SUSTAINABILITY AND GREEN SOCIOECOSYSTEM RESILIENCE: A CONCEPTUAL VIEW

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ABSTRACT

Humanity is facing a series of important challenges, global warming being one the most important. Consequently, sustainability and resilience have become key elements in providing a better response to the crisis and in maintaining an equilibrium between ecology, economics and various social domains. The design and use of urban land should consider the inclusion of a multi-functional green infrastructure to obtain different benefits, from ecosystem services to value creation. Additionally, the urban land-use planning system contributes to economic growth, social development and environmental sustainability, while biodiversity is able to provide renewal and reorganization capacities for changes in social- ecosystems. All these elements bring forth a different paradigm for the future decisions of communities.

Keywords: *Resilience, sustainability, urban land use.*

INTRODUCTION

Human development has a profound imprint on nature and co-evolving ecosystems with long term sustainability through competencies. This has resulted in complex, economic-socio-ecological challenges for sustainability and future economic development. Human activity alters the dynamics of ecosystems with its fundamental impact on the atmosphere, climate, land surface, forest, sea, and waters. As a result, green human resources development is required for the betterment of the society. Shafaei et al. (2020) described that at the organizational level, organizational environmental culture is positively related to green HRM, and green HRM management positively associates with organization's environmental performance. Cities have been portrayed as predominantly monumental static and architectural structures of ever evolving and increasing ecological complexity.

Disturbances change the resilient capacity of nature to supply ecosystem services, and they can degrade socio-ecological systems and lead to social and economic vulnerability (Grundmann, 2016). Urban dwellers pose a high impact on ecosystem services with their habits in trade and consumption, claiming support in waste absorption, carbon emissions, residential water use, and wood for industrial purposes (Folke et al., 1997, Grimm et al., 2008). Government, civil society organizations and the financial institutions should take a more active role in promoting and encouraging businesses to produce and market green products (Islam, Ali, & Medhekar,2017).

The Guardian (3 Novemebr,2021) depicted the activists in Glasgow, UK have "re-opened" a disused building to house climate justice campaigners visiting the city for the Cop26 summit, as those forced to camp because of lack of affordable accommodation face plummeting temperatures. Eisenmenge et al. (2020) opined that the 17 SDGs and 169 targets address all countries and aim at reconciling economic and social with ecological goals and they adopt a social ecology perspective and critically reflect on the SDGs' potential for monitoring, supporting, and bringing about a transformation towards sustainability.

According to Levin (1999), humans depend on fragile ecosystem services. Global health control of the ecosystems, published in 2005 by The United Nations Millennium Ecosystem Assessment (MA) observed that technological advancement is the major cause of degradation of the Earth's ecosystem services, which are being used unsustainably. The growing eco-deterioration also impedes the battle against poverty (Millennium Ecosystem Assessment (MA), 2005). Human well-being, economic growth, and social development are dependent on the interrelationships between and within regions and environmental sustainability (Arrow et al., 1995; Folke et al., 1998, Feola, 2015). Uncertainty, diversity and variability of socio-ecosystems are all factors that contribute to their diminishing capacity to cope with disturbance and change within functional groups in the adaptive capacity of ecosystems (Folke et al., 2002; Jackson et al. 2001; Scheffer et al. ,2001).

To conserve ecological resources, it is essential to promote sustainable and resilient lifestyles in sustainable urban social-ecosystems (Romero-Lankao, et al., 2016). This can be done with various activities that range from the construction of green spaces, sustainable architecture, green housing, eco-villages, green business and green economic sectors, sustainable urban agriculture and farming, green technologies, renewable energies and designing reversible and flexible systems (Zhang and Babovic, 2012). Sustainable architecture or ecological economics, sustainable technology, and agriculture (Costanza and Patten, 1995) stand out as specific types of sustainable and resilient urban development.

The resilience approach provides a conceptual and theoretical framework for interdisciplinary collaboration with ecological economics, sustainable development and governance (Lambin, 2005, Homsy & Warner, 2015). Contextual and conceptual factors of urban change can be assembled into a framework of ecological urban design. Adverse human impacts on the social-ecosystem and the biosphere can be minimized by using resilient and sustainable environmental approaches such as environmental resource management, conservation biology, environmental and ecological economics, bio economics, green technology, etc.

Ecology refers to the paradigm, knowledge, methods and procedures of contemporary ecological Science (Kolasa & Pickett, 2005), and is a multidimensional and complex concept that requires an interdisciplinary framework of analysis for its application in urban spaces (Pickett & Cadenasso, 2002). The dimensions of ecology are the notion, the models and the metaphors used to communicate assumptions, values and experiences (Cadenasso et al., 2006a). In densely populated areas, urban farming, agriculture and gardening offers an alternative use and integrates multiple functions.

However, current land-use practices in urban sustainable planning prohibit agricultural and farming activities in urban spaces while there is a significant loss of farmland nearby (Pothukuchi & Kaufman,1999; 2000).

Urban agriculture, farming and gardening have become increasingly necessary and are supported by sustainable urban planning and design to improve the quality of life in the city (Cohen, 2020). The benefits of urban agriculture are recognized for their multicultural traditions, recreational trends and poverty alleviation (Hough, 1995, p. 230). Urban ecosystem services are important in the conception of urban green spaces and the biodiversity, micro-climate control, carbon sequestration, soil infiltration, food production and recreation that it can contribute to its community (Hamel, et al., 2021). Urban planning seeks to create and incorporate attractive land-use combinations to sustainable development plans, and provide recreational, educational, cultural and agricultural resources, as well tourism, farming and gardening, urban forestry, aquaculture, health services and commerce, (van de Berg and van Veenhuizen, 2005; Deelstra et. al, 2006).

The urban land-use planning and design authorities don't always consider the relevance of natural resources and land provision to support urban food production (except for urban planning policies that support gardening). Therefore, urban land-use policies and rules may have negative impacts on local food production and distribution (City of Portland, 2007). Innovative types of land-use can offer benefits to vulnerable groups (Clement 2013, p. 76). On the other hand, multi-functional urban planning involves the participation of various stakeholders in making decisions on green infrastructure planning. Furthermore, community greening initiatives are a community-based effort to transform underutilized sites and areas into valuable green spaces like community gardens (Tidball and Krasny 2009).

