

# Preface

## INTRODUCTION: AN OVERVIEW OF THE SUBJECT MATTER

*Bioeconomical Solutions and Investments in Sustainable City Development* is the title of this book that we, José and Justyna as editors, offer to the academic and scientific community. It is inferred from the mere title that the main subject matter is sustainable city development. From this subject, two main tools are analyzed as variables that are directly related to sustainable city development and have an impact on results, the bio economical solutions and investments. Sustainable urban planning and development is a methodological framework as a toolkit to transform a vision into reality using urban spaces as resources to engage stakeholders for achieving sustainable city development. A brief analysis of the three variables related and involved as the main axes of the book are briefly analyzed below.

Sustainable city development strategies are supported by urban planning practices based on urban governance involving stakeholders under the assumption that urban growth is interdependent with economic growth and can be reconciled in participatory and sustainable planning. As part of the integral urban spatial plan, some sustainable city development planning objectives should be attached to contemporary urban development trends. A sustainable city development can be achieved through an urban planning process (UN 2009) that responds to the requirements of sustainable urban development is needed for the sake of sustainable cities.

Regarding bio economical solutions to sustainable city development is sustained by the recent developments of bio economics. The term bio-economy is related to the role of sustainable biomass. Bio-economy is also named bio-based economy, although bio-economy refers to food and feed chains and bio-based economy refers to the bio products of non-food goods. However, bio economy is more useful term to mean both the use of food and feed, and the bio production. Also, aquatic biomass expands production for the bio-economy. Bio-economy activities are connected with sustainability inherently fossil-free shifting away from oil-based production and using more biomass and bio-based materials where no waste is produced.

Bio-economics is the set of economic activities that obtain products and services, generating economic value, using, as fundamental elements, resources of biological origin, in an efficient and sustainable way. In bio-economics, viability is a concept that implies time, context, and the nature of economic value. Bio-economy is characterized by the creation and efficient use of natural and biological resources, raw materials and capabilities in sustainable infrastructures aimed for the bio production of goods, bio services, bio energy, bio health, etc. to achieve sustainable lifestyles, wealth and economic growth.

One of the objectives of bio-economy is to integrate economics and environmental sciences associated with the use and conversion of biomass to bio production. The premise of bio economy is based on achieving a balance between economic activities and the use and management of biological natural resources. The Bio-economy addresses some major environmental, economic and social changes for sustainable production and transformation of biomass material for better living and working. Integrated bio-economy provides better living conditions for a sustainable human development, better food, raw material for bioenergy and bio products while halving the environmental impact.

Bio economics begun with rural-urban food chains and food banks promoting green diets. Integrated bio-economy secures transition to sustainable future by creating biomass as a renewable raw material for bio production and food security provided by agriculture. Sustainable bio-economy supports a transition from fossil economy to exploitation of renewable natural resources and biomasses produced by forests, waters and fields. In some countries such as Finland, bio-economy relies in forests based on sustainable exploitation. Transition towards a bio economy should be supported by policy instruments to achieve a sustainable economy and political stability. Legal and regulatory frameworks may facilitate organizational transitions towards a more bio economy-oriented activity in the market place and become positioned in a market share.

Bio-economy responds to current developments and challenges in global economics, social and environmental issues. Bio economic and environmental analyses are strongly correlated. Bio-economy has a relevant contribution to economic growth with the production of multiple public and social goods such as supplies in food, energy, coastal, rural production, and conservation of natural and biodiversity environments.

There are some value opportunities in bio-economy from producing high value products from using waste resources and feedstock. Bio economy sectors in economic activities have increased in wood-based industry, consumer goods industry,

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bio-based plastics, energy, etc. Bio-economy is not restricted to waste feedstock which also takes on process and harvest residues not produced as bio products but as by-products, co-products and biogenic components of industrial and consumer biodegradable bio-waste.

Bio-based products are products that are wholly or partly derived from materials of biological resources origin, excluding materials embedded in geological formations and/or fossilized. Bio-economy implies the capacity to develop a long term vision for the future use of bioenergy and bio resources, the production of renewable biological resources or biomass to provide more food security and a better life conditions to future generations.

