal that all societies recognize the importance of nature and built space harmoniously co-existing. Also, there is a universal recognition that public interests trumps private preference when it comes to nature in built space. As Wright and Boorse (2017) have noted, even in Western societies where individual land ownership is the norm, there is a recognition of the fact that 'ownership' is essentially a temporary phenomenon as any given piece of land is always guaranteed to outlive its 'owner.'

Despite the universal nature of certain practices and preferences, many politico-economic, socio-cultural and geo-ecological factors are unique to certain regions. There are vast differences in the ways in which these factors impact efforts to promote nature in built space by region. However, there are many gaps in knowledge of these differences. How, for instance, does the dominance of an aspect of culture such as Islam affect efforts to promote nature in built space in Middle-Eastern countries? How does the communitarian ethos, an element of African indigenous culture affect such efforts in sub-Saharan Africa? How is such an ethos received in the context of promoting and protecting nature in built space in the avowed capitalist societies of North America and Western Europe? This book is intended to contribute to efforts to these and cognate questions. It accomplishes this task by analyzing the impact of political, economic, social, technological, ecological, cultural and historical factors on efforts to promote nature in built space. The units of analysis are the major United Nations Environmental Programme (UNEP) regions of the world. The focus is on four specific substantive areas in environmental policy, namely forestry, water, food, and energy. Although these substantive areas or resources are important everywhere, their degree of importance differs by region contingent, especially, but not exclusively, upon ecology, geography and availability.

1.4 Forests in Built Space

Forestry in built space falls under the general rubric of afforestation. Broadly defined, this includes conventional forestry initiatives and ‘greening activities’ such as tree planting and gardening or horticulture in urban areas. Urban greening programs are increasingly being implemented as a strategy to promote environmentally sustainable urban milieus. The activities that go into efforts in this connection are elaborate and often require the participation of many entities including individuals, members of the beneficiary communities, groups, government agencies, non-governmental organizations, and private commercial organizations. Thus, afforestation, like many other areas of environmental management, has many stakeholders. These entities invariably interact with each other; and their effectiveness, according to inter-organizational relations theory, depends on the quality and magnitude of this interaction. This interaction is of centrality in the book. The aim is to investigate the impact of the interaction and other proximate factors on efforts to promote nature in built space.

1.5 Water in Built Space

The second substantive domain of interest in the book is water. The impact of PESTECH factors on water resource management cannot be overstated. By its very nature as an indispensable resource, water tends to involve the greatest number of stakeholders; its quality and quantity is also vastly affected by geo-ecological factors. Water transcends familiar geo-political boundaries, including conventional borders circumscribing communities, regions and even countries. This explains the proliferating number of studies dedicated to analyzing water in terms of its quantity, quality and distribution networks. These studies fall into two categories, namely potable water supply and agricultural water control. I have personally completed many studies belonging to the first category, including a number of community-based water supply projects in Cameroon (see e.g., Njoh 2002, 2006). I have also played a leading role in similar projects elsewhere such as Kisumu, Kenya (see, Ananga et al. 2017). Examples of works in the second category include, Dungumaro and Madulu (2003). This work uncovered a number of justifications for community participation (CP) in water systems management. In this purely qualitative study, the authors accentuated the importance and the indispensability of CP in improving water resource management. In another study, Apipalakul and colleagues (2015) investigated the role of CP in dealing with problems facing communities in the Pong River Basin in Thailand. Like communities in other river basins, those around the Pong River Basin commonly encounter problems arising from their joint activities such as agriculture, irrigation and industry in the basin area. The authors’ articulation of the CP concept suggests that it is more than simply a framework for understanding collective purposeful processes. Rather, it is also a useful strategy for