Community organizations for nature conservation focus on preserving urban social-ecosystems and protecting them from dysfunctional anthropogenic activities to adapt the development and achieve economic efficiency. Social ecosystem will allow the transformation of vacant spaces into resilient green spaces and allow them to carry out their many inherent functions (Akers, 2013; Detroit Works Project, 2014, p. 51). Vacant land restoration should be an interdisciplinary approach that combines economic and socio ecosystem concerns from a holistic urban land use perspective. Sustainable environmental scenario along with green social and ecosystem may be helpful for long term political will, economic environment and social upgradation.

Research question of the study is whether sustainability and Green Social-ecosystem Resilience co- exist?

The plan of the study is as follows: introduction, literature review, methodology of the study, present scenario, discussion, conclusion and recommendation.

LITERATURE REVIEW

One of the core values in sustainable practices is sustainable development and interconnection in the domains of ecology, culture, politics, and economics (James, et al., 2015). From this social perspective, sustainability is a challenge that has an impact on economic efficiency, production, distribution, urbanization, transportation, lifestyles and ethical consumerism, and it involves local and global efforts to meet core human needs without distorting the ecosystem (Kates et al., 2005; IISD, 2009; EurActiv, 2004). Sustainability is a set of goals combining social equity, economic viability and ecological integrity (Curwell, Deakin, & Symes, 2005; Jenks & Jones, 2010).

Sustainability is also defined by the capacity of a system or process to be preserved, enhanced, upheld, or maintained. It is the capacity of biological systems and processes to endure disturbances and remain vigorously diverse, remaining as the systematic combination of environmental Science and sustainable development (Lynn et al., 2014). Sustainable development also implies proactive and responsible decision-making. It requires innovative processes that maintain balanced social and ecological systems between resilience, economic efficiency, social inclusion and equality, political justice and vibrant cultural values that work to ensure a lively, desirable and sustainable ecosystem for all its residing species (Liam et al., 2013).

Resilience is defined as the capacity of socio-ecological systems to self-reorganize after any disturbance. Resilience is a concept and model framework used to operationalize normative sustainability (Childers, Pickett, Grove, Ogden, & Whitmer, 2014). Resilience is a system's ability to adapt to any kind of disturbance and self-reorganize while undergoing transformation, and retaining its initial forms, roles, identity, and feedback characteristics (Walker et al., 2004). The concept of resilience is defined by its capacity to absorb the uncertainty that follows any shocking event or conflict, maintain its primary functions, and go through self-growth, renewal, development, and reorganization. (Gunderson and Holling, 2002; Berkes et al., 2003). Any disturbance of a strong and resilient socio-economic and ecological system can have the potential to create new opportunities for innovation and advancement. However, when the system is weak, any slight disturbance can be disastrous. (Adger, 2006).

Resilience is concerned with the management of sustainable interactions between human-developed systems and natural ecosystems. Social resilience linked to social change is the communities' capacity to cope with extrinsic disturbances to their social infrastructure, such as political turbulence, socio- economic reforms, and environmental variability (Adger 2000; Anderies et al., 2004). Resilience can interfere and conflict with other beneficial social objectives, such as economic efficiency, due to redundancy. In other words, economic efficiency reduces resilience. The resilience of the socio- ecosystems requires more adaptability to stress while maintaining stability in the face of extrinsic disturbances and to find a solution to the conflict between stability and resilience for sustainable development in terms of complex system cycles.

Apart from representing the measures taken by a social-ecosystem to self-organize and cope with disturbances while still maintaining its inertia, attraction and capacities for learning and adaptation (Carpenter et al. 2001), resilience can also be an approach for cogitating and critiquing social– ecological systems, with policy implications for sustainable development (Folke et al., 2002).

Social-ecosystem resilience is essential in coping with uncertain and complex systems for sustainable natural resources and ecosystem services (Gunderson and Holling 2002). Any disequilibrium between sustainability and development change leads to the collapse of ecosystems. In addition, it is challenging to transform a resilient ecosystem into a more congenial one (Scheffer et al., 2001; Gunderson, &Holling, 2002; Walker et al., 2004).

On the other hand, resilience plays an important role in the field of ecology (Holling, 1973; Wu & Wu, 2013) Ecological resilience is a concept that must be operationalized to be applied in urban environments and cities (Musacchio, 2008). Older perspectives of resilience assumed that a stable and static equilibrium between socio-economic and ecological systems was required to adapt to nature (Berkes et al., 2003, Smit and Wandel, 2006).

Resilience has tools that were developed upon structured scenarios and adaptive management that can be used to build complex and uncertain systems. These tools increase the capacity to build ecological resilience. Sources of natural resilience and complex adaptive systems are more than just preserving ecosystems and resistance to change. Traditional and dominant theoretical perspectives assume certain stability and resilience in the environment and static equilibrium in the natural elements of the system after the external disturbances have been dealt with and removed from the system (Holling, 1973).

Response diversity is the set of reactions among species belonging to one ecosystem, whose functions promote environmental change. Species and populations diversity within functional groups maintain ecological redundancy in ecosystem services (Luck et al. 2003). Resilience concerning species should consider that the loss of species is non-random in relation to response diversity and the functions of the ecosystem. However, response diversity in ecosystem resilience is linked to ecosystem disturbances and environmental changes. Biological diversity is essential in social ecosystem resilience and in sustainable ecosystem change (Peterson et al. 1998).

Moderate perturbations and disturbances on the stability of resilient socio-ecosystems may either be absorbed by their ability to reorganize or may bring small changes in resilience supported by response diversity (Deutsch et al. 2003). For example, response diversity helps maintain resilience in ecosystems that are affected by toxic chemicals and acidification, such as lakes (Carpenter and Cottingham 1997). Response diversity does not necessarily support the notion that high biodiversity is synonymous with high ecosystem resilience and that the ecosystem is less vulnerable to environmental change. The migration of the population to urban centers has reduced ecosystem biodiversity (MA, 2005; Sala et al., 2000).