Thus, spatial bio economics can support a modeling approach of efficient decision making mechanisms. The managerial control of spatial bio-economic models is related with restoration, development, harvest of habitats in any location and the dispersal and diffusion of species across the space.

The social importance of bio-economics seeks to facilitate access to basic services. Economic adaptability of bio economy is understood as the ability of social actors to produce and maintain maximum value over productive capacity in the territory, by strengthening links between sectors, combining assets to enhance the specific character of local products and services.

The other variable, investment and its implication in sustainable city development is sustained on the assumption that sustainable urban planning can foster economic development by promoting urban economies of scale and agglomeration, adaptation to climate change impacts, reducing use of energy, etc. Sustainable city development requires a realistic financial scenario with the sources of investment and mechanisms of cost-recovery to ensure social affordability and financial sustainability. Sustainable city planning and development is linked to budgeting in terms of investments in infrastructure and services to balance economic growth, social equity and environmental challenges.

Some challenges for institutional investors are represented by the development of green bond markets, investments in low-carbon and climate-resilient infrastructure, greening and achieving inclusion and equity in the public and private financial institutions and banking services, etc.

Sustainable urban planning and development processes must link economic development concerns to investment planning in infrastructure development. Sustainable urban planning and development infrastructure investment decisions can improve the living conditions of population over the long term. Sustainable city planning and development supports local economic development and coordinates

the urban spatial locations and the efficient distribution of economic, social and environmental activities achieving value capture from public investments. The participatory planning processes have influence on environmental investments to respond to local environmental and sustainable city development.

It is also important to consider the investments in human capital. Bio economy-based companies have to train their working forces with specific technical issues and challenges related to industry sector besides training with specific managerial skills, change management and other techniques to be used to enhance the sustainable city development. Pioneering business organizations facing these challenges are training and developing the next generations with creative and co-operative knowledge and entrepreneurial skills to use it as innovation drivers and venture builders.

## **A DESCRIPTION OF WHERE THE TOPIC FITS IN THE WORLD TODAY**

Spatial development is a discipline aimed at protection of specific values and rational development by stimulating economic processes. It is a domain that combines different groups of interests operating on one area. Its interdisciplinary nature arises from its definition; therefore, the solutions developed in spatial development have the impact on many users. Especially difficult and complex matter is spatial development and policy for large agglomerations, regarding modern challenges to minimize the negative impact of urban development on the environment. One of the ways to really impact quality changes in this respect is to strengthen the potential of bio economical solutions and investments.

Quality changes in city perception and its role in civilization progress occur in front of us. The issue of self-sufficient residential units is being increasingly discussed and in higher scale, such as the whole urban agglomeration. One of the ways is to introduce innovative solutions that can result in more radical and quality changes in the future. The political will, social awareness, financial resources and physical location will be necessary to implement these solutions.

This work is to collect different aspects related to development of sustainable city models based on investment in eco-oriented solutions that is literally, by protecting and making publicly available green areas and by innovative investments with the use of bio economical solutions. These solutions may be essential for both large agglomerations and shrinking cities. Bio economy and investments to develop green urban areas can be successfully used in both situations – as a way to reduce the demand for supply of external resources and step reduction of operating costs

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in the future. The main objectives of the book are to expand knowledge on possible implementation of innovative solutions in cities and nearest environment and to highlight a role of green areas in sustainable development of urban setting.

## **A DESCRIPTION OF THE TARGET AUDIENCE**

Given the interdisciplinary nature of issues in question, they are directed to urban planners, architects, city authorities, experts, officers, business representatives, economists, politicians and academic centers and scientists. It can be used both as a source of practical information and to start common initiatives by different centers. The book will provide insights and support executives concerned with the quality of built sustainable environments.

## **THE CHALLENGES**

In the history of the planet earth, the Homo sapiens has been the great predator of nature. Nowadays, the planet earth is confronting several grand and complex challenges in rural and urban development such as climate change, energy security, food security, resource depletion, etc., difficult to solve at the point to put at the brink the mere existence of high percentage of living natural species, including human beings.