conflict resolution in water basin communities. In yet another study on the role of CP in water resource management, Boakye and Akpor (2012) summoned evidence to demonstrate CP's versatility. However, they were quick to acknowledge the fact that meaningful CP remains a challenge especially in historically impoverished communities. The avowed purpose of their study was to determine the extent to which residents of communities in South Africa consider their participation meaningful in a water catchment forum. Yet, it is important to note that CP in water resource management is not confined to developing countries. Rather, it is increasingly becoming a universal strategy for ensuring the sustainable management of water resources throughout the world. In the European Union, this trend is exemplified by legislative actions such as the European Water Framework Directive; and in the United States, it is manifested by the U.S. Clean Water Act (Carr et al. 2012). Each of these pieces of legislation mandates public and stakeholder participation in water resource management. Geo-ecological factors are also well-established determinants of water quality and quantity. In this regard, the arid regions, such as the Middle East, tend to suffer the most from problems of water stress. Yet, these regions do not have any monopoly over water stress problems. For instance, the European Environment Agency (EEA) recently noted that a third of EU-member countries are facing low water availability problems (EEA 2019). Countries in this category boast less than 5000 cubic meters of water per head per year. The problem is particularly grave in Southern Europe, where a country like Malta, with only 100 cubic meters of water per head per year is located.

1.6 Energy Generation and Supply

The third substantive domain of interest in the book is energy. Energy is a natural product whose production and use are conditioned by politico-economic, ideological and socio-cultural as well as historical factors. Thus, the PESTECH is apropos as an analytical framework in the context of energy as an element of nature in built space. In concert with the book's concern with sustainability, the analysis will focus more intensely on renewable energy. There is a resurgence of interest in renewable energy that is increasingly attracting the participation of members of the general public. The level of interest is heightened in both the developed and developing world. In the former, the concern is typically with renewable energy as a more environmentally-friendly alternative to conventional energy. In the latter, interest in renewable energy is provoked mainly by the need for energy cost minimization given the resource scarcity problems of developing countries. Over the years, residents of these countries have developed creative strategies for making energy more affordable. Prominent among these strategies is community participation (CP). It is employed mainly as a strategy to pool the resources necessary to defray the high cost of energy supply equipment. In India for instance, this strategy permitted villages such as Sagar, Mousuni and Sundarbans in East Bengals, to develop their own off-grid power systems (Dwivedi, Online). However, it must be noted that these systems involved

not only the input of the villagers alone but also that of the Indian Government, which furnished half of the cost in each case. Another example of such an initiative comes from Gambia. Here, residents of Batokundu Village marshalled resources such as money, labour, land and enlisted the technical support of a German NGO, to complete a windmill electrification project for the village (Hathaway 2010). Two more examples of projects exemplifying this trend come from Kenya. The projects are located in the Mount Kenya area and specifically in the villages of Kathama and Thima (Hathaway 2010). With the technical support of the British NGO, Practical Action, the two communities joined forces to tap power from a micro-hydro plant to meet their electricity needs. While the NGO helped the communities to navigate the cumbersome process of securing government permits, members of the communities contributed labor, building materials, and land required for the project.

1.7 Food Security Issues

The last substantive area of interest in the book is food. Despite improvements occasioned by modern technology, much physical space is still required to produce food. Accordingly, human population increases cause a lot of ecological footprint because of the huge demands these increases make on land (Deelstra and Girardet 2000). The concept of ecological footprint is vital in illustrating the complex ways in which human settlements, particularly cities, affect the natural environment. Conventional footprint analysis typically assumes that activities in these settlements depend on the supply of a finite quantity of vital resources such as land, food and water. The quantity of these resources required to sustain the population of a city is that population's ecological footprint on the earth.

A more obvious and ominous problem has to do with the scarcity of livable space. This problem is especially acute in densely populated urban areas. This accentuates the need to maximize the use of available space. The U.N. Food and Agricultural Organization (FAO) has been at the forefront of efforts in this regard. In one of its Factsheets on "urban and peri-urban horticulture," the organization describes a strategy "to boost the overall supply of horticultural produce to the world's developing cities" (FAO 2019, para. 1). The strategy calls for low-income households to supplement their food supply by developing micro-gardens. Micro-gardens permit urban residents to produce their own vegetables, roots, tubers and other food in very little space. These gardens have three main attractive features, namely ability to maximize the utility of extant spaces, mobility, and environmental friendliness. The space maximization prowess of micro-gardens is evident in the fact that they require very small and typically un-used spaces such as balconies, patios and rooftops that already exist in/or around buildings. A micro-garden can operate on an area as small as one square meter. The mobility aspect of micro-gardening is a function of the fact that crops are grown in movable containers. Thus, instead of planting directly into the ground, the crops are planted in arable soil and manure in containers such as plastic-lined wooden crates, custom-built tables, and used tires. The environmental-

friendly attribute of micro-gardening relates to the fact that it depends on rainwater and household waste to function. In this case, rainwater is harvested in containers from where it is collected and used for watering the plants.

