

Biosphere Compatible Cities and Villages: How Can We Turn Them into Reality?

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Abstract

In this review article, an attempt is made to analyze the problem of gradual though accelerating degradation of the environment in the Russian Federation, its reasons and outcomes. The factors aggravating the problem are classified, and their impact is assessed. Intensive industrial development, enormous gas and oil consumption, a huge number of cars and other vehicles in urban and rural areas are among the most substantial factors. The co-authors insist that if the humankind follows this path, it will lead the Earth to the ecological catastrophe. The co-authors also try to find out why the humankind took this path, and conclude that the present-day consumptive treatment of the nature is the outcome of the technology-intensive trend of the western civilization. However this development pattern may be reversed by the green building efforts, including Masdar City designed by Norman Foster in Abu Dhabi, Tianjin municipality in China, and other projects implemented worldwide. Moreover, the co-authors address the research works written by V.I. Vernadsky, a prominent Russian scholar, and developed by V.A. Ilyichev, member of the Russian Academy of Architecture and Construction Sciences, who believes that the rational correlation between the biosphere and the technosphere is a must. The authors believe that the theory developed by V.A. Ilyichev may serve as a means for the reasonable and rational preservation and development of the natural environment.

Keywords: technosphere, anthropogenic load, V.I. Vernadsky, biosphere compatible cities, ecological villages

1. Introduction

Cities and towns are home to over fifty percent of humans. Russia's urban population reaches about 74% of its total population. In 2012, the ecological rating of major Russian cities was compiled; the rating covered 2011 and the first quarter of 2012. The urban population of the cities, covered by the rating, was equal to 55 million people (over one third of Russia's population). (Russian Ministry of Natural Resources' website, 2013)

The rating assessed the cities on the basis of the following seven factors: air environment, water consumption and quality, waste treatment, land use, transportation, power consumption, and environmental impact management. Thus, major Russian cities on the "black list" compiled on the basis of the rating included Moscow, Krasnoyarsk, Irkutsk, Chita, Novokuznetsk, Magnitogorsk, Nizhny Tagil, Ivanovo, Bratsk, Volzhsky, Norilsk, and Yuzhno-Sakhalinsk. "According to the recurrent observations made in 2011, the air pollution level remained high in the RF. 55.1 million people resided in the cities that demonstrated high and very high air pollution levels, and their number was equal to 53% of Russia's urban population. The top-priority list had 27 cities where 16.3 million people resided (in 2010, this list had 36 cities, and in 2009 – 34 cities)." (Eco-rating of the Russian cities, 2013)

Ecological problems have aggravated to a significant extent in several areas of the world due to the rapid industrial development, extension of cities, huge consumption of oil and gas, and an ever growing number of cars. By now, specialists have identified the following groups of ecological problems: (1) condition of forests; (2) degradation of land resources; (3) reduction in the number of flora and fauna species; (4) pollution of water, soil, and air; (5) social diseases as a consequence of ecological problems.

The above-listed grave problems have arisen as a consequence of the intensive development of the urban industry and intensive exploitation of natural resources available on Earth. On the one hand, there is no doubt that the advanced level of technologies generates a favorable setting for the cultural and economic development,

improves the quality of living and provides for a high material standard of living. However, on the other hand, globalization processes accompanied by the evolution of the consumer society aggravate the problems of the technosphere, including the exhaustion of natural resources, aggravation of environmental problems, birth rate decline in technology-intensive areas and intensive population growth on Earth (from 5.7 billion people in 1994 to 7.2 billion people in the early 2014). (Vesti News Channel website, 2014) Therefore, production and consumption figures go up, respectively. Colossal disproportions arise in the field of consumption, as in some areas minimal consumption needs fail to be covered, while other areas live in abundance. The consumer society that emerged in the middle of the 20th century in industrially developed countries makes the notion of “human needs” senseless, according to Jean Baudriillard, a French sociologist, as the consumer society imposes a false (excessive and senseless) consumption pattern on humans. In other words, human needs emerge together with the commodities produced to satisfy them. Jean Baudriillard believes that “any production and consumption, exceeding the needs of severe survival, may be assessed as squander.” (Baudriillard, 1970, p. 69) As “commodities are produced to be eliminated” in a while for new commodities to be produced and for new profits to be generated through their sale, the amount of natural resources recovered and the intensity of the anthropogenic load produced on the natural environment intensify substantially.

