

## **Ecopolis – search for sustainable cities in Russia**

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### **Abstract**

“Ecopolis” is an interdisciplinary program established in 1979 at Moscow State University (Russia). The main goal of this program was to understand what a sustainable city is and to find ways to harmonize the relationships between man and nature. The scientific foundation of Ecopolis was a concept of the coherent evolution of the biosphere and humankind in terms of dynamics and the concept of noosphere (Vladimir Vernadsky).

The town of Pushchino (Moscow Region, 20,000 population), the Scientific Center of Biological Research of the USSR Academy of Sciences was chosen as a case study. Scientists and graduate students from Moscow State University and many other Moscow institutions worked very closely with local community and city administration. A wide range of specialists from ecologists, biologists, sociologists, psychologists, teachers and doctors, to artists and journalists were involved in theoretical investigations and practical experiments.

The practical output of this program was impressive, including nature conservation through a network of wildlife reserves within the city and the nearby suburbs and halting the operation of ecologically unfriendly passenger ships on the river Oka. Recommendations to improve the town’s waste-treatment plant were considered and special ecological educational programs in schools were successfully introduced. A visible positive change in the urban environment with a wide participation of the people of Pushchino was the most significant achievement of the Ecopolis program. Ecopolis was one of the first holistic eco-sociological programs around the world that introduced the concept of ecologically sustainable cities. Because of many years of political isolation, the ideas of Russian Ecopolis were not widely known in Western countries. “Ecopolis” ideas have been very influential in Russia during the last 20 years.

## **1 Initiation of “Ecopolis” Program at Moscow State University**

At the end of the 1970’s Russia as well as many other countries around the world experienced rapid urbanization and connected with it a whole range of environmental problems such as air and water pollution and degradation of natural ecosystems. For many years, Moscow State University led in the search for nature conservation programs. There was the Student Brigade of Nature Conservation, a series of complex practical field works around the Moscow region and other parts of Russia. Scientists from Moscow State have been actively involved into the Working Group of the UNESCO program “Man and the Biosphere.” Biology Faculty of Moscow State University had many years of connection with the town Pushchino—a center of biological research of the Russian Academy of Sciences. Pushchino hosted numerous summer field trips, conferences, and workshops. When the Laboratory of Ecology and Nature Protection at Moscow State University started a new innovative holistic program “Ecopolis” in 1979, the administration of Pushchino suggested using their town as a case study.

In Russia, socialism was the main political and ideological doctrine in the end of 1970’s. Ecopolis with its vision of nature/human relationships fitted perfectly into this ideology. “Socialism furnishes a foundation for promoting harmonized relationships between man and biosphere; yet, these relationships do not form spontaneously, and purposeful efforts are needed for them to occur” [1]. Actually, Ecopolis demonstrated a very progressive, innovative, and humanistic vision of future cities and the search for principles of sustainable cities.

Professor Kavtaradze, an ecologist from Moscow State University and Professor A. Brudny, philosopher and social psychologist, incorporating Vladimir Vernadsky’s theory of noosphere, developed the scientific concept of the program in 1981 [2]. Vladimir Vernadsky wrote: “People are children of the Earth, virtually, of the biosphere, the share of their life and death. Human activity reforms the biosphere to such an extent that everlasting natural relationships in the latter change and planetary regimes are deranged or even replaced by new ones.... Under the influence of intellect and human labor biosphere changes into a new state-noosphere. In noosphere, man for the first time becomes a mighty geological force. He can and must reconstruct his share of life with the help of his labor and intellect.” [3]. The “Ecopolis” concept is based on the idea of a coherent evolution of the biosphere and mankind in terms of dynamics. “Ecopolis” used the principle of constructive ecology that aims to help man manage natural environments as a tool for the coherent evolution of nature and society towards the noosphere. One of the “Ecopolis” goals was to search for a new type of settlement, while ensuring coherent development between the biosphere and process of urbanization. One of the very important features of this new concept was “a maximum use of the advantages of the developed socialist system, interdisciplinary use of imitation models, priority of constrictive and ecological factors, receiving food production from urban areas, availability of wildlife reserves in urbanized landscapes and

accordance of urban environment to biological and socio-psychological needs of humans" [2]. In other words, the aim of "Ecopolis" was to create an optimal ecological and socio-psychological urban environment and to combine this objective with nature protection in urban areas.

