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ORIGINAL ARTICLE

"Eco Cities" Under Construction

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ABSTRACT

Ecological and livable cities need an objective method to be jugged. This paper is in search of a method to determine the level of livability and ecology of the cities.

Examples chosen for this methodology are: 1.DongTang (Shangai, China); 2.Masdar (Abu Dhabi, United Arab Emirate); 3.Arcosanti (Arizona, USA); 4.Chang Chun (China); 5.GlobeTown (Nizhny Novgorod, Russia)

The results show that livable city should be in the pursuit of the overall development and ecological progress. Ecological city needs to properly make up for the weakness of city construction under fine ecological environment.

Keywords: Eco cities under construction, Comparative analyses of eco cities, Eco-deficit of cities.

1. INTRODUCTION

Cities are overcrowded and locked with no available land for expansion. In addition to relieving the stress of overpopulation, the city needs means of alleviating the need for dependency on fossil fuels and nuclear power by incorporating the latest in eco-friendly energy generating technology. It is essential to design a system which will help alleviate the overpopulation issue, one which is self-sustaining through its use of eco-friendly means of energy production.

Cities can play a leadership role in catalyzing global action to address climate change. In addition to being more nimble and willing to take risks than larger government bodies, cities have easy access to their citizens and local businesses, schools and institutions, and therefore, the effects of new policies are immediate and meaningful.

"Working with a network of cities is an effective way of significantly reducing greenhouse gas emissions and providing models that national governments can adopt". Cities occupy only two percent of the world's land mass yet contribute more than two thirds of global greenhouse gas emissions. Cities programs include building retrofits, outdoor lighting, waste management, and CO2 measurement, with projects in transportation and airports under development. Each city has its own degree of technical expertise and experience, some projects start from scratch to build the necessary infrastructure and political will.

Efforts to render cities environmentally and socially sustainable are not new. Urban planning and regeneration over the last one hundred years or so have been significantly influenced by attempts to redress the perceived detrimental effects of large-scale urbanization, such as environmental degradation, social inequalities and urban sprawl. The Garden City movement[1], the New Town and the Techno-City are nineteenth and twentieth century exemplars of such attempts to reinvent the city in the (post)industrial era.

More recently, these efforts have culminated in a new phenomenon – the so-called Eco-city. The term can be traced back to the mid-1970s, when it was first coined in the context of the rising environmental movement. Throughout the 1980s and early 1990s, it remained

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mainly an innovative concept, with practical examples few and far between.

The United Nations 'Earth Summit' held in Rio de Janeiro in 1992, and the resulting sustainable development programmed ('Agenda21'), formed the background to a first wave of practical eco-city initiatives. Richard Register first coined the term "ecocity" in his 1987 book, "Ecocity Berkeley": building cities for a healthy future.

A sustainable city is a city whose citizens are able to have their own needs met withoutendangering the living conditions of other people and the well-being of the natural world biodiversity[2], at present or in the future. In the first instance the emphasis of the term is on people and their needs for long-term survival, the relationship between the present generation and the future generations.

A sustainable city can feed itself with minimal reliance on the surrounding countryside, and power itself with renewable sources of energy. The crux of this is to create the smallest possible ecological footprint, and to produce the lowest quantity of pollution possible, to efficiently use land; compost used materials, recycle it or convert waste-to-materials and fertilizes, and thus the city's overall contribution to climate change will be minimal, if such practices are adhered to.

Characteristics of an eco city

The idea of an ECOCITY is that it should be in balance with nature. This can be achieved through space-saving and energy-efficient settlement patterns, combined with transport patterns, material flows, water cycles and habitat structures that correspond to the overall objectives for sustainability. An ecocity is composed of compact, pedestrian-oriented, mixed-use quarters or neighborhoods, which are integrated into a polycentric urban system in public-transport-oriented locations.

In combination with attractively designed public spaces, integrating green areas and objects of cultural heritage to create varied surroundings, an ecocity should be an attractive place to live and work. Such sustainable and livable structures contribute to the health, safety and well-being of the inhabitants and their identification with the ecocity.