The FAO has provided funds to assist the state and municipal authorities in poor developing countries to launch micro-gardens. These gardens have helped to meet the nutrition needs, and serve as a viable income source, for low-income families. Efforts in this connection have registered enormous success. For instance, an FAO-supported program designed to promote micro-gardens in Caracas, Venezuela helped 10,000 poor, barrios residents to grow their own leafy vegetables, cabbages, pumpkin, tomatoes, and eggplant (FAO 2019, para. 4). Similar FAO-supported programs have proved equally successful in some African countries, notably among which are Gabon, Namibia, Niger, Senegal and Rwanda. Empirical data suggest that micro-gardens serve not only as a source of food, but also a source of income for low-income urban households. For instance, a study on Senegal showed that only 35% of the micro-garden produce is consumed by the producers while the rest is sold (FAO 2019: para. 4).

1.8 The Concept of Ecological Footprint

The importance of ecological footprint is amplified by the increasingly domineering stature of cities today. In fact, 2000 marked the first time in human existence that more than 50% of humanity lived in urban centers. One upshot of this is the fact that cities are consuming an increasingly voluminous quantity of natural resources on the one hand, and generate much waste, on the other. Both phenomena result in destroying the habitat of several species. A more obvious consequence of the growth and proliferation of cities is the multiplicity of the number of mouths that must be fed. This magnifies the need for efforts to promote the development and preservation of natural resources, particularly those that can serve as sources of edibles in human settlements. Such efforts are anything but novel. Often undertaken under the rubric of urban agriculture, these efforts have contributed to supplementing the food inventory in human settlements for a long time. The following examples are illustrative (Deelstra and Girardet 2000). In the 1980s and 1990s, urban agriculture was the source of 30%, and 40%, respectively of the dollar value of agricultural production in the United States. A few urban centers boast levels of urban agricultural activities that render them self-sufficient with respect to some food items. For instance, Singapore, which is entirely built-up, has always produced enough meat to feed its population, meanwhile Bamako, the capital of semi-arid Mali, has been able to meet its vegetable need without resorting to importation (Deelstra and Girardet 2000).

Of interest in this book is the impact of socio-cultural factors in facilitating the functioning of agricultural activities in built space, particularly urban centers. Socio-cultural factors have always been instrumental in food security initiatives. This is true in contemporary as in ancient civilizations. For instance, communities throughout ancient Africa operated highly sophisticated and effective systems of

community food programmes. The best-known testament to this assertion is provided in the Holy Bible (see e.g., Genesis 41). Here, one finds a vivid description of the elaborate granaries that were created by Joseph—known as Joseph’s Granaries—to store grain in seasons of abundant harvest to be consumed during seasons of famine in Egypt. In Zimbabwe, ancient Shona communities are on record for operating community food programmes under the rubric of ‘Zunde Ramambo,’ a Shona appellation for the Chief’s Grain Reserves (Swikepi 2011). The programme entailed households within a given community jointly farming a designated parcel of land to meet their future collective food needs. Food from such jointly operated farmland was usually stored in silos at the chief’s palace and only distributed in time of low harvests or to families in need such as widows, widowers, orphans or the physically challenged. With the introduction of the capitalist mode of production and the commensurate growth and proliferation of urban centers, the importance of communal food programmes waned. However, programmes bearing a passing resemblance to these were instituted from the mid-1980s to the early-1990s to address the adverse effects of the World Bank/International Monetary Fund-initiated Structural Adjustment Programmes (SAPs) (Sseguya et al. 2013). Among other things, SAPs prescribed trade liberalization, privatization and especially the elimination of food subsidy programmes. Thus, the purpose of community food programmes has remained the same—to meet people’s food need—from time immemorial. This need has certainly not been confined to Africa although it took until the 1970s for international authorities to acknowledge food shortage as a global problem. Upon this acknowledgment, the World Food Conference of 1974 underscored the right-to-food as a human right (Adams et al. 2007). Also emerging from this renewed consciousness has been the determination to maintain an acceptable level of security. The notion of food security has been described as a situation in which people within any given community have easy, safe and sustainable access to food (Adams et al. 2007). Efforts to guarantee food security in the United States have included *inter alia*, the operation of community food banks. In doing so, American authorities have tapped on an important aspect of the country’s Judeo-Christian culture, namely the requirement to ‘love thy neighbor as thyself.’ Food banks exist throughout the country. The book analyzes how culture and other PESTECH factors affect efforts to create and preserve natural resources such as food in built space.