Such an ambitious and big problem needed the efforts of many people. "Ecopolis" introduced an interdisciplinary approach: biologists, sociologists, architects, planners, teachers, physicians, economists, and engineers from different research institutions on the one hand and the community and the town administration on the other were involved. Both Moscow State University and the Town of Pushchino benefited from such cooperation. First of all the nature protectionists realized that without investigating the urban environment it was impossible to find an effective solution for nature conservation. Practically all global and regional problems of nature conservation have one common source—urbanization [4]. Many students and faculty (at least 150 people from Moscow State University and another 22 institutes) received a unique opportunity to work in the Ecopolis program. The Town of Pushchino had access to scientific expertise that was used as a foundation for practical decisions by the local administration.

## **2 Pushchino town as ideal city and case study for the "Ecopolis" program**

Pushchino (population of 20,000) was founded in 1963 as the special Scientific Center of Biological Research of the USSR Academy of Sciences. The idea was to create a special 'ideal' town with clean and green environments that encouraged Soviet scientists to work creatively and productively. There are six research institutes at present: Institute of Albumen, Institute of Biological Physics, Institute of Biochemistry, and Microorganisms, Institute of Photosynthesis, Institute of Agrochemistry and Soil Sciences and Scientific Computer Center. There is also the Constructor Bureau of Biological Apparatus, Radio Astronomy Station and a branch of the biology faculty of Moscow State University. As can be seen from the above, all institutes have a biological profile.

The town of Pushchino is situated on the bank of the river Oka about 120 kilometers south of Moscow. The surrounding landscapes are very old and have historical and natural value. Teschilovskoe Gorodize—archeological monument of ancient Russian town (12-16 centuries) is situated on Pushchino's boundary as well as Pushchino usadba (homestead) with park (monument of landscape architecture of 18-19 century). Prioksko- Terrasny Biosphere Reserve (area 4945 hectares) is located on the opposite bank of the Oka River. Pushchino has a unique visual esthetical connection with this reserve. From residential houses, parks and recreational zones the huge green "sea" of conifer and deciduous forests is especially spectacular.

The Pushchino urban design conception was very innovative and scientifically based at that time. Compared to old cities new scientific towns were built on open areas and close to natural ecosystems. Soviet scientific towns

were planned as “towns of new type, which are close to modern and future urban planning ideal” [5]. The task of “right” organization of scientific spirit and productive work of scientists demanded a specific functional scheme of zoning structure of the city. There was a special urban planning firm under the patronage of the USSR Academy of Sciences that specialized a planning and design of such scientific centers. This classical scientific town consisted of the following zones: institute (working), residential (living), social, and administration center, zone of recreation and sport, and supply zone (power station, warehouses etc.).

Pushchino was founded on abandoned agricultural lands surrounded by natural forests, meadows, and riverbank plant communities. One of the essential ideas of the planning structure was the principle of maximum protection and positive use of surrounding landscapes (inspiration for scientists!). There are at least 5 local reserves within the city and 15 in the nearby surroundings [6]. Not too many towns around the world have such unique opportunities –to be so close to nature. For example, residents can gather wild strawberries or enjoy the blossom of unique floodplain meadows in just 5 minutes walk from their flats! (Figure 1)

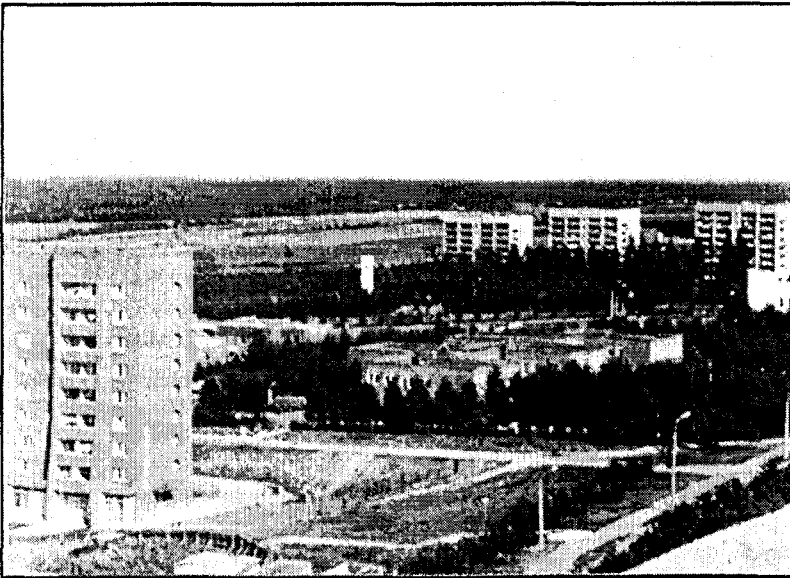


Figure 1: Pushchino: meadows and forests next to the residential zone.