Biodiversity and response diversity, a variability in species' responses to environmental change, are both critical factors of socio-ecosystems. On the other hand, cultural diversity and common property systems build resilience in urban socio-ecological systems. Urbanization processes have led to higher levels of cultural diversity in cities (Zanoni and Janssens, 2009).

The terms "urban" and "city" are used to describe densely settled regions. These urban systems have spatial and functional contexts that combine social, biological, architectural and geophysical components (Graham & Marvin, 2001; Seto et al., 2010; Naveh, 2000; Pickett & Grove, 2009). Some of the main social dimensions of urban systems are economics of production and consumption, economic and political power, social inclusion, identity, equality and change, social justice and vulnerability, the nature of livelihood and lifestyle (Dow, 2000; Grove et al., 2006; Machlis, Force, & Burch, 1997). Urban spaces have a direct influence on the environmental values of urban populations (Miller, 2005; Tidball et al., 2010).

Urban spaces and territories are changing rapidly, becoming globally interconnected across contrasting types of landscapes and are always facing new environmental, demographic and social threats. Additionally, urban green commons (UGCs) have the potential to facilitate civic participation and cultural integration, to manage urban land and biological diversity in urban spaces and promote urban resilience building (Colding, & Barthel, 2012). Urban transformation is benefiting from the shift in the framework of urban ecology, which has seen an evolution from its earlier approach to metabolic urban energy budgets to that of city resilience, focusing on hybrid systems such as the biophysical - social structures and processes (Cadenasso et al., 2006b; Cadenasso & Pickett, 2013; Cadenasso & Pickett, 2008; Pickett, Cadenasso, & Grove, 2004).

An ecosystem is a structural and functional unit of the biosphere. Ecosystems have complex interrelationships with human activities that constantly threaten their sustainability. The vulnerability of an ecosystem is related to the other organisms that exist within that functional group. Contraction of spatial resilience increases the disturbance to catastrophic levels (Nyström, & Folke 2001).

Ecosystem resilience is the ability to accommodate and adapt to disturbances and buffer and persist in the face of external interference. In other words, it is the amount of disturbance that a system can absorb while remaining in the same state and maintaining its attraction (Holling, 1973, 1996). Ecosystem resilience also represents the degree of ability a system must learn, adapt and self-organize when confronted with external disturbances (Carpenter et al. 2001). The dynamic changes of ecosystem resilience are related to species and functional groups (Walker 1992, 1997; Norberg et al. 2001).

Ecosystem resilience has a cross-scale response diversity. This means that biodiversity has an important role in formulating policy for sustained economic and socio-ecological development. Managing for resilience is to constantly work with uncertainty in the biosphere shaped by human action (Folke et al. 2002). The framework for sustainable planning in urban ecosystems draws notions from urban ecology, green resilience, green infrastructure, multi-functional and sustainable landscape planning, etc., to create and develop healthy and sustainable economic and social–ecological urban systems.

Urban ecology is rooted in landscape ecology and combines principles from physical and atmospheric sciences, soil, hydrology and social sciences, etc. (Sukopp, 1990; Collins et al., 2000; McDonnell & Hahs, 2009; Pickett, Burch, Dalton, & Foresman, 1997; Redman, Grove, & Kuby, 2000). Green resilience deals with the coping of our planet with anthropogenic disturbances and ensures that it remains viable for future generations. The concept of green resilience may be seen from a narrow interpretation to broader one of the socio-economic and ecological contexts. An ecological unit is the functioning of components and their relationships and interactions with each other, forming a complex and dynamic whole. These regenerative forces are solar energy, water, soil, atmosphere, vegetation, and biomass (Ben, 2013).

The dynamic adaptive capacity of the ecosystem is provided by the connection between resilience, development change, and sustainability (Smit, &Wandel 2006). Green resilience-building in complex, uncertain and unpredictable urban ecosystems is supported by structured scenarios and active adaptive management for sustainable development. Green resilience management enhances sustainable development in changing complex environments where the future is uncertain and unpredictable (Walker et al., 2004; Adger et al., 2005).

Ali (2018) described that green economy can possibly reduce the magnitude of the worst shock of natural disasters which increasingly occur as regular variation in addition to severe problems on human being and non-human assets. Ali (2018) depicted that in Bangldesh, who are responsible internally to increase climate change should be supported by creating employment opportunities for affecting community development Sardá, & Pogutz (2018) viewed that corporate sustainability, with a focus on corporate sustainability strategies and corporate value chains has an impact on the global economy in the long run. e- strategies in any system of urban green resilience focus on green infrastructure and aim to transform and adapt various resources to face future challenges such as climate change and food insecurity.

Liu et al. (2021) argued that changes of socioeconomic conditions could always improve (Sustainable development goal) SDG indicators, with or without climate policies. In many respects, socioeconomic conditions are more important than climate policies in achieving SDGs, particularly SDGs concerned with food security and energy affordability, as well as in simultaneously achieving multiple SDGs.

METHODOLOGY OF THE STUDY

The study is based on conceptual view. As such the study did extensive literature reviews and analyzed different aspects on the topics. However, the study tried to mention all the sources properly. Time period of the study is from 1st May 2021 to 3rd Novemebr,2021.

Present Scenario

Reitz et al. (2020) argued that the Random Forest model predicted a narrower distribution of CO2 fluxes, though our methodological improvements look promising to achieve high-resolution net ecosystem exchange data sets at the regional scale. The term "ecosystem", coined by Roy Clapham in 1930, describes the biological and physical environmental components that come together as a unit, and where all the elements coexist in relation to one another. The ecosystem was described as the interaction between the living creatures (biocenosis) and the environment where they live, or (biotope) (Tansley, 1935). According to the Convention on the Biological Diversity (1992), ecosystems are dynamic and complex systems, where communities of plants, animals and micro- organisms live in harmony with their non-living environment in a functional unit. Other definitions of "ecosystems" define it as biological organizations formed by living organisms interacting with each other and in a symbiotic relationship with their environment. An ecosystem can harness solar energy during photosynthesis and convert it into carbon dioxide and other inorganic chemicals that are essential to organic life.