In the course of setting the limits to growth, D. Meadows, D. Meadows and J. Randers, authors of the reports submitted to the Roman Club, warned that if the population numbers and the economy went beyond the physical limits of the planet, the only two possible alternatives would include an inevitable catastrophe, or a controlled reduction of the ecological load as a result of the conscious choice made by the society. (Meadows, Randers, & Meadows, 2007, p. 258)

2. Methodology

Why did the humankind take this development path? Why did this predatory exploitation of the Nature begin? Why do we face the global ecological catastrophe? Can we find the way that will value the Nature for the man to feel responsible to the Biosphere? These questions are asked both by researchers and ordinary people who deal with the extraordinary contamination of the environment and have its impact produced on their health.

The methodology, employed in the course of the research that laid the basis for this article, consists in the study of the authentic sources of information, including statistical data, legal acts, resolutions issued by the government authorities, United Nations Environment Program (UNEP) materials, works written by sociologists and philosophers based in different countries, and the co-authors’ analysis of the concept for biosphere compatible cities and villages, developed by V.A. Ilyichev, a Russian scholar. Ilyichev’s concept ties the satisfaction of rational human needs to the sustainable regional (local) development and alteration in the human mindset.

This article represents an overview; it is one of a series of articles written within the framework of the research project serving as the basis for a new master-level module developed within the framework of CENEAST, a Tempus Project entitled “Reformation of the Curricula on Built Environment in the Eastern Neighboring Area.” (Sociological Methods Used for Sustainable Urban Development, Module Specifications).

3. Results

The majority of researchers, our contemporaries, agree that the anthropocentric thinking and the antagonistic treatment of the Nature, that may involve the devolution of the humankind, arose in the course of development of the technology-intensive western civilization.

In his work entitled “The Economic Ethics of the World Religions”, Max Weber, a German sociologist, argues that the economic ethics of any nation maintains its original consistency based on specific geographical and historic peculiarities that distinguish it from the pattern of the human treatment of the world driven by religious or other reasons. However, there is no doubt that one of the determinants of the economic ethics – just one determinant – is the religious dependence of the human behavior. (Weber, 1917, p. 44) Each confession shapes its personal “worldview”, whereby the treatment of the world is based on this or other set of ideas implemented in it. Max Weber identified three types of the world treatment, and each of them is based on its unique mindset and area of human activities: 1) the adjustment to the world, based on the Confucian – Taoist tradition, 2) the escape from the world, based on the Hindu and Buddhist tradition, 3) the mastery of the world, based on the Judaic and Christian tradition. Ethno-religious traditions of the peoples demonstrate varied world treatment patterns: its acceptance is typical for Chinese religions, while its non-acceptance and negation characterize Hindu religions. Some religions accept the world on condition of its improvement and correction: they include Christianity, Islam, and Zoroastrianism. “The attitude of the religious ethics towards politics, power, and

violence depends on the acceptance of the world and the degree of its acceptance,” says P. Gaidenko, a Russian researcher, specializing in the study of Max Weber’s works. (Gaidenko, 1990, p. 35)