Pushchino has a linear type of planning structure, which can be characterized by the parallel design of the residential and institute zone divided by a broad pedestrian esplanade-boulevard-green zone. The Green Zone is the compositional axis of the town (Figure 2).

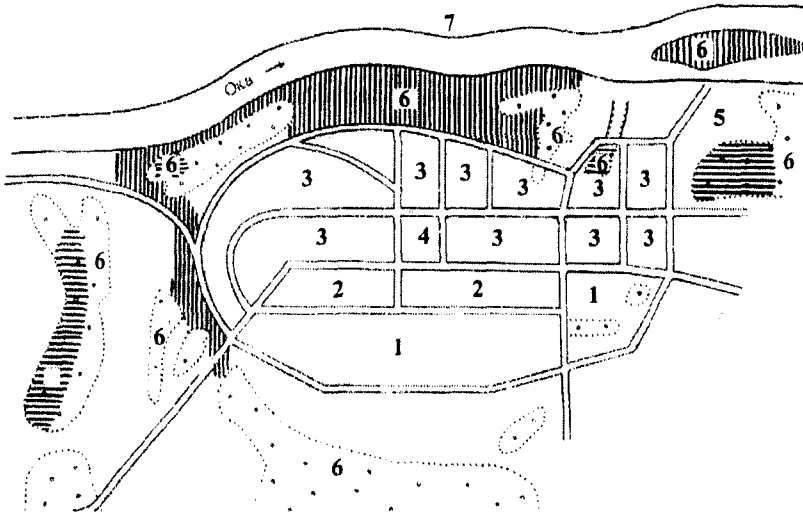


Figure 2: Scheme of Pushchino and nearby suburbs

1. Zone of Institutes
2. Green zone-boulevard
3. Residential zone
4. Administration
5. Supply zone
6. Zone of recreation (reserves and natural forests)
7. Prioksko-Terrasny Biosphere Reserve

It consists of five groves (birch, pine, oak, larch, and lime) and plays a windbreak role. This zone has visual connection with surrounding natural forests. There are no industries in the town (except power and a heating center), nor railways or airports.

Unfortunately, the landscape architecture scheme suggested in the 1960's for Pushchino was not realized. It was a very new and innovative plan of creating a united system of green areas with identity for the town in general and for each zone and strongly connected with surrounding native landscapes. For example, this plan suggested the principle of deontological accents where each residential district (named in Pushchino "АБ," "В," Г "D") has dominated woody native plants (birch, oak, and lime) and actively use the remnants of native plant communities along the ravines). The structure of landscape compositions was supposed to be informal and consist of mostly native plants.

### 3 Research in "Ecopolis"

The "Ecopolis" program was carried out for 18 years (1978-1996). Broad investigations of different aspects of urban ecosystems were completed):

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- flora and fauna (and their monitoring),
- soils,
- geology of Pushchino and its natural surroundings,
- design and planning,
- social aspects of urban life,
- the impact of water and automobile transport on nature,
- pesticide circulation within urban ecosystems,
- peculiarities of the ecology of cats and dogs in town conditions,
- the impact of summer and winter recreation, the opinions of Pushchino residents on nature conservation and others.
- interactive methods in education.

Based on floristic and ecological investigations the principles of ecological design were elaborated. One of the main criteria of sustainable plant communities would be biodiverse, rich, and complex in composition and structure plant communities- urbanophytocenoses that could exist under high level of anthropogenic pressure and meet the requirements of environmental, aesthetic, and social functions. There were a series of experiments with native woody and herbaceous species for wide introduction in landscape architecture. In the Pushchino, landscape design only 51 (5.6% from all species) native plants were used for green areas. However, more than 98 species of natives were recommended for wide planting in parks, gardens, and residential areas [7]. The conception of “plant signatures”- the wide use of native plant community images and their composition and structure that was introduced for Pushchino is similar to the New Zealand “plant signature’ concept [8]. In Pushchino, only landscape compositions based mainly on native species can effectively be linked with natural landscapes visually and ecologically.