How does an ecocity differ from other exemplary developments projects on the one hand and the currently common urban developments on the other?

Compared to the most comprehensive model projects, the main difference is a more intensive adaptation of the urban structure to the requirements of pedestrians, cyclists and public transport.

However, compared to currently common new urban development (including sprawl), there are additional differences comprising more efficient use of energy, reduced impairment of nature and more attractive environments for the inhabitants.

The ecocity offers many benefits, ranging from personal convenience to global sustainability. All the actors involved – individuals, groups and institutions – can gain: an ecocity offers more space for people in an attractive, safe and quiet environment and also has lower life cycle costs and is less costly in relation to repairing negative impacts on human health and the environment.

Comparative analyses of eco cities

A comparative analysis goals is based on which will be discussed idea for the role and impact that these cities have in nature and in the community.

- **Urban planning**

The first step towards an ecocity neighborhood is the selection of a suitable location. The site in question should have a high potential for having an appropriate social, cultural and economic infrastructure and workplaces nearby. Masdar city is a sort of integration of new eco center design with the inner city while the Dong Tang is a kind of satellite city in the suburb area of the city. The guiding theme for urban planners in this context is accessibility. This means that shops for daily needs, schools, nursery schools, services, jobs, leisure activities, etc. must either be located within the site itself or in the direct surroundings and that, ideally, the site should fit within a polycentric urban structure. If the inhabitants need to commute or travel, they should be able to rely on environmentally-friendly transport modes. A special focus should be on rail transport, which normally corresponds to an urban development that is oriented along axes.

Another guiding theme for ecocity planners is the responsible use of land in order to prevent urban sprawl. The ecocity project came to the conclusion that the selection of the site must take account of internal city developments, as well as the existing or planned public transport infrastructure. Well-located, Brownfield projects and inner city development must be given priority.

Greenfield projects may be justified if the demand for new housing cannot be satisfied within the city area and if it is combined with high-quality cycle routes, a high-quality public transport system and clearly defined ecological and social objectives.

Dense and compact housing structures are an important tool in creating an ecocity, as they reduce land consumption, lead to shorter walking distances, facilitate good public transport provision, are a precondition for economically feasible district heating systems, promote social interaction and reduce the cost of infrastructure provision. As achievable densities are dependent on use, location, social and cultural factors and climate conditions, the ecocity case studies exhibit a range of densities, most of which can be labeled 'high density' in the local context.

Hence the recommendation is to strive for an adjusted building density which takes the local settings into account. The objective is to find an ecologically, economically and socially acceptable density level – a so-called 'qualified density' – which combines building layouts with an energy-efficient urban structure, an adequate amount of landscaped areas and sustainable technologies (e.g. the use of solar energy).

Another core issue of sustainable urban development is to create settlement structures which are suitable for a mix of different uses. This means bringing living and working together again and planning for a great variety of functions, including the cultural and economic infrastructure, in order to avoid the disadvantages of a segregated city. In the case of the ecocity project, functionally diverse structures played a major role in almost all the case studies. The ecocity case studies feature different sizes of mixed-use areas with a range of ratios for residential and other uses. Furthermore, they include fine-meshed structures with mixed use on the floor, building or block level.

With regard to green areas within the ecocities, it was possible to achieve good results even in densely built settlements. In addition to areas with natural vegetation, the creation of areas of water, the planting of trees along streets, as well as the greening of roofs, terraces and façades were used as tools to bring nature back into the town. "*And for many architects and engineers, they see architecture as engineering. They stuff the building with portable takes, they stuff the building with solar collectors, with water recycling systems, with living machines and so forth, and you haven't been architecture. Yes I think these are important systems. But that's not the end for green architecture. So I called this the gray Infrastructure."(Opening Remarks: Dr. Ken Yeang)*[3].