An ecosystem is an open system that requires a flow of energy and matter between diverse organisms and their environment, driving biogeochemical processes. A functioning system has living and non- living components interacting with each other (Christopherson 1997). Therefore, any ecosystem has both living organisms and abiotic (non-living matter) elements. The biotic components are the living forms that inhabit the ecosystem and have a biogeochemical energy cycle. The term "ecosystem" refers to the bionic community of living organisms and biocenosis in continuous interaction with their environment or biotope and functioning in space as a unit.

The abiotic elements represent the environment's nonorganic material that determines which life forms can thrive in the ecosystem. Energetic processes in ecosystems are formed by trophic levels defined by the role of organisms and their energy flow. Ecosystems fall between the extremes of biological complexity (Odum, 1971). Living organisms continuously interact with environmental biotic and abiotic components (Golley, 1993).

Besides being complex and adaptive systems characterized by historical dependency and non-linear dynamics, ecosystems have multiple basins of attraction (Levin 1999). The biosphere is the largest ecosystem, and it interacts and exchanges matter and energy with the lithosphere, hydrosphere and atmosphere.

Ecosystem processes respond seasonally to solar activity, representing the largest biogeochemical carbon cycle on the planet (Odum, 1971). An ecosystem-level process can be represented by a biogeochemical exchange cycle between organisms and their environment (Golley, 1993). Energy transfer and matter cycling processes are essential in determining ecosystem structures and functions of a wide diversity of species and defining the interactions between organisms and their environment (Golley, 1993). The living elements are continuously competing to reproduce and survive among each other. When the strength of dominant species begins to decline, other subdominant species in the same functional group can survive (Elmqvist et al. 2001).

The ability of a social ecosystem to sustain itself relies on its ability to adapt to the environmental changes that often occur in multiple-equilibrium systems and human-dominated environments (Folke et al. 1996; Norberg et al. 2001; Luck et al. 2003). Environmental change with low response diversity may result in extinct or ecologically insignificant functional groups contributing to ecosystem services. Protecting a social ecosystem from compounded perturbations requires the functional groups of species to be ready for renewal and reorganization (Lundberg and Moberg 2003).

Response diversity management sustains and enhances the flow of ecosystem services that are confronted with disturbances and operate within and across spatial and temporal scales.

The impact of disturbances on the loss of species has many implications for social ecosystems and their flow of services (Zimov et al. 1995). The persistence of functional groups of species prevents shifts to ecosystem states and helps sustain the flow of ecosystem services. Species loss may entail low rates of ecosystem processes. Low or absent response diversity redirects ecosystem development into a different pathway. Stress-sensitive species populations tend to decline, and response diversity deteriorates while less sensitive species experience minimal changes in ecological processes (Schindler ,1990; Frost et al. ,1995, Rudd et al. ,1988).

On the other hand, urbanization is rapidly expanding in cities, becoming frontiers for landscape ecology in urban ecosystem science. Urban land is a natural resource constraint threatening to meet the needs of the increasing urban population, the city's economic prosperity, and socio-political stability, and is constantly influencing policy decisions. Resource depletion and pollution are two global issues that are directly related to land-use change. The movement of people into more densely populated urban settlements can lessen pressure on urban and suburban sprawl and more remotely located ecosystems (Colding, 2011).

There has been an increasing emphasis on sustainable urbanization regarding eco-oriented urban land uses since metropolitan areas are engaged in upgrading land-use regulations, infrastructure, urban form and ecosystem services, etc. This has been done to protect urban biodiversity and create a better urban resilient socio-ecosystem, capable of developing a sustainable urban environment with more social justice and economic growth while improving the city's competitiveness and attractiveness (de Jong et al. 2015). Additionally, urban land maintains its relationships with the urban land market, local government regulations, management practices, and technology innovations. It is influenced by the complexity of societal processes and ignores the systemic consequences and effects on the resilient socio-ecosystem services.

Land use must prioritize nature and biodiversity to support sustainable urban development in a territorial context. Networks of open urban spaces unite nature and gardening, intending to build green and resilient cities inspired by nature and biodiversity (Quincerot, & Weil, 2009, p. 175; Daune, & Mongé, 2011). Land uses can be appropriate to develop a network of green open spaces for gardening in core areas of the city (Quincerot, & Weil, 2009).

A contemporary and ecological movement advocates for principles of sustainable land use in urban planning even though this movement is not always involved in projects that demonstrate those principles (Seana, Johnson, & Peters, 1999). Furthermore, the integration of land-use initiatives formulated in urban planning is not always implemented or realized and can become negotiation spaces for less formalized land-use initiatives and practices.

Biodiversity in the suburbs constitutes both natural and semi-natural land, increasing the semi-rural urban fringe (Blair, 2001; McKinney, 2002; Sukopp et al., 1979 Colding et al., 2006). Urban development emerges in high levels of biodiversity areas with high ecosystem productivity (Ricketts and Imhoff, 2003; Hansen et al., 2004; Ljungqvist et al., 2010).

In addition, cities that show a commitment to urban planning and the implementation of ecosystem services in support of greening projects for transforming urban green infrastructure are likely to benefit from the value creation of these projects, which would be beneficial for all the population. The modernist model of urban development is described as a life cycle of cities moving from commodity exchange and industrialization through an ecological version that mitigates all the ills of the urban ecosystem. Therefore, urban design and planning consider the coordination of resources, capacities and efforts to be implemented in comprehensive agendas across the city.

Landscape ecology comprises the concepts of landscape sustainability. It represents the capacity to consistently provide long-term and landscape-specific ecosystem services that are essential for maintaining and improving human well-being (Wu 2013) and ecosystem services in changing landscapes (Wu, & Qu, 2013). Urban green infrastructure is a strategically planned and manages urban network of natural lands, working landscapes, and urban open green spaces that provide a range of diverse benefits. Ecosystem services, for example, can offer many benefits to human beings. (Millennium Ecosystem Assessment 2005). The social-ecosystems capacity to minimize the impact of disturbances affects the flow of the services required for the well-being of its community. Landscape services can benefit the population because they function as a function-value chain to create landscape development (Termorshuizen, & Opdam 2009). Urban planners and landscape designers can coordinate activities across different fields and urban functions, allowing these spaces to fulfill their full potential as multi-functional and sustainable spaces.