Several researchers argue that the arrogant and heavily pragmatic treatment of the Nature is based on the Christian anthropocentric vision of the natural world. The Man is the top creature, as he is made in the image and likeness of God, while the environment exists for his benefit; he can take advantage of the world and the natural wealth provided to him as a gift. However, according to historian Lily White, Judaic and Christian beliefs could have escaped such consequences as the excessive exploitation and destruction of the Nature, but for the occasional close unity of the technology and science.” (Soule & Lease, 1995) Possibly, there would have existed no western type of the technology-intensive and anthropogenic civilization, and no civilization would have triggered the processes of globalization and expansion of western worldview standards eastwards, unless Christian religious views, elements of the ancient culture, and modes of adjustment of a European personality to the world had blended in the points of bifurcation. V.S. Stepin, member of the Russian Academy of Sciences, says: “The technology-intensive civilization originated in Europe approximately in the 14th-16th century, it was preceded by the two mutations of traditional cultures. They are the culture of an ancient polis and the culture of the Christian Middle Ages. The grandiose synthesis of their achievements occurred in the days of Reformation and Enlightenment to generate a nucleus for the system of values underlying the technology-intensive civilization. The technical and technological processes served as the fundamental process of its development.” (Stepin, 2014) Moreover, “the value of innovations and the progress takes a special position in the system of dominating vital essences of the technology-intensive civilization,” and this is something not typical for the traditional eastern culture.

Eastern ethics was different. A passive attitude to the world, omission of any action, and withdrawal – these are the characteristic features of the eastern ethics, including the ethics of relations with the Nature. In the East, the attitude towards the Nature was different; it was value-intensive and meditative. The world perception pattern accepted and stressed the initial beauty of the Nature. The culture is the extension of the natural world; therefore, it must not ruin its harmony. The man must adjust his behavior to the laws of the Nature, he must refrain from interfering into any natural processes; he must adapt to them and act in concordance with them. For example, in Taoism, the insight of the world and the understanding of the essence of being are attained through the communication with the Nature. “Trees gently and tenderly flourish in front of me. A noisy sound of a small stream turns into a water flow. I will skillfully look at the nature represented in a variety of its incarnations, as any creature will find its time and place there, and with all my senses and heart I will understand where I am on my life journey and how it will be interrupted in its end,” this is how the process of meditation was described by Tao Yuanming, a most talented Chinese poet of the 4th century A.D. (Yuanming, 177) Taoism does not request any alteration of the Nature, rather, it teaches humans to practice their sensitive and caring treatment of the Nature; the Nature does not exist to be altered, it exists to be sensed; it exists for the wisdom to be extracted in the process of communication with it.

The concept of the Nature as the “cosmic body of Buddha” originates from China; and it is developed both in China and Japan. “In Zen Buddhism, the sole important item is the “cosmic body of Buddha”, or the Nature, and it serves as the starting point for everything, including the mindset, the life style and behavior, the attitude towards arts and towards the identification of aesthetic criteria. If the exposure to the “cosmic body”, or the Nature, is the sole path to the truth, then all the phenomena of life, including spiritual and material, religious and secular ones, merge into one flow of being, which becomes the synonym of Buddha. Therefore, Zen Buddhism lacks any doctrine of paradise, which is replaced by the doctrine of Enlightenment, or Satori.” (Nikolayeva, 1975)

The cult of beauty, originating from the deification of nature, pre-determined the character of the Chinese and Japanese landscape architecture, interior design, landscape painting, ikebana, and the tea ceremony. Zen gardens, personifying the Universe and serving as the items to be worshipped, have turned into an original model of the world, a concentrated and laconic expression of the Universe. Each item in a garden is secular and symbolic; each dry leaf and each sand particle contain Buddha’s living body, the whole Universe. A small garden area may accommodate the whole immense Nature. Gardens are designated for meditation, and they are to generate various images in our minds. The art of adjusting architectural structures to the natural landscape to avoid any infringement or domination, is manifested in the landscape architecture of China, Korea, and Japan. Traditional wooden Japanese dwellings strive for simplicity, minimalism, and transformation.

