

EFFECT OF THE CREATION OF A COMFORTABLE URBAN ENVIRONMENT FOR THE ACCUMULATION OF POPULATION — OSAKA CITY AS A CASE STUDY

I. Wakai

Sangyo University, Osaka (Japan)
Moscow State Regional University, Mytishchi, Russia

Влияние создания комфортной городской среды на рост населения — пример города Осака

И. Вакай

Университет Сандзю, Осака (Япония)
Московский государственный областной университет, Мытищи, Россия

Modern cities, having suffered from the bitter experience of pollution which caused population outflow over many years, began to create comfortable urban environments in order to encourage the settlement of people, which serves as the source of urban vitality. This study clarified the effectiveness toward this end in order to verify both quantitatively and qualitatively the achievement resulting from the creation of a comfortable urban environment in the case of Osaka city, by introducing environmental indicators. It thereby demonstrated that populations have been re-accumulated at the center of modern cities, which have become more convenient and comfortable.

Keywords: Comfortable urban environment, environmental indicators, accumulation of population.

Современные города, страдая последствий многолетнего загрязнения, вызывавшего отток населения на протяжении многих лет, начали создавать удобные городские условия для поощрения поселения людей, которые служат источником городской жизнеспособности. В этом исследовании была разъяснена эффективность в этом направлении, с тем, чтобы проверить как количественно, так и качественно роль создания комфортной городской среды в случае города Осака, путем введения и контроля экологических показателей оценки городской среды. Продемонстрировалось, что население возродилось в центре современных городов, которые стали более комфортными и экологически безопасными.

Ключевые слова: комфортная городская среда, экологические индикаторы, рост населения.

Basic Resources of the Global Environment

Since ancient times, the global environment has been comprised of four elements; the three elements of air, water and soil, plus sunlight from outer space. Based on these four elements, living organisms capable of photosynthesis were generated, and advanced their phyletic speciation over centuries, before the global environment reached its present state comprised of diverse organisms. Humans are one such living organism and nothing more, however, what largely separates us from other animals and plants is the fact that we acquired an intellectual activity, the source of great thinking. As a result, humans have systematically advanced science and technology through creation of the tools necessary for their living and production [1, 2]. Furthermore, during the course of the dramatic development of science and technology, humankind has raised agrarian, industrial and communications revolutions, while extending them from villages to cities, thereby building today's civilized society.

However, although we have greatly benefited from the resulting convenience of civilization, we have at the same time lost or are about to lose the irreplaceable and diverse blessings of nature. This is what we call the global or urban environmental issues, which are indeed in a critical situation. Among them are the examples which most significantly demonstrate the deprivation of nature in cities that have undergone artificial changes and reform. Despite this, a large number of people reside and work in cities where various sophisticated urban functions are concentrated [3]. The main reasons lie not only in the convenience but also the fact that comfort of the living environment has been enhanced with an improved natural environment in cities. As a result, such greater convenience in the urban environment now not only controls the population outflow from cities but also encourages migration from suburban areas to city centers.

This study, selecting Osaka city, which suffered from the bitter experience of pollution, aimed to empiri-

cally clarify that the city's population, once in decline turned to an increasing trend again, as its natural environment began to show a quantitative and qualitative improvement while recovering its aim to be a Human Environmental City.

Representation of a Comfortable Urban Environment by Environmental Indicators

In cities built following changes and reforms of their natural environment, many people have resided and worked in them while benefitting from the convenience of living and various activities, despite fewer natural elements. However, as society became more mature, citizens' values changed and their focus has shifted from material sufficiency to emotional satisfaction. Against the background of such changes in human consciousness, it is now required to provide a diverse and abundant natural environment in cities, not only convenient transportation and communication systems, and highly advanced urban functions in the areas of commerce and human interchanges. That is to say, a comfortable urban environment is necessary for today's cities. In response, quantitative and qualitative expansion and improvement of natural environmental elements remaining in cities, represented by air, water and greenery are carried out while focusing on the creation of a comfortable living and working space.

In order to create a comfortable urban environment, a substantial amount of investment is required, while at the same time one has to demonstrate its benefit. The use of environmental indicators is one of the methods to verify such return on investment [4, 5]. Originating from the social indicator, the environmental indicator is now utilized to understand and predict the present and future status of the environment including nature and living. Today the concept of indicators has spread

throughout various fields such as medicine and welfare, in addition to the environmental field, where effective indicators have been developed [6, 7].

Therefore this study also attempted to apply environmental indicators to the creation of a comfortable urban environment.

Application of Environmental Indicators for Creation of a Comfortable Urban Environment

As environmental indicators were applied, this study selected Osaka City as a case study and verified the effectiveness of such indicators, while clarifying accumulation of the urban population resulting from the creation of a comfortable urban environment.

As mentioned above, natural elements remaining in cities are air, water and greenery, and the environmental indicators which represent these elements were considered as follows. As for air, focusing on its quality, carbon dioxide was chosen as a major environmental indicator, which is generated from domestic and production activities, and the combustion of automotive fuel. As for water, again focusing on its quality, biological oxygen demand (BOD) was chosen as a major environmental indicator which measures the natural purifying power of sewage, likewise resulting from the use by domestic and production activities. Regarding water, the presence of which mitigates human mental stress and river water surfaces as its extension were also chosen as an environmental indicator. As for greenery, parks and other green spaces were chosen as a representative environmental indicator, focusing on green spaces in consideration that such urban spaces provide relaxation and peace.