1.9 Book Outline

The book contains eight chapters including this introductory chapter. Chapter 2 discusses environmental stewardship and its role in efforts to promote nature in built space. Six chapters—Chaps. 3 through 8—follow this, and focus respectively on the major regions of the world approximately corresponding with the regional grouping scheme preferred by the United Nations Environmental Programme (UNEP). As employed in this book, the regions include, Sub-Saharan Africa, Middle-East and North Africa, West Asia, Asia and the Pacific, North America, and Latin America

and the Caribbean. Each of the chapters begins with an introduction that includes a brief description of the region's main environmental problems affecting built space in terms of their magnitude and intensity. This is followed by a discussion of culture, beliefs, and other factors affecting efforts to promote nature in built space in each region. The focus is particularly on belief systems, especially religions and their influence on the desire and willingness to develop and maintain natural resources in built space. Following this in each chapter is a discussion of efforts in each of the four substantive domains, forest, energy, water and food in each of the major target regions.

References

- Adams AE, Swisher ME, Monaghan KN (2007) Defining community food security. Document #AEC 383, Series of the Agricultural Education and Communication Department, IFAS Extension, University of Florida.
- Ananga EO, Njoh AJ, Ananga GO, Pappas C (2017) Examining the relationship between community participation and water handling hygiene practices in the informal neighborhoods of Kisumu, Kenya. *Habitat International* (in press)
- Apiplakul C, Wirojangud W, Ngang TK (2015) Development of community participation on water resource conflict management. *Procedia Soc Behav Sci* 186:325–330
- Bas E (2013) The integrated framework for analysis of electrical supply chain using an integrated SWOT-fuzzy TOPSIS methodology combined with AHP: the case of Turkey. *Electr Power Energy Syst* 44:897–907
- Beute F, de Kort YAW (2018) Thinking of nature: associations with natural versus urban environments and their relations to preference. *J Landsc Res* 44(4):374–392
- Boakye MK, Akpor OB (2012) Community participation in water resources management in South Africa. *Int J Environ Sci Dev* 3(6):511–516
- Carr G, Bloschl G, Loucks DP (2012) Evaluating participation in water resource management: a review. *Water Resour Res* 48(11). <https://doi.org/10.1029/2011WRO11662>.
- Catron J, Stainback GA, Dwivedi P, Lhoka J (2013) Bioenergy development in Kentucky: a SWOT-ANP analysis. *Forest Policy Econ* 28:38–43
- Deelstra T, Girardet H (2000) Urban agriculture and sustainable cities. In: Bakker N, Dubbeling M, Gundel S, Sabel-Koshella U, de Zeeuw H (eds) *Growing cities, growing food: urban agriculture on the policy agenda*. ZEL, Feldafing, pp 43–66
- Dungumaro EW, Madulu NF (2003) Public participation in integrated water resources management: the case of Tanzania. *Phys Chem Earth* 28:1009–1014
- EEA (2019) Renewable energy in Europe: key for climate objectives but air pollution needs attention. European Environmental Agency. Briefing No. 13/2019
- FAO (2019) With micro-gardens, urban poor “grow their own.” urban and peri-urban horticulture. Factsheet 6. Retrieved on 30 July 2019 from: <http://www.fao.org/ag/agn/greencities/pdf/FS/UPH-FS-6.pdf>
- Fuller RA, Irvine KN (2010) Interactions between people and nature in urban environments. In: Gaston KJ (ed) *Urban ecology*. Cambridge University Press, Cambridge, pp 134–171. <https://doi.org/10.1017/CBO9780511778483.008>
- Hardin G (1968) The tragedy of the commons. *Science* 162(3859):1243–1248
- Hathaway T (2010) What is driving dams in Africa. *World Rivers Rev* 25(4):5–5. (December 2010)
- Humphrey A (2005) SWOT analysis for management consulting. *SRI Alumni Newsletter* (SRI International) 1:2005