The ability to feel the Nature and to see unusual things in the day-to-day life is a typical feature of the aesthetic reasoning in the East. “Wonderful things originate from people themselves.” These words pronounced by Pu Sunling, a Chinese novelist of the 17th century, express the peculiarities of the association-driven perception of

the world, which is typical for the Chinese, the Japanese, and the Koreans, who demonstrate a very good imagination and numerous flashes of intuition. (Pu, p. 22)

Chinese landscape painting, Korean and Japanese landscape painting techniques that have a Chinese origin, transmit the same core idea: the man is an organic part of the Nature and its manifestation. Traditional genres of Chinese and Japanese painting include “mountains and waters” (“sansui”), “flowers and birds” (“katyo”); they poetize the environment, represent the unity of the Nature and the man; the “bird’s eye view” painting technique makes it possible to fit a wide panorama into one canvas and to stress the infinite grandeur of the Nature. Korean artists painted portraits, landscapes, animals and four noble plants: a plum tree, a chrysanthemum, an orchid, and a bamboo tree, as they personified the four virtues.

It would be untrue to say that European paintings neglect the Nature. Masterpieces created by the West-European and Russian painters of the New Time and by our contemporaries reflect the grandeur of the Nature. The works of landscape painters demonstrate their affectionate love for the homeland, the pride and admiration of its beauty. The Nature depicted on their canvases makes in way into the consciousness of viewers, transforms into the symbol of homeland, generates lyrical thoughts or brings a restless warning of the Nature’s fragility and a need for its caring treatment. Nonetheless, European painters neither come near Chinese and Japanese artists in their acute vision of the environment and, nor they are able to elevate the day-to-day reality to aesthetic ideals. The sense of beauty, typical for the Europeans, is neither better, nor worse than the one of the Chinese or the Japanese; it is simply different. Today, if we say that the aesthetic intensity of the Japanese culture is higher than the one of the Europeans, we mean that the Europeans have lost something in their technology-oriented race. Research and business communities take interest in the Nature as a source of new resources needed to produce more commodities. As we have already said, the feature of the consumer society is the human involvement in the never-ending consumption race aimed at the satisfaction of ever growing needs.

However the anthropogenic type of the civilization produces a huge impact on the East and forces it to join the process of the technological upgrade. Japan, China, South Korea and several other countries have entered upon the path of industrial and post-industrial development. As a result, these countries suffer from the same environmental problems as the West. “The top position in terms of sulfur dioxide emissions, acute water shortage in the northern provinces, desert invasion, contamination of rivers, seas, and subterranean waters, continued deforestation, a growing number of people contracting diseases caused by the polluted environment... this list of ecological problems to be resolved by the government of China for the benefit of the country and the world is far from being exhaustive.” (Ananshina, 2014)

4. Discussion

Therefore, the question “how has it all been accomplished?” must be followed by the question “what’s to be done next?”

As the area of research covered in this article is limited to the problems of biosphere compatible cities and villages, let’s see what actions are taken to reduce the ecological load on the Biosphere in the present-day cities worldwide.

Green building technologies are widely spread in Europe and in the USA. Green building, green construction and sustainable building technologies have converted into a regular construction and building operation practice, whose mission is to reduce consumption of power and other material resources and to preserve or improve the quality of buildings and their comfort. The most reputable green building standards include LEED in the USA and BREAM in Great Britain. A discussion of local green standards, that will take account of the climate, landscape, and the lifestyle of residents, is underway in Russia. Principles of the ecologically sustainable design are being introduced into the architectural practice. Norman Foster, a famous British architect, argues: “Our approach to design is similarly guided by a unique sense of place - by the national and the local context; by research and analysis of the climate, culture, and the needs of many different users. The potential to harness nature to provide foliage and shelter, to ventilate or bring light into a building, is equally profound - by working in harmony with the environment, design can help to protect and conserve energy and natural resources.” (Clemence, 2014) Simplicity, ecological friendliness and expediency constitute the main principles of Norman Foster’s projects. They can be considered biosphere compatible. For example, Hearst tower in New York City demonstrates ecological innovations: the rainwater, collected in specialized tanks on its roofs, is used to water the flowers inside; it is also fed into air conditioners, whereas airflows around the building are employed by the ventilation system. Terminal 3 of the Beijing airport, designed by Norman Foster, represents a combination of the ecological approach and historic traditions cherished by the Chinese. The core novelties implemented by the

architect include his passive method of environmental protection. The building roof has sources of light. Their position ensures maximal natural lighting and heat exchange to reduce electric power consumption.