Table 1 shows the results of application based on these concepts and the introduction of representative environmental indicators to Osaka City. In order to clear-

Table 1. Representative environmental indicators for a comfortable urban environment in Osaka City

		Year	1996	2006	2016
Air quality	NO ₂ (ppm)	Ambient Air Pollution	0.036	0.027	0.019
		Monitoring Station			
		Compared to 1996	100	75	53
		Roadside Air Pollution	0.048	0.034	0.025
Water quality	BOD (mg/L)	Monitoring Station			
		Compared to 1996	100	71	52
		Rivers in the city	2.9	1.9	1.0
		Compared to 1996	100	66	34
Water area	River surface (100 m ²)	Citywide	185,541	195,681	196,285
		Compared to 1996	100	105	106
Green space	Parks/Green areas (100 m ²)	Citywide	120,014	120,167	119,495
		Compared to 1996	100	100	96
Remarks			Water quality: surveyed in 1997 Water area/ Greenspace: surveyed in 2000	Water quality/ Water area/ Green space: surveyed in 2007	Green space: surveyed in 2013

Note 1: Prepared by the author based on Osaka City Statistics Report.

Note 2: Air and water quality measurements are the average of all measured points.

Note 3: ppm: parts per million.

ly show changes in the urban environment, each indicator was selected at three periods with intervals of ten years and compared with the base year. The table revealed the following:

In Osaka City, air quality has improved significantly with the pollution level being reduced by half in 2016, compared with that of 1996, a period of just 20 years. As for water quality, it has improved dramatically with the pollution level being reduced to one third over the same 20 years. The water area has increased slightly, despite the constraint on urban space resulting from development. On the contrary however, the green spaces have decreased slightly, which is likely due to the exploitation of urban space.

Viewing changes in the urban environment in the case of Osaka City from the perspective of the movement of environmental indicators, the city's effort to create a comfortable urban environment aiming to restore humanity appears to be gradually bearing fruit.

Effect of the Creation of a Comfortable Urban Environment for the Accumulation of Population

It was demonstrated that the outcome of the creation of a comfortable urban environment, although not necessarily sufficient, can be represented by the use of representative environmental indicators. Now, it is necessary to establish the effectiveness of the creation of a comfortable urban environment. This section demonstrates the effect as seen in the accumulation of population in the city. To this end, the population change in Osaka City was examined at three periods with intervals of ten years as in the case of environmental indicators, the results of which are as shown in Table 2. It shows that the total population of Osaka City has increased slightly in 2016 compared with 1996, a period of just 20 years. However, when looking at the central three wards; Kita-ku, Chuo-ku and Nishi-ku, the population increased greatly by 1.25 times in 2006 and 1.60 times in 2016 compared with 1996. This is due to the effect of the creation of a comfortable urban environment in its entirety as demonstrated by the before mentioned movements of environmental indicators, in addition to the improved convenience in urban living and

Table 2. Population shift in Osaka City (Unit: person)

Year	1996	2006	2016
Kita-ku	86,371	102,811	125,983
Chuo-ku	53,127	69,285	95,457
Nishi-ku	59,058	75,017	95,522
Total of above three central wards	198,556	247,113	316,962
Compared with 1996	100	125	160
Osaka City	2,600,058	2,634,944	2,702,033
Compared with 1996	100	102	104

Note: Prepared by the author based on Osaka City Statistics Report.

working as well as transportation. The development of a comfortable urban environment advanced particularly in the three central wards, which encouraged a thriving population inflow from other districts within the city or its suburbs.

Thus the creation of a comfortable urban environment in big cities brings about an effect concerning the accumulation of populations.

Future Tasks

This study demonstrated the validity of environmental indicators as a reference which shows the development of the creation of a comfortable urban environment. It also revealed that such creation contributes to the accumulation of populations in cities.

However, the number of selectable environmental indicators is limited and not sufficient. Therefore it is essential to further study and clarify the level of soundness as well as the necessary amount for cities, of air, water, soil and greenery which are fundamental elements of the Earth and impact on all living organisms including humans. It is especially vital to explore the concept and methods concerning selection of environmental indicators, from the viewpoint of biological diversity and symbiosis between humans and living organisms in cities. Furthermore, in terms of the effects brought by the creation of the so-called Human Environment City, that is to say comfortable urban environment, it is necessary to clarify, not only the accumulation of populations, but also aspects of human health and well-being.

Литература

1. Wakai I. Effect of Creating Environmental Value by Development/Regeneration of Sound Waterfronts in Major Cities: Osaka City as a Case Study, *Policy Science*. 2018; 25 (3): 183—196.
2. Wakai I. A Comparative Study of Waterfront Use as Ecosystem Services in Saint-Petersburg and Osaka, *Architecture and Engineering*. 2016; 1(1): 71—78.
3. Wakai I. Impact on Land Value of Waterscape as Part of Ecosystem Services, *Herald of the International Academy of Science (Russian Section)*. 2017; 1: 39—42.
4. Bauer P.A. *Social Indicators*. The MIT Press, Cambridge, USA. 1986.
5. Organisation for Economic Co-operation and Development, OECD. *OECD Environmental Indicators; Towards Sustainable Development, Millennium Ecosystem Assessment, Ecosystems and Human Well-Being: Synthesis*, World Resources Institute, 2005
6. Naito M., Nishioka S. & Harashina S. (Corresponding authors). Japan Association for Planning Administration (ed.) *Kankyo Shihyo (Environmental indicators)*. Keikakugyosei-sosho 2, Gakuyo Shobo. 1986.
7. Naito M. & Morita T. Japan Association for Planning Administration (ed.) *Kankyo Shihyo no Tenkai-Kankyo Keikaku eno Jirei- (Development of environmental indicators—application examples to environmental planning)*. Keikakugyosei-sosho 8, Gakuyo Shobo.1995.

Сведения об авторе:

Икуджиро Вакай — доктор наук, профессор Университета Санджю, Осака (Япония)
гость-профессор Московского государственного областного университета