The multi-scale analysis of land-use compositions is a valuable element for planning land use and designing policy for urban sustainability. This analysis of land uses may be conducted with a participatory design process of visioning, defining, relating the elements, elaborating the site plan and the implementation process. Multiple land-use scenarios simulate the future changes in the composition of their functions, such as self-sufficiency in vegetable production. Changes in land use may lead to inaccurate counts of land abandonment and vacant land (Bowman and Pagano 2004). Furthermore, multi-functional landscape frameworks are applied to both agroecosystems and planning urban ecosystems, and it provides beneficial production, ecological, and cultural functions, considering the needs and preferences of users and owners (Otte et al. 2007; Lovell et al. 2010).

A commitment to multi-functional urban green infrastructure brings the value of ecosystem services to urban populations. The optimization of urban green space functions can be tested using a multi- functional landscape framework for sustainable urban design and planning of green infrastructure. Multi-functional green infrastructure provides ecosystem services and the presence of biodiversity in urban areas can bring many benefits to the environment and society. These urban ecosystem services are supplied through participatory planning processes focused on multi-functional green resilience infrastructure, which are developed to contribute to the city's sustainable ecological, social and economic welfare.

Ecosystem services transform urban green infrastructure through the integration of empowerment and creative processes into small-scale greening projects. A multi-functional role of land uses can provide urban corridors of gardening spaces to preserve nature, agriculture and farming practices, and perform educational and recreational activities that help protect biodiversity and the natural environment while improving resilient socio ecosystems and inner-city densification.

The relationship between biological diversity and the various functions of an ecosystem is founded on the abilities of self-renewal and reorganization that biodiversity can bring to stimulate change and growth in socio-ecosystems (Loreau et al. ,2001; Kinzig et al. ,2002). Despite the diversity in compositions and considerable species turnover, the organization and functioning of socio- ecosystems can be seen as conservative due to patterns of species loss. (Schindler ,1990; Kalin Arroyo et al. ,1995; Forys, &Allen, 2002; Brown et al., 2001, Havlicek, & Carpenter, 2001). Otherwise, socio-ecosystems may change when some species are lost or when there is an invasion of other new species (Estes and Duggins 1995; Terborgh et al. 2001; Vitousek, & Walker 1989).

Some spaces can also be used for the reuse and recycling of waste. This specific type of land use can help reduce transportation and improve city management on a long-term basis. Cities often struggle to manage opposing external and internal frontiers of land and should be more spontaneous in their decisions regarding land-use management of soils. (Berger, 2007). This constant tension between the expansion of urban periphery and unused spaces has always existed in the internal frontier of the urban core (Rusk ,1993).

The accelerated conversion and change of land use from arable or forested lands to urban land use is threatening the biodiversity, the species and the natural resources which have historically provided the sustenance, valuable goods and services, climate regulation, water recharging, nutrient recycling, agricultural products, timber, seafood and waste assimilation, etc. All these benefits are in danger of extinction due to increasing urban land use. In response to the growing challenges posed by the conversion from agricultural to urban land uses, it is crucial that local governments formulate and implement urban development strategies that ensure more eco-efficient benefits in terms of economic growth and productivity as well as more socially equitable, inclusive and environmental sustainability.

Land-use issues require a multi-disciplined and cross-departmental approach that will directly impact economic efficiency and urban growth, employment, social inclusion and equality, health and a sustainable environment. Urban zoning, neighborhood plans, and the spatial-temporal patterns of inequality are other factors that significant impact of land use. However, the use of land for agriculture and farming are not broadly accepted by local governments because they believe that there are possible health risks associated to these practices. Urban agriculture and farming practices can sometimes be divisive within their societies, especially when the spaces could be used for other scarce economic activities.

Urban land-use planning and zoning is growing exponentially and conflicts with other similar practices that question the usefulness of urban agriculture. Enhanced security is required around the physical limitations of the urban spaces, and although this has potential productive qualities, it also causes the spaces to become unbuildable, and their urban parcels underutilized (Pagano and Bowman 2000). The high land prices, the exposure to pollution, the contamination of water, air and soil from industrial and commercial activities and traffic affect the land use for housing, education, recreation, agriculture, farming and gardening. This causes hampering investments and leads to poor land-use security (Mougeot ,2000).

In addition, buildings and infrastructure put significant pressure on urban land use. Vacant residential yards and industrial rooftop spaces are considered different land uses. Some land-use maps do not distinguish parking lots from other vacant spaces. An excellent example that Hui reported in 2011, is the abandoned land used to plant flowers, ornamental plants, herbs and vegetables, next to a government building. However, urban land use for agriculture, farming and gardening have become quite attractive because of their potential to meet multiple needs of their community, such as supplying fresh and healthy food in neighborhoods with limited access, articulating the linkages between the built environment, food systems and health while offering opportunities to residents for employment, recreation and education (Hodgson et al., 2011; Redwood, 2011).

Montreal for example, has the largest municipal urban agriculture program in Canada, and has effective land-use designation (Cosgrove, 2001). Public actions can be taken to promote the social dimensions of urban public spaces as part of collective re-appropriated spaces for diversified uses of unused vacant land around housing areas. Recovered unused land is often used for agriculture, farming, and temporary gardening projects created on constructible land and adapted to residents' demands. These public actions for more integral city development are aimed to foster conviviality, proximity and social cohesion between residents (Canton de Genève, 2013), and enhance the urbanite social interaction and cohesion while improving quality of life.

