

# **DEVELOPMENT PLANNING: PANGAEA-GAMING SIMULATION EXERCISE FOR TRAINING IN SUSTAINABLE REGIONAL DEVELOPMENT**

## **Hideki KAJI**

*Professor of Faculty of Policy Management, Keio University, Fujisawa, Kanagawa, Japan*

## **Yasunori MINAGAWA**

*Coordinator of Planning Technology Development Office, United Nations Centre for Regional Development (UNCRD), Nagoya, Japan*

## **Hidehiko KANEGAE**

*Assistant Professor, Department of Social Engineering, Tokyo Institute of Technology, Tokyo, Japan*

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## Summary

PANGAEA is a game of virtually experiencing regional development planning for "sustainable development", using methods of role playing or *gaming* through the planning process and *computer simulation* which enables the players to see the future changes brought out by their own planning as if they were there at the planning term's end. In PANGAEA, the regional development plan is implemented by selecting and investing the best mix of development projects with the budget made available by negotiation.

The analysis, decision-making and negotiation parts of the gaming always have to be done manually and face to face. Citizens' Assemblies and other activities by the citizens' groups are performed in the conventional fashion, not on the Web pages, although they can monitor and assist their governments' activities on line. Analysis on the simulation output and performance evaluation, other than that of the target achievement rating by the system, are also done by fully using the players' group dynamics. And the players are encouraged to derive their own creative devices in managing the planning process in order to achieve more sustainable development in their country "Pangaea." PANGAEA is flexible enough to leave a lot of room for the players' creativity and genius to make the gaming more meaningful and enjoyable for them.

Since PANGAEA system's user interface is designed to lessen the players' work load of simple and repetitive types, such as referencing of data and calculation in formulating budget and investment plan proposals, a good part of the necessary information retrieval as well as the players gaming is available on screen in Web pages, including a variety of forms to be used in the respective steps of planning process. The user friendly interface

by Web pages, also enables players' easy navigation through the detailed steps of gaming, where to start and how they proceed the planning phases until they can finalize the project investment plan reflecting their policy implementation, without

## **1. General Features of Pangaea**

### **1.1 How PANGAEA was born**

For the past ten some years, UNCRD has been conducted a microcomputer-based regional planning exercise as an integral part of UNCRD's International Training Course in Regional Development Planning. This exercise has both *gaming* and *computer simulation* components on policy formation for regional development. It serves well as an instrument to increase trainees' interest and motivation, a laboratory for applying and testing their acquired knowledge and skills, a virtual model for facilitating comprehension of world realities, as well as chances to get insights into the decision makers' predicament. The first gaming simulation exercise which UNCRD developed in 1984 is called "REPLEX," signifying "REgional PLanning EXercise."

The Earth Summit shed light on sustainability in development more than ever before. Sensitive to the newly emerging concepts and practices of regional development as well as responsive to the felt needs of developing countries reflecting the drastically changing circumstances in the 1990's, UNCRD started to develop a new gaming and simulation exercise for regional planning focusing "*sustainable regional development*" in 1995. The new game is designed for a nation building of a young virtual island-country "Pangaea," to be located somewhere in Asia and the Pacific Region. The country's name, "Pangaea" comes from the supercontinent which is believed to have existed on the Earth more than 200 million years ago before breaking up into the current seven continents of the world. The underlying intention of the game's naming was that the players are expected to perform as if they are developing their country not merely as one of the countries on the earth but as a prototype of the human habitat, the Earth itself. Thus, the virtual country for this gaming simulation is called "Pangaea," the land on the Earth.

As in the case of REPLEX, this new game PANGAEA enables participants to improve their behavioral skills such as negotiation and coordination, understand the complexity of the planning process, and formulate plans in rational manners supported by micro-computers. The participants also take part in role playing and gaming. In addition, the advancement of PANGAEA can be described as follows; (a) It is based on a sustainability oriented simulation model, reflecting the tradeoff between development and environment, in total capacity of the nature, efficiency in resources conservation, spatial distribution and pace of development. (b) It has three alternatives in the institutional setup for planning, namely, centralized-sectorial, centralized-coordinate, and decentralized planning systems. (c) It is played in a server-client network environment, on the Internet, in particular. (d) Utilizing Internet browser and other currently available multimedia provide more user-friendly interface tools.

Among these features of PANGAEA, the most peculiar one is that the players are actually induced to think about how to manage the development planning process for

realizing sustainable development. Because otherwise, their performance would turn out to be poor as the system's indicator evaluates at the end of the gaming, although they might have achieved an excellent economic growth for the country. It is a human nature to try one's best so that the player won't lose the game.

It is hoped that PANGAEA would be enjoyed by more and more people in training of regional development planning and their feedback would facilitate its upgrading in the future.