The majority of the site concepts also ensured proximity and accessibility of larger green areas for social activities (e.g. sports or recreation), which helps to reduce transport demand. However, these goals are more difficult to achieve in city centers and historical cores. Due to the hot climate, the ecocity concepts in Abu Dhabi, United Arab Emirate favored urban forms which were more compact and had greater contrasts between built-up and outdoor green areas. In the northern countries (Globe Town, Russia), on the other hand, there is a higher degree of greenery infiltration into the housing areas. New approaches in this field were the reconstruction of landscape in Brownfield areas and the integration of urban agriculture into the ecocity concepts.

- **Schedules of projects**

In the last decade are designed many eco projects. These include the cities and that we are going to investigate. We can mention Dong Tang designed in 2005, Masdar designed in 2008, Globe Town[4] in 2010, also can mention and the regulatory plan of Tirana in 2003 (winner project). The exception is Arcosanti designed in 1970 which may be cited as the predecessor of eco cities of the future and it is under construction. The first eco city in the world is Dong Tang.

Cities in question have a broad vision regarding the termination. These values dating from 2010-2050 which makes you think that the timing of introducing the full efficiency of these cities is remote. We are dealing with no more than pilot projects.

- **Population**

Based on the number of residents planned to above-mentioned cities, we can have a clear picture of natural and human potential.The largest population cities are Dong Tang and Chung Chan in China and Globe Town with approximately 500.000 inhabitants .Total number of residents will not be fully attainable within the first years of city life. It will be increased steadily until it reaches the intended figures.

The smallest cities are Masdar and Arcosanti respectively 50.000 and 15.000 inhabitants. According to the project Arcosanti should have 5.000 inhabitants but in reality it has only 100 residents.

- **Cost**

Project cost is a key element of the project, which is depending on the quality of life. This is a value which varies based on the number of residents, the design philosophy and also the technology that is going to implement in the cities. The greater the number of residents, the greater is the cost of design. According to this philosophy, Baku City is in first place. Construction costs vary depending on the typology of the construction site. For example, Dong Tang which is a coastal city cannot have the same cost projection as Masdar City, which is a continental one.

- **Surface**

Surface of the construction site is essential to understand the coefficients of utilization of the land. Ratio between building surface and free surface plays an important role in the determination of the green. Green spaces play a vital role in the life of eco cities. Surface of the construction site is an important link in determining the total cost of the project. The surface topography plays an important role in determination of cost. According to the table the biggest city is Dong Tang and the smallest is Arcosanti.

- **Transport**

Ecocities another important component of ecological city is transportation. Goal is to reach non carbon system and zero emission in the atmosphere.

Regarding the transport of people Dong Tang City and Masdar City have almost the same philosophy. Masdar exception uses 7% Fuel fossil fuel because he is part of a study incorporated within a city. It cannot totally neglect the rest of it. On the other side, Dong Tang is a satellite town on the outskirts of Shanghai. For instant, Dong Tang uses non-carbon system, pedestrian paths and electrical and hydrogen machine; on the other hand Masdar City uses also non-carbon system, person rapid transport, light rail transport, electric, solar. Globe Town and Tirana has approximately the same philosophy for the transport. Leading role in these cities is the use of personal cars and public transport. Arcosanti uses a different philosophy called bets Conveyer system which was innovative for the time. Chang Chun city uses metro lines, cars, bicycle and pedestrian paths.

- **Water**

Water is precious for everyone; it plays a very vital role also in eco Cities. Use of this philosophy in some countries is vital for example in Masdar City where water is precious. Water in this city will be provided by desalination plants fuelled by solar power. Approximately 80 percent of the water used will be recycled and waste water will be reused "as many times as possible," with this greywater being used for crop irrigation and other purposes. Dong Tang uses approximately half the potential of Masdar city. Water consumption down by 43% water, discharge down by 88%.

In the other hand Arcosanti city has begun some experiments on how to integrate these systems into the current water system.

In Tirana, the capital of Albania, untreated sewage is discharged into the Lana River. So far, the public sewer system does not cover the suburban areas. For per urban as well as rural areas the most important means of sewage disposal are seepage pits. In these facilities the solids are

kept back, while the liquid waste infiltrates into the ground where groundwater is contaminated by nutrients and pathogen. Tirana city needs an immediate project for recycling of water in Lana River.