The urban land-use planning system contributes to a city's economic growth, social development, and environmental sustainability. Vancouver's Food Action Plan (City of Vancouver, 2003) supported the land-use decision to serve as a public resource to support the city's commitments to sustainability. In states like Oregon, the land-use planning system demands that each city set an urban growth boundary to show the physical limits and control of "sagebrush subdivisions, coastal condo-mania, and the ravenous rampage of suburbia" and the protection of farm and forest lands (McCall, 1973). The awareness of sustainable urban land-use planning reinforces the development and maintenance of a data-based development system. It manages issues of urban growth or decline as well as rundown and waste resources. (Carley, 1995; Curwell and Cooper, 1998; Department of the Environment, Transport and the Regions (DETR), 1998). The decision-making process around land use, urban development, and parallel policies supports sustainable planning. The policies are made based on an inventory of natural resources.

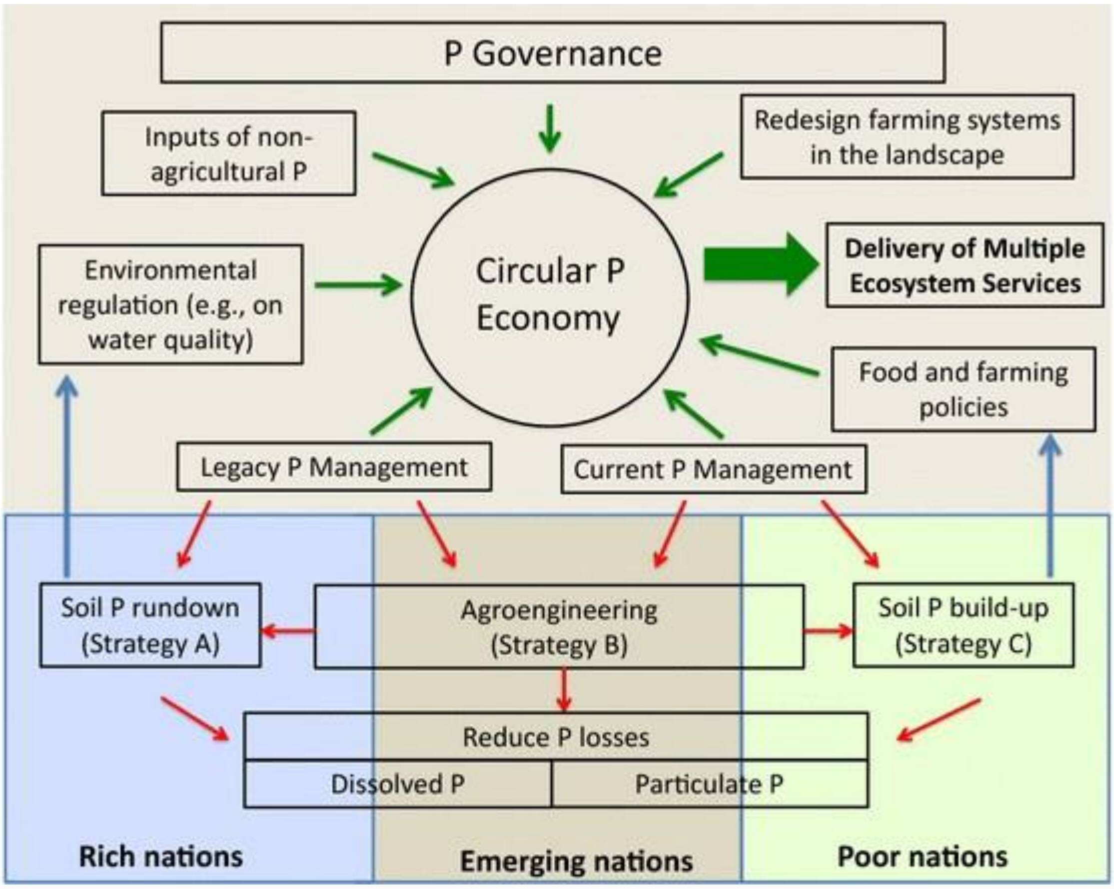
In most cities, urban land-use planning for commercial farming requires special permits and must follow zoning and building regulations and city codes for water sources, fire and energy as well as waste disposal. Urban planning and food production policies developed by local authorities may connect the issues of land-use planning and sustainable development. Some cities have already implemented an urban land-use and comprehensive plan that includes urban farming and agriculture. To do so, they adjusted zoning and permission granting procedures and included infrastructure, materials, knowledge, and other resources in their city plans. (Mukherji and Morales 2010). The land- use planning system fills the middle layer vacuum. Although land availability and land use are not statutory requirements for sustainable urban planning, they are at the center of the development of urban food production.

Land-use planning has an essential role in urban policy as it delivers sustainable development ideas. Urban gardening, for example, contributes to the growth of cities' economies by promoting health practices. (Hynes, 1996, p. 161). Urban land use policies and regulations are also used to manage vacant city spaces, which in turn, creates networks of sustainable urban spaces and provides better ecosystem services for the development of more sustainable cities. Long-term vacancy requires more oriented regeneration policies (National Land Use Database, 2000).

Vacant buildings require the recording of reliable and comprehensive information. The rights to access the city and its built environments are other vital elements that grant citizens the right to part- take in the development of their community. It allows them to participate and help make democratic decisions about their city planning and gives them the right to access, occupy and use urban spaces. (Lefebvre, 1996).

The term "built environment" refers to "the human-made structures that provide the setting for human activity such as buildings, parks and green spaces, neighborhoods and cities. The supporting infrastructures of built environments, such as water supply or energy networks, are often incorporated within these environments. "The built environment is a material, spatial, and cultural product of human labor that combines physical elements and energy in forms for living, working, and playing." (Kaklauskas & Gudauskas, 2016, p.413). These concepts underline the communities' opportunity to care for their surroundings and increase the quality of life by providing the necessary elements to propitiate a resilient and sustainable environment.

Figure:1 below indicated how phosphorus circular economy impact on sustainability



Source: Nesme, & Withers, (2016)

From the Figure:1, the study observed that P (phosphorus) governance related to Circular P economy. It is directly related to delivery of multiple ecosystem services and environmental regulation. Input of non-agricultural phosphorus works in circular economy. Environmental regulation is also very important for the society and the country as well. Legacy of management and current management but put impact on circular economy, Food and farming policies had impacted on circular economy. Agro-engineering had affected by legacy phosphorus management and current phosphorus management. Legacy phosphorus management had impacted on soil P rundown while current phosphorus management worked on soil P build-up. Agro-engineering reduce P losses which had two segments: Dissolved P and Partiulate P. All the resultant factors ultimately worked with rich nations, emerging nations and poor nations.