In the early 21st century, architectural designs of ecological cities turned particularly relevant. Norman Foster is the author of a first architectural design of an ecological city, that is, Masdar City in Abu Dhabi, United Arab Emirates. The same actions are taken in China and South Korea. Tianjin, a seaport town located eastward of Beijing, is the first attempt of this kind made in China. About 350 thousands of Chinese are to move to eco-cities before 2025. (Tianjin Eco-city website) Eco-districts and cities are also designed in Korea. New Sondo International Business Center, one of the largest projects worldwide, is being developed there. This future city has absorbed an extensive collection of eco-features. It has a park, a subway line, bicycle lanes, rainwater tanks, and pneumatic waste collection networks. 75% of waste, generated in the course of its construction, is to be processed. This pilot city will serve as a testing platform for new technologies in order to create an advanced living environment and to implement a sophisticated vision of the urban civilization on our planet. (Caprotti, 2014) Gwanggyo City is another sustainable development project in Korea. (Kain, 2008)

However here arises another question. Will these steps help to preserve the atmosphere? The pace of its destruction is a lot faster than the process of development of several eco-friendly sanctuaries scattered worldwide. Now let's address the works of V.I. Vernadsky, a prominent Russian scholar. According to V.I. Vernadsky, the noosphere, created by the man, is the future condition of the biosphere, the outcome of the scientific thought which is capable of reengineering the biosphere into the noosphere. It is possible? "Even if the human mind spies into the secrets of the biosphere and compels any the processes, that are underway in it, to the human will (which is hardly possible), the future of humans remains uncertain. The main and yet unexplained issue is whether this process will cause the unlimited rule of one species over the inexhaustible variety of the fauna and whether the biosphere will be able to evolve against the background of absolute anthropocentrism?... The main alternative is that the biosphere must be preserved rather than transformed. The man cannot and must not interfere with the processes of natural evolution in the biosphere which are beyond the reach of his consciousness." (Osipov, 2004, pp. 998-1005)

V.I. Vernadsky offers a list of specific conditions to be met for the noosphere to be generated: "The problems of food and production must be reconsidered. Thereafter, the revolution of social principles, that control the public opinion, will follow." (Vernadsky, 1925/1993)

The main principles, developed by V.I. Vernadsky, include (1) the equality of all races and confessions, (2) the freedom of the scientific thought and scientific research from any pressure produced by religious, philosophical, and political constructs; development of the background promoting the freedom of the scientific thought within the framework of the social structure and political system; (4) higher welfare of the working people. As for the biosphere, V.I. Vernadsky suggests a reasonable transformation of the Earth's initial nature, so that it could be able to satisfy all material, aesthetic, and spiritual needs of the population that keeps growing in its number.

V.A. Ilyichev, a Russian scholar and member of the Russian Academy of Architectural and Construction Sciences, develops V.I. Vernadsky's core ideas into specific actions aimed at the improvement of existing development patterns. He is sure that the rational correlation between the Biosphere and the Technosphere and its symbiosis require the calculation of humanistic regional balances between the population numbers, areas designated for the satisfaction of human needs (the technosphere), and the Biosphere's life potential, or the Humanitarian Balances of the Bio-technosphere.

"The Humanitarian Balance of the Bio-technosphere represents a system of equations that sets quantitative normative correlations between:

- (a) the Biosphere's life potential, the population, and the number of areas designated for the satisfaction of human needs in the regions,
- (b) the need of the humans and the technosphere for the resources of the Biosphere and the ability of the Biosphere to satisfy them in specific regions." (Ilyichev, 2011, p. 152)

5. Conclusion

Presently, leading researchers, public leaders, and governments take steps to make a change. However, any steps must be comprehensive, so that they could tackle specific problems, be applicable to small territories and particular technologies, on the one hand, and reengineer the public consciousness, values and objectives, primarily, in the business environment and in the government agencies, on the other hand.