The benefits arising from the economic growth in urban development have been accompanied by serious environmental degradation, social inequalities and production challenges. Some major environmental challenges to overcome are the increase of human population, over consumption, depletion and decoupling of natural resources, unsustainable economic development and growth, impacts on environment and ecology, global warming. Other challenges are related design of a wide range of feedstock characteristics, availability and quality, processing paths, product portfolios and trade-offs with energy consumption and production, distribution and market prices (Tsakalova et al., 2015).

The bio economy and the related biotechnology industry face outstanding and large technical challenges for sustainable city development production of high-value biomass or bulk green products. Renewable biotechnology is lagging behind when compared to developments of green, renewable chemistry in production of commodity chemicals. The alliance and convergence of green chemistry with industrial biotechnology is already solving some challenges in sustainable city development.

Sustainable city development challenges of scale for green chemicals are more easily surmounted than for other commodity chemicals. For example, biotechnology solutions to aromatics are particularly challenging. The aromatics challenge reinforces solutions for biotechnology that are lagging behind those for chemicals. Companies of renewable chemistry should have solutions to the aromatic challenge through process of non-food biomass such as corn stover, sugar cane bagasse, wood, sawdust, etc., are gasified and converted into hydrocarbons identical to the petroleum-derived products.

There are also some technical challenges to sustainable city development in perfecting processes when using waste materials as feedstock. Different degrees of uncertainty and complexity make it challenging for diverse industry sectors, business investors, authorities and officials from local governments, decision makers, etc., to identify the most promising bio economy options, including their technological and economic risks.

Different industry sectors that have been conducting research and innovation in bio economy development have been operating in isolation. Industry is struggling to produce bio-based products and chemicals at a scale influencing the market. Bio-based production challenges regulations across boundaries. Fossil-based feedstock are already unsustainable means of the production system that requires a gradual replacement with bio-based ones. However, bio-based production faces a challenge given the economies of scale in petro chemistry. Genomics applications have a great potential for bio-based sustainable economy and development.

Renewable aromatic material lignin, a complex organic polymer deposited in the cell walls of many plants, making them rigid and woody, which creates the challenges of availability in the biosphere exceeding 300 billion tons and increasing annually by around 20 billion tons (Smolarski, 2012). Other major challenge is the bio economy based on genetic engineering for strain improvement and higher biomass and green product yields, and the need to gain market and regulatory acceptance of such organisms (Sayre et al., 2013).

Sustainable bio economy is more than environmental sustainability, rural and urban industrial ecosystems, sustainable city development, wealth creation, green production, etc. It is a concept related to green rural and urban revitalization and regeneration, smart city, green re-industrialization, bio production, biodiesel refineries, creation of value chains.

## **SEARCHING FOR A SOLUTION**

To tackle the increasing climate change and socio-economic problems in urban settlements is required to incorporate sustainable urban spatial planning in sustainable

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city development under the term sustainable city development. Among the functions of sustainable city development is planning and projecting the population distribution and land regulation under sustainable development criteria in cities and metropolitan areas (SEDATU, 2015).

The effectiveness of the sustainable urban planning and development is linked to the size and share of the informal city, development regulations and availability of resources. Sustainable city planning and development legislation and open dialogue with stakeholder groups are important factors for the urban development of green urban areas, sustainable city development and urban containment and densification. Sustainable urban planning is a governance tool to achieve sustainable city development. Urban planning is a core component of an urban governance model to promote democracy, inclusion, participation, transparency and accountability aimed to ensure sustainable city development.

Urban planning needs an integrated approach to cover urban policy, governance and sustainable city development. A holistic approach to sustainable city development integrates sustainability through urban planning. Sustainable strategic city development planning focuses in developing a common vision, mission, goals, strategies and policies, as the result of stakeholder's risk sharing. The urban development planner must sustain his behavior in ethical grounds and moral philosophy framed by a neo modernist sustainable city development and urban planning ethos.

Bio economy is part of the solution to face the challenges of a sustainable city development if it can be economically growing, environmentally sustainable and socially inclusive and equality oriented. The benefits coming out from bio economy are notwithstanding because there are several defining challenges that are proving difficult to overcome (Cheali et al., 2015). Bio economy refers to the activities spread across diverse economic sectors relating to the invention, creation, development, production, distribution, consumption and use of biological products and processes.