DISCUSSION

From the study of the present scenario the study can discuss following points:

Pressures arising from climate change are related to some extent to the increasing scarcity of land for urban use and other natural resources, such as water and natural nutrients. In many places, the population is continuing to rise and becoming an essential concern for the policy agenda. The orientation toward resilient and ecological land use is only one of the municipal governments' challenges as they must work to converge the structures and processes of urban social-ecosystems with energy, fuel, climate, water and food. These challenges incorporate economic, social and environmental perspectives and integrate initiatives of diverse stakeholders to invest in natural resources and capital projects and generate the development of green resilience in the city. A sustainable and resilient socio-ecosystem does not largely depend on human input or activity since anthropogenic interferences can interrupt the provision of inputs. Instead, it is more reliant on the ways of nature.

A sustainable urban transportation system that uses renewable resources and energy and operates efficiently and affordably helps minimize the use of land and limits emissions of the emission of waste and noise in the atmosphere. Urban ecosystems are a potential solution for future ecological and environmental issues caused by the loss of natural landscapes. When the natural resources and the ecosystem are controlled by a few privileged people, the capacity of adaptive development is reduced, the resilience diminishes and there is more disequilibrium. The balance between natural and urban ecosystems and the surrounding regional landscape is limited.

The social ecosystem is currently threatened by anthropogenic activities that find themselves at the brink of collapse, and this requires prompt action. In the context of social-ecological systems, management and flexible collaboration are crucial; they help develop policy frameworks as a basis to build adaptive capacity. Nature should be strengthened to stimulate development through the interaction and interdependence with humankind to enhance resilience in socio-ecosystems. Another important element is urban green space, or an underdeveloped piece of land located within the territorial context of a city and open to the public. Urban green spaces are pressured to provide economic, social, cultural and ecological functions. These spaces provide ecosystems services to human beings and must simultaneously meet the needs and preferences of local population. Resilience sustains the urban ecosystem under uncertain and complex situations.

Because of this, human activity can have direct consequences and cause shifts in resilient social ecosystems. Response diversity among species within a functional group is a component of resilience and is critical to ecosystem reorganization. Individuals, groups, organizations, and ecosystems are fundamental to respond to significant disruptive changes. Resilience refers to the ability of an ecosystem to respond productively to significant disruptive change and adapt to external variables that threaten its existence. Urban land-use is inextricably interrelated with resilient social-ecosystems, which is influenced by the behavior of individuals, groups, organizations and communities.

Urban land-use is targeted at specific and limited functions of the city, such as biomass and water passage and accumulation. In recent population trends, urban land-use and vacancy patterns must consider their impacts on vacant land and structures.

Sustainable, environmental and ecological systems are being identified within resilient socio-ecosystems as the elements that have the capacity to continue functioning despite being confronted with natural and anthropogenic disturbances, anticipating and preparing ahead for them.

The phenomenon of resilience in sustainable development may lead to some policy recommendations to improve the interrelationships between economic efficiency and the social-ecosystems and biosphere, develop flexible and innovative relationships of collaboration, and achieve sustainability and its operationalization in the context of socio-ecological resilience. Other policy recommendations should focus on developing indicators to measure any change in the level of resilience, signal and monitor uncertainties of social–ecosystem variables, and manage diversity.

CONCLUSION AND RECOMMENDATION

Human beings are living in a time of qualitative changes in many areas of urban life. These changes have a significant impact on city management. Seemingly, now is the time to redefine the city's functional structure; many countries still operate under obsolete and ineffective functional and spatial divisions. In the face of significant changes in civilization, many existing regulations impose barriers and impede the rational development of communities; it's time to introduce new and innovative solutions. Notably, urban land-use plans propose innovative and pro-environmental solutions that support green, resilient and eco-oriented uses of urban ecosystems and promote a better quality of life in the city. In sum, urban land is scarce, and it should be treated more sustainably.

City planners and landscape designers consider agricultural and farming landscapes to be important areas for the future of sustainable urban development. The urban agriculture and farming lands are inherently multi-functional and can offer many public benefits beyond sustainability and commodity outputs. The amount of vacant land in urban centers is increasing, significantly where land-use densities are declining. This is the result of the decline seen by manufacturing activities after limits on employment creation and population density have been reached.

Urban land use scenarios are a tool that helps to allocate vacant urban spaces to vegetable production in residential green spaces like gardens and rooftops. Land-use control and building regulations constraint and limit farming and gardening in urban areas.

To determine the current characteristics of land uses, it is necessary to conduct some data-base analysis from primary and secondary sources. This approach allows cities to broaden their vision by considering the multiple functions of a specific site and defining its various components by comparing data with other cities. Then, land uses are identified for functions such as education and recreation, etc. Land-use components, their dimensions and locations are included in the proposals. This whole process serves to identify the needs and expectations of the urban community regarding land uses, spatial design and site plans.

Ecological resilience is the capacity of a site in an urban system to adjust and control its interactions with external vulnerabilities, disruptions and shock, thus ensuring a more sustainable urban component of the ecosystem. Ecological resilience is the ecosystem's capacity to cope with disturbance while maintaining its structure and functions. Unlike engineering resilience, which can return to its previous existing state before perturbation, ecological resilience refers to patch ecology or landscape and the notion of megacity and experimental modeling and design.

Sustainable urban planning still underestimates that the food system is its turf, pointing to the responsibilities to land-use regulations and the built environment. The temporal urban land-use plans that are applied to open green spaces have formalized the concept of urban gardening and farming initiatives to help provide more qualitative resilient ecosystem services that contribute to the development of more resilient cities.

In addition, land-use planning must meet the demands posed by the socio-economic activities and urban growth to ensure the effective management of value creation and environmental sustainability. However, farming and gardening may not always be alternatives in an urban setting, especially when other competing lands with a higher value can meet the city's needs. Urban agriculture, farming and gardening are integrated into the city's sustainable land-use planning and policy processes. These sustainable practices offer new frontiers for sustainable land-use planners and landscape designers and provide endless possibilities for sustainable urban development and the transformation of urban spaces.