Sustainable development of urban plant communities was seen also in systematic ecologically based management at the moment of their creation and during the next few decades. An understanding of time (changing through time) in urban plant communities is one of the important feature of “Ecopolis” researching sustainable ecological design.

Each research investigation of the “Ecopolis” program was arranged as a tool to educate the townspeople, managers, and local authorities. The local community was actively involved in the program. People participated in conferences, excursions, lectures, and discussion of Pushchino themes, film showings, and simulation games.

## **4 Practical output of “Ecopolis”**

The practical implementation of the “Ecopolis” program was unprecedented:

- a special decision concerning nature conservation was adopted at the session of the Executive Council of People’s Deputies
- a network of ten protected natural areas/reserves was set up within the town boundaries;

- The tasks of environmental education (both school and out-of-school) and relevant training of adults were defined (The Children's ecological club 'Good-will, Ecology city, Cooperation' was established [9]; Ecological programs in secondary and high schools were developed. Children worked in hydro meteorological, geological, soil, wildlife, botany, entomology, and ecological technology labs and participated in many field trips, conferences, and publications. Later the Laboratory of Nature Optimization and as a part of it the Educational Ecological Center arose from this station. Many teachers, primary, middle and high school students from Russia, USA, Great Britain and Germany studied in the Center [10]
- A program of Subbotniks (days of voluntary work without pay) was formed;
- Measures were taken to improve the operation of the town's waste-treatment plant "Zarya", a passenger ship was found to produce damaging waves on a lowland of the Oka river resulting in the death of many young fish. Because of joint efforts of scientists and townspeople, a decision was made to stop the operation of this type of ship on the river.
- The special Ecopolis laboratory staffed by Moscow State University and Pushchino community was opened in 1985.
- A series of instructional and methodological brochures were published: "Psychological aspects of establishing contacts between individuals", "Nature Reserves near the town of Pushchino", "Walking Routes in the Environments of Pushchino", "Methods of Registering Animal Fatalities in Road Accidents", "The Children's Ecological Station", "Ecological Education in the Raduga (Rainbow) Family Club".

A visible positive change in the urban environment with a wide participation of the people was the most significant practical output of the Ecopolis Program.

The latest phase of Ecopolis program was the shift from theoretical and field investigations to principles and methods of Ecopolis design. The experimental workshop of artist Rosenblyum helped to create artistic images of city-Ecopolis. Finally, it was possible to talk about the chain: "from scientific conception to field works, from research to artistic image. From image to the project" [4].

Through conferences, publications and television programs the Ecopolis program became famous in Russia. The small town of Kosino (also not far from Moscow) and later the city of Vologda adopted the main concepts of Ecopolis and especially the framework of the coherent development of nature and society and a holistic approach to the research of urban ecology. The idea of Ecopolis as "ecology of small town," was continued in Kosino and Vologda and was an excellent case study for "the ecology of middle size city" [11]. The idea of city-ecopolis as an opportunity for sustainable design of big cities also started to be quite popular among Russian ecologists (Ulyanovsk, small and big cities in Siberia for example).

In November 2000 the 3rd International Conference "Ecopolis-2000: problems of urban ecology and sustainable urban development" was held at Moscow State University and highlighted again life-history backgrounds and problems of urban ecology, socio-cultural features of the urban settlements, public participation in the forming "of green measures" in policy in urban

developments of policy making and how to educate townspeople in the field of nature conservation in cities and towns (biodiversity, habitats and landscapes).

## 5 Lessons of “Ecopolis” program

Ecopolis had suggested a program of analyzing a concrete modern city and attempted to answer the question ‘what is sustainable city’ and how we can understand and change the paradox “nature and society” in the urban environment. Using Pushchino and other case studies it is possible to talk about the principles of sustainable design in which the urban environment would be optimal from ecological and socio-psychological points of view. The practical experiences of running Ecopolis program also clearly demonstrated the difficulties of practical realizing new, innovative research in the urban environment.

Every city needs to have an ideal model (Ecopolis for example) for future development. If people will have no images, ideas, or debates about their future desirable city, it will be impossible to develop the quality of urban life. Ecopolis is “relationships between people and with nature”. Cities are the most complex object for research and they need the efforts not only of scientists but also of citizens and politicians. Ecological education is a very powerful and effective tool.

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