The bio economy is a discipline that considers new green technologies that are designed and developed as biotechnological processes and evaluated their sustainability and performance in response to social challenges such as green food safety, smart cities, waste disposal, green urban areas, sustainable energy, health, digital and networking security, etc. Bio economy research and innovation is conducted in specific programs related to food security, urban green innovation areas, sustainable agriculture and forestry, marine, maritime and inland water.

Bio economy strategies in sustainable city development are formulated and implemented to overcome the challenge of sustainability on many levels. Bio economy policy ensures biomass sustainability by collecting and using it within the boundaries of natural resources that the planet can provide bio economy policy frameworks and environmental ecosystems can tackle some of the toughest of the

grand challenges such as climate change, food security energy security and resource depletion. The diversity of economic sectors includes agriculture, fishery, forestry, food, waste management, health, trade, etc.

The bio economy concept emerged and has grown from a biotechnology-centric vision to be applied in economic activities giving place to a more complex bio economy policy framework and sustainable city development and environmental ecosystems. Despite the challenges, the biotechnology production offers several advantages over the chemical production. The chemical industry poses challenges largely invisible in manufactured goods despite the essential role it plays. The traditional chemical industry facing the challenge of struggling with a poor public image (Moreau, 2005) is being replaced with new bio-based materials in a range of different bio-based chemicals already close to the market.

The first-generation of biofuels and bioenergy had lower added value and job creation potential. Incineration with energy capture can be used to tackle the waste plastics problem (Yamashita & Matsumoto, 2014). A new agenda centered on strategic innovation and research aims to have added value increasing the wealth creation and employment and high economic growth by meeting the grand challenges posed by sustainable rural and urban regeneration, energy security, climate change, textile, food processing, chemicals industries, health industries, etc.

The ongoing research and innovation in bio economy production is rising in some industrial sectors such as the chemical, textile and other industries and their contributions to sustainable city development. However, there is an urgent need of market research, studies, analysis and development. Biggest changes are taking place in bio economy markets for the last decade.

## **ORGANIZATION OF THE BOOK**

The content of this book aims to reflect and analyses the innovations currently taking place in the changing bio economics policy framework and environment and the attraction of investments to propose and design solutions and its implications in sustainable city development.

The book is divided in three sections. Section 1 is dedicated to the chapters dealing with the conceptual and theoretical bio economy framework of reference. Section 2 aims to concentrate more on issues related to investment in different industry sectors. Section 3 presents some specific cases on sustainable city development.



## **SECTION 1: CONCEPTUAL AND THEORETHICAL BIO ECONOMY FRAMEWORK OF REFERENCE**

### **Chapter 1 – Bio-Economy: Visions, Strategies, and Policies**

Bio economy is transforming the world`s economy from conventional to sustainable mode. This chapter analyzes the development of sustainable bio economy through the implementation of the adequate visions, key strategies and policies in some specific cases.

### **Chapter 2 – Strategies of Sustainable Bio Economy in the Industry 4.0 Framework for Inclusive and Social Prosperity**

The chapter makes a descriptive analysis to the unpredictable transformations in knowledge related areas in what has been called the fourth industrial revolution, basically a knowledge revolution that have affected many areas of knowledge, among them the bio economy. The chapter offers some bio economic strategies to further the Industry 4.0 relations.

### **Chapter 3 – Urban Farming in Sustainable City Development**

This chapter deals with urban Farming by integrating urban space and buildings in green spatial systems for the preservation of the environmental balance of urban spaces and connections concerning the coexistence of architecture and greenery in the city.

### **Chapter 4 – Parametric Evaluation of Beam Deflection on Piezoelectric Material Using Implicit and Explicit Method Simulations: A Study in Energy Engineering**

The chapter deals with an energy harnessing method from rainwater using the piezoelectric materials with the purpose to visualize an interconnection in parametric analysis of piezoelectric effect-based energy harvester using two different commercially available piezoelectric materials

## **SECTION 2: ISSUES RELATED TO INVESTMENT IN DIFFERENT INDUSTRY SECTORS**

### **Chapter 5 – Entrepreneurial and Institutional Analysis of Biodiesel Companies in Mexico**

This chapter makes an institutional analysis of entrepreneurial activities in biodiesel companies and their important contribution to the bio economy energy sector in Mexico and its relationship with quality and maturity of joint relationships. The analysis concludes that the institutions in Mexico have achieved their maturity and incentive to increase the number of producers and distributors of biodiesel thus taking advantage of the growing market.