We believe that the concept of biosphere compatible cities and villages, developed by V.A. Ilyichev, is a pioneering innovation. V.A. Ilyichev developed an integrated and systemic approach to tackling most relevant

problems. His team developed “the principles of biosphere compatible urban planning, based on the indicators of efficiency, setting the priorities and the hierarchy of notions, identifying the bottle necks in urban life patterns, employed as an instrument for the analysis of symbiotic relations between the city and the natural environment, and implementing a quantitative assessment of the opportunities provided by the city in terms of the personal development of its residents.” (Ilyichev, Emelyanov et al., 2014, p. 72)

V.A. Ilyichev thinks that there is a need for a new, completely different pattern of civilization-related development on the planet. The apprehension by the new civilization of the values typical for the eastern ecological aesthetics and ethics, self-education practices, in combination with the positive features of the western economic ethics, including reasonable rationality and pragmatism, could open up new horizons for the humankind.

The program of biosphere compatible villages, developed by V.A. Ilyichev, is being implemented in several Russian regions. In particular, it serves as the basis for the concept of urban development in Orel.

Practical actions, developed by V.A. Ilyichev and consolidated into a unified methodology, are to convert cities and villages into biosphere-compatible ones. The actions contemplate the elimination of inorganic/organic waste landfills and filtration fields. Waste-conversion units, designed by the Institute of Physical Chemistry based in Chernogolovka, Moscow region, Russia, are capable of converting solid organic waste into gaseous products, including methane and CO, through the application of the burn method. These gases may be applied to produce energy or be used as fuel additives designated for thermal power plants. Vast areas, cleaned as a result of the above procedure, may accommodate residential housing buildings, shopping malls or leisure centers; alternatively, they may be returned to the Nature. This methodology offers a triple benefit: the operator of the waste-conversion unit is paid for collecting waste, any gas generated by the unit raises cash; moreover, any burned soil sells as the road-building material. Sewage effluents shall not be discharged into filtration fields. They may be fed into organic waste treatment plants that will generate pure water. Towns and villages located in the close proximity to coal mines may consume coal waste, including coal slam and rash, to produce power. An advanced wooden housing industry may be launched on the basis of the power generated by wood waste. Raw wood is often exported from Russia due to the high cost of electric power. This action may reduce the exportation of raw wood, generate workplaces in the wooden housing construction industry, provide households with cheap, ecological and comfortable houses and improve the ecological environment. The manufacturing of slam-based Portland cement and fillers will improve the strength and reduce the weight of cement-based construction materials. Thus, the pressure produced on the soil, seismic loads, and transportation expenses go down, while insulation capabilities and fire resistance of the housing go up. Besides, any new buildings, that have four stories and less, may reduce power consumption three-fold through the application of local sources of power. These actions may be financially expedient and feasible if applied as a consolidated program; they are insensitive to the economic environment (inflation, crises, etc.), as they operate as a combination of resources (know-hows, patents, raw materials, machines, financial means, land plots, etc.). The application of the above actions will cause partnership relations to be generated, corruption to be eliminated, and the natural environment to be improved.

The co-authors of this article also cooperate with V.A. Ilyichev and his team in the development and implementation of socio-humanistic constituents of his program. The contribution made by the co-authors into V.A. Ilyichev’s program, include their articles, organization of science conferences, performance of sociological surveys, and implementation of specific actions aimed at environmental protection. Sociological surveys were conducted in Kovcheg eco-village in the Kaluga region, Slavnoye eco-village in the Tula region, and Raduzhnoye eco-village in the Ryazan region. The surveys served as the basis for several research articles and a PhD thesis. The co-authors find it impossible to present the findings of these sociological surveys in this article. They will be presented in further articles covering the problems of biosphere compatible villages.

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