- **Waste**

Dong Tang City will recover, recycle and reuse 90% of all waste in the city, with eventual aim of becoming a zero waste city. Masdar City will also attempt to reduce waste to zero. Biological waste will be used to create nutrient-rich soil and fertilizer, and some may also be utilized through waste incineration as an additional power source. Industrial waste, such as plastics and metals, will be recycled or re-purposed for other uses. Arcosanti[5] apply the theory that in nature there is no 'waste' from organisms, only nutrients to be used for another organism.

To construct "Applied Eco-Systems", which are not as much a technology as a technique on how use natural, biological, process' to treat sewage and waste-water. In using this technique one balances various flora and fauna in a container, the plants and animals then do what nature has done for millennia, use biological process to turn 'waste' from one organism into nutrients for another.

Living Machines into our existing waste treatment systems and local landscaping. Excluded from this opportunity Globe Town waste is recycled and converted into fuelThanks to a regasifier and there is special asphalt, cement and photo-catalytic paint to combat smog and pollution.

- **Energy**

Energy management is an important factor for a city. Essential is the energy savings with a low cost. For example Dong Tang commit 64% reduction in energy demand with no emissions from energy for power/heat, saves 350,000 tonnes of CO2 per year. Masdar city will employ a variety of renewable power resources. Among the first construction projects will be a 40 to 60 megawatt solar power plant, which will supply power for all other construction activity. Arcosanti uses Energy Apron that is the incline of the topography. The Energy Apron wants to be more than an optimal greenhouse. According to Arcosanti apron of energy' draped around the habitat to which it can deliver energy in three forms: 1. Green food 2.Hot water 3.Warm air

Globe Town uses non passive system of energy; the subsoil is exploited to the maximum through a system for storing ice and water to ensure the houses are cool in the summer while, heat pumps ensure they are warm in winter. Dong Tang and Masdar produce its own energy from wind, solar, bio-fuel and recycled city waste. Photovoltaic modules will be placed on rooftops to provide supplemental solar energy totaling. Globe Town is the city which has delicate position in Siberi and it is obligated to use solar energy as a renewable energy. Full advantage of sunlight buildings made of aluminum, glass and steel.

CONCLUSION

The idea of creating an ecocity is fascinating, yet also very complex. On the one hand, the ecocity vision, which served as a basis for planning the model settlements, contains appealing and very important concepts, such as living in harmony with the environment and maximizing people's quality of life. On the other hand, the vision and the plans, by their very nature, contain some elements which to some may appear utopian. This makes it hard to predict whether and to what extent the plans will be implemented, although an implementation-oriented perspective was an explicit ecocity requirement.

Nevertheless, such visionary ideas and concepts for greater sustainability, the challenges of the zero emission city (in urban development and elsewhere) are needed to provide inspiration and direction for the development of human society. As such, they play an important role in ensuring the healthy, diverse and balanced natural environment that is needed for the long-term survival and thriving of humankind.

Eco city should be spread out throughout the world, today more than ever the presence of CO_2 in the atmosphere, heat islands, waste management, recycling of water, and energy, are serious concerns. The Fossil Fuel Age very quickly is going to an end. We have to prepare ourselves for the worst and for this the best solutions are the eco cities of the future.

Comparison of all these projects, impressive results revealed that these entire architects have a common goal which is the name of eco city, a futuristic city free of pollution where every human been would like to live. Eco city use the natural resources, renewable energy by becoming the vanguard of other cities.

Presently, rapid urban development in Tirana has caused the problem of the lack of green spaces in urban settings. Consequently, the lack of green spaces in urban areas has contributed to the problem and issues related to unsustainable development such as urban pollution, heat island, and erosion .Tirana citizens suffer every day the lack of a plan which should use renewable energies in order to lower the cost of living. Also the aim of this comparative study is an attempt to assess, but perhaps even to improve the lives of the citizens of Tirana.

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