- Lamprecht M (2016) The role of the built environment in human life. *Eur Spat Res Policy* 23(2):65–78
- Mazzotti FJ, Morgenstern C (2014) A scientific framework for managing urban natural areas. Document No. SSWEC74, Wildlife Ecology and Conservation, UF/IFAS Extension, University of Florida IFAS Extension. Accessed 17 Apr 2017 at: <http://edis.ifas.ufl.edu/uw112>
- Njoh AJ (2002) Barriers to community participation in development planning: lessons from the Mutengene (Cameroon) self-help water project. *Commun Dev J* 37(3):233–248
- Njoh AJ (2006) Determinants of success in community self-help projects: the case of the Kumbo (Cameroon) water supply project. *Int Dev Plan Rev* 28(3):381–406
- Njoh AJ (2017) The SWOT Model's utility in evaluating energy technology: illustrative application of a modified version to assess the sawdust Cookstove in sub-Saharan Africa. *Renewable an Sustainable Energy Reviews* 69:313–323
- Ostrom E (1990) *Governing the commons: the evolution of institutions for collective action*. Cambridge University Press, Cambridge
- Poundstone W (1993) *Prisoner's Dilemma*. Random House, New York
- Sseguya H, Mazur RE, Njuki JM, Owusu FY (2013) Determinants of participation and leadership in food security groups in Southeast Uganda: implications for development programs and policies. *J Rural Commun Dev* 8(1):77–97
- Swikepi C (2011) *Community participation and food security in rural Zimbabwe: the case of Marange area in Mutare District*. Unpublished Master's thesis, University of Fort Hare
- Vince G (2014) *Adventures in the Anthropocene: a journey to the heart of the planet we made*. Chatto & Windus, London
- Vince G (2015) Whom is nature for? *Am Sch* (November 15, 2019)
- Wright RT, Boorse DF (2017) *Environmental science: toward a sustainable future*. Pearson, New York

Chapter 2

PESTECH and Nature in Built Space: Analytical Framework



Abstract Of centrality in this book is the issue of nature in built space. As a subset of the broader conversation on the natural environment, and a matter of scholarly and professional interest, this issue has a major flaw. It lacks a well-developed analytical framework. Consequently, meaningfully discussing the issue has often proved difficult at best. Cognizant of this, this chapter proposes a framework that promises to facilitate efforts to analyze matters in the environmental policy field. The framework is fashioned after the environmental scanning models (ESMs) that have been employed to evaluate the environment of business organizations. In particular, the framework focuses on the political, economic, social, technological, ecological, cultural and historical (PESTECH) factors of the proximate and remote environments of efforts to promote nature in built space. This chapter paints a vivid picture of the framework, which guides the book's entire discussion.

2.1 Introduction

The discourse on nature in built space is a subset of the broader conversation on the natural environment writ large. A common flaw in this conversation is the absence of well-developed analytical frameworks. The natural environment as well as the principles and rules that govern its treatment are often believed to be universal. This is erroneous because people's perception and relationship with the natural environment are conditioned by many factors. Foremost among these are the political, economic, social, technological, ecological, cultural and historical (PESTECH) factors of the proximate environment of the object being analyzed. Considering these and related factors is akin to scanning the environment of the object under examination. PESTECH is fashioned after PESTLE, a popular environmental scanning model (ESM) used in the business world. It is typically employed to analyze the political, economic, social, technological, environmental and legal environment of business organizations (Business 2016). PESTLE also assumes other identical acronyms such as PESTEL and PEST. It is often employed in tandem with cognate tools such as SWOT (Strengths, Weaknesses, Opportunities, and Threats). The model has proved versatile in analyzing the macro-environmental factors with real or potential implications for the performance of business organizations.