## **SECTION 3: SPECIFIC CASES ON SUSTAINABLE CITY DEVELOPMENT**

### **Chapter 6 – Ecological Centre of Warsaw as a Development Path**

The purpose of this chapter is to present a new development path towards greening the city center of Warsaw by converting disperse green areas into a continuous network of green areas in the context of the increasing density of building development on both sides of the Vistula River. This future structure of green areas is based on the elements of bio economy.

### **Chapter 7 – Green Spaces of the Metropolitan Area of Guadalajara**

This chapter analyses the green areas and public parks of the Metropolitan Area of Guadalajara as a system that shares common problems with other Latin-American cities, such as the deficit of urban green spaces, insecurity, unemployment, social exclusion and stress, etc.

### **Chapter 8 – Application of UAV Technology to Planning Study on Chinese Villages in Guanzhong**

The chapter describes the multiple problems that the Guanzhong region in China faces in its rural planning research to implement the Chinese state strategy of rural

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revitalization. Despite this situation, this rural area offers better work environment conditions to implement UAV technology

## **Chapter 9 – Developing a Sustainable Eco-City in Pre-Olympic Tokyo: Potential of New Methods and Their Limits in an Urban Era**

This chapter deals with the emergence of sustainable urban development in Tokyo in light of the upcoming 2020 Olympics by exploring some practices such as rooftop- and wall greening or river projects in the inner city.

## **Chapter 10 – Forest-River-Ocean Nexus-Based Education for Community Development: Aiming at Resilient Sustainable Society**

This chapter elucidates bio economic research aimed to developing a more resource-efficient and sustainable society that uses renewable biological resources to produce food, materials, and energy. This paper examines the effectiveness of forest-river-ocean nexus-based education for community development (FRONE) in encouraging the sustainable use of biological resources.

## **CONCLUSION**

This book has a positive impact and makes significant academic and scientific contributions to the subject matter of bio economy solutions and investment to sustainable city development by such a diverse group of scholars from around the world. These contributions further advance and deepen the theoretical and conceptual frameworks of the elements and attributes to bio economy as a new scientific approach to sustain the practice of sustainable city development projects, which will be crucial in future. As a concept, the relevance of bio economy encompasses economic growth and efficiency driven by the sustainable development of renewable biological and natural resources and biotechnologies to produce sustainable products and services, creation of value, employment and generation of increasing income.

Sustainable city development is under pressure for more efficient economy, more inclusive societies, more sustainable environment based on more rational use of natural resources to meet competing and complementary objectives in energy, health, food, water and other important urban sectors interrelated with sustainable urban green areas, housing, building, public spaces, etc. of urban environments. The

interactions and interrelationships between these sectors have become increasingly affected by the investments in bio economy.

This book explores the bio economy and its interlinked relationships with investments and sustainable city development elements as three relevant interacting variables that are essential requirements aimed to influence affecting and impacting the execution of urban projects for developing more livable sustainable sites. The bio economy based-strategies, policies and tools described and explained in each chapter, either at the theoretical, conceptual or methodological level of analysis or in the specific cases, demonstrate the intention and commitment the implications in real life. Besides the direct implications the chapters of this book has in sustainable city development, it is wise to recall other implications to the large range of related policy formulation and implementation in other areas such as urban building and housing, environmental and ecological development, urban innovation, business and industry operations, trade, urban farming, urban green areas, taxes, waste materials, etc.

At least but not the last, all the authors involved in writing the chapters are academic experts in their fields who are elaborating their proposals for sustainable city development based on investments and bio economy. The implementation of their proposals are dependent on sustainability of the feedstock and the processes of the bio economic products and services to turn around the negative trends in global warming, pollution, and in general the unsustainable city development implemented until now.

Let us analyze, follow and implement the advices of the authors of the chapters of this book to work for a healthier and ecological urban environment, more economic efficiency and more equal and inclusive city, because the mistakes of the past are not to be repeated in the future. Let us design a better place where to live with human dignity.

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