City authorities and local governments should adopt innovative urban planning and sustainable development strategies based on the use of land, resource protection practices, environmental and ecological services, social inclusion and egalitarian issues, economic growth and efficiency, etc. Strategic orientation of initiatives could seriously obstruct zoning plans. On the other hand, sustainable urban planning aims to encourage urban agriculture, farming, and gardening to effectively use land. Land-use planning and landscape design should reconcile the demands of socio-economic activities and urban growth.

Ultimately, new forms of value are ascribed to public and private urban properties to meet other land use priorities such as housing, commercial areas, urban green areas and open spaces, roads and other infrastructure. The efficiency of urban land use can be achieved through different means and variables, such as energy consumption, water, other natural resources and waste management. The ecosystem and natural resources are controlled by a few people who do it for short-term economic gain, but policy makers should adopt a proper planning for sustainability. The survival of humankind is also dependent on healthy and resilient social-ecological systems and sustainable environments.

Urban green spaces play a critical role in conserving biodiversity, mitigating the impacts of climate change, sequestering carbon, improving micro-climate, protecting water resources, conserving biodiversity, protecting water resources and supplying fresh food. Sustainable urban planning seeks to create attractive land-use combinations to meet the needs of residents and environmental challenges through initiatives like urban farming, agriculture and gardening. The innovation of productive land- use as landscape typology is designated for local food production and, with innovation in ecological resilience, these open spaces require decommissioning of urban services and encourage residents to seek employment in agriculture.

Innovative and integrated sustainable initiatives and strategies in urban land-use planning can contribute to green, resilient economic growth and social development issues such as inclusion and equality and environmental sustainability. Sustainability is also a normative social goal that can be promoted with the mechanisms of ecological resilience. Resilience is also a dynamic process that forms symbiotic relationships within and between the social ecosystem and its environment. Social- ecosystem resilience is found in the continuous cycle of adaptation and transformation all while maintaining the system's integrity and viability. It is the reaction of the socio-ecological system towards disruption and destruction and its capacity to recover and develop in a state of uncertainty, discontinuity, and emergency. Social-ecosystem resilience happens when self-organization and learning meet adaptation and persistence.

For the implementation of strategies, it is important to create a typology of community land-use types based on vacancy characteristics, the income of the area's residents and vacancy market rates. Biological diversity enhances the social ecosystem resilience and ensures the production of ecosystem services. Green resilience is an institutional capacity to cope and deal with stress and conflicts arising from climate change, unforeseen contingencies, unsustainable development to live and other emerging environmental issues within the ecosphere. Green resilience sources intertwine with complex adaptive and mitigate systems of dynamic changes in the ecosystem.

For this reason, resilience approaches the opportunities that arise from ecosystem changes in its structures, processes, the emergence of great developments, and coping with disturbances. Resilience is an essential factor for sustainable development, especially to maintain a dynamic equilibrium with the social ecosystem's natural disturbances. Response diversity as a method to sustain ecosystem states, functional groups and ecosystem services come together to face disturbances and environmental change. Response diversity operates across spatial and temporal scales. The key to cope with change in social systems is anticipating and combating disturbances, adaptive development, and integrating resilience in interactions with ecological sustainable development need to be considered by the civil society as well as policy makers of different countries for their own country's sake.

Adaptive development in the social ecosystems can carry out the ecological assessment of actual events and take corrective action. Sustainable development pretends to reduce social and ecological damage on both a local and a global scale through fairness and social inclusion, protection of the environment, and economic efficiency. Institutional Capacity Development, Good Governance, political will, ICT for the People and the Role of Media, Status of growth, Industrialization, Rural Infrastructure, Social transformation, education, Health, Population and Development, Gender Development, Forests and Biodiversity, Food Security and Sustainable Agriculture, Water Supply and Sanitation, Energy Security, Green Development, Green Economy and Green Jobs, Green HRM may work as an integrated manner to attain sustainability.

High response diversity increases the insuring buffer for resilience and the effectiveness of ecosystem management policies and actions. Response diversity is relevant to resilience because the diversity of species contributing to an ecosystem's functions work towards the renewal and reorganization of environmental changes. In addition, it contributes to resilience when planning, managing and restoring social ecosystems. It provides adaptive capacity in uncertain and complex systems and human-dominated environments.

Urban land use has different applications for the multiple levels of society: from the entire city to small neighborhoods, from communities to small vacant lots, houses and buildings. Urban resilience in cities is the ecological approach used to analyze changes, disturbances, vulnerabilities and mutability of a city's development and its relationship with climate change. On the other hand, sustainability measurement requires transparent accountability between the resources depleted and those used to replace them in the ecosystem. The accountability of natural resources in an ecosystem occurs through the adaptation process after an external disturbance.

Adaptive processes contribute to the adaptive cycle in urban socio-ecological systems. Urban land should be used by evaluating based on landscape multi-functionality, and account for the various contributions, functions, services, and benefits that it can provide. The urban social-ecosystem's cultural functions, biodiversity, ecological services, economic efficiency, social inclusion, and equality have the potential to bring significant benefits to communities and neighborhoods and society. Results of Cop26 summit must be followed by all the nations of the globe to save from environmental hazards. It is possible to prevent degradation by promoting the system's congeniality with nature. Creation of HRM of different countries by government and public sector is very important.

Moreover, circular economy should be worked in search of sustainable socio-economic and pollical factors for the betterment of the nations and thrive in the world when global warming is continuously disrupting the world. SDGs and their targets should work for ecological balances and keeping the world from the dangerous of environmental degradations so that countries of the world can remain safe for which international collaboration among different countries are being required to implement them including technological transformation and even for least developed countries funding may be provided. Strong political will of the global leaders are being required.

In future, an in-depth study may be taken using qualitative and quantitative analysis for which it needs to take various countries with at least thirty years data. For sustainability purposes, some case studies are being required to analyze in a different study. Another interesting study may be done why advanced nations are not keeping their promises for green environmental financing.

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