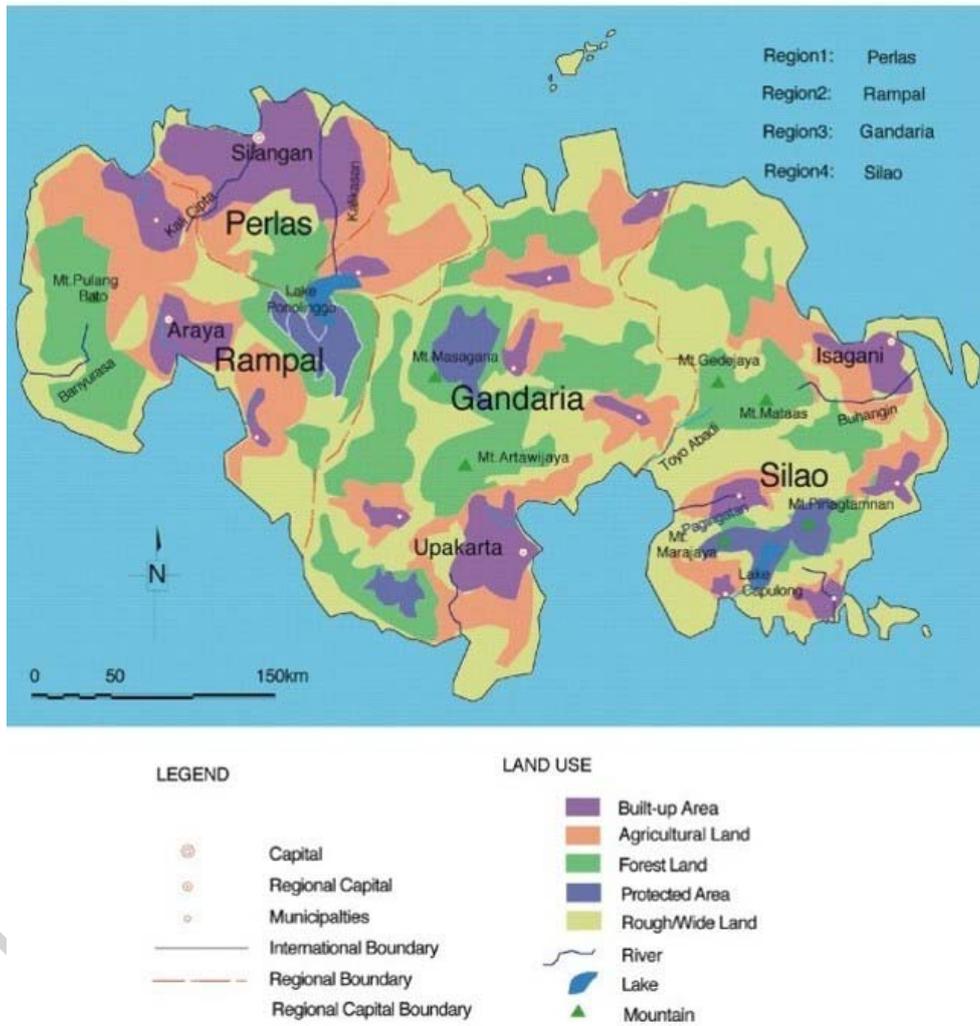


Figure 1: Map of Pangaea: Land Use

## 1.2 Objectives of PANGAEA

In the gaming simulation "PANGAEA", the players, planning groups formulates and implements national development plans which would achieve socioeconomic growth within the means of environmental resources through gaming and computer-simulated exercises. The players will be assigned various roles of development planners involved in the above exercises; for instance, national government officials and regional governors. Each player will formulate development plans by performing his/her

assigned role according to its capacity and responsibilities. The formulated plans will be processed as the input of the computer model for simulating the changes in economic growth and environmental resources. The output will present the profile of the country's future. The players study the input and output of their own plans, and evaluate them in terms of sustainability. They will review and discuss factors of success or failure in achieving sustainability of their development plans, thus helping each other to learn the tradeoff relations and the development process in this gaming simulation.

The objective of this gaming simulation is learning by doing the planning process of the real world development in the virtual settings of gaming and the resulting socioeconomic changes simulated in a computer model world. The players are expected to learn the following aspects by the gaming simulation: (a) Awareness of the complexity in the world systems dynamics, (b) Importance of integrated planning, (c) Systematic and rational way of thinking to justify their proposal.

### **1.3 Features of PANGAEA**

In PANGAEA, the simulation model and projects available for development inputs are designed in such a way that the above objectives would be reflected as much as possible. Basic policies to be made by the players in formulating their plans for project investments are on economic development and environmental sustainability.

In the process of this policy making for planning and negotiation, as well as the review of the simulation output and evaluation on the players' own performance under the selected institutional arrangements, the players would get deeper insights on the relation between development activities and environmental degradation.

The main features of PANGAEA are as follows:

- (a) The game is concerned with planning for sustainable development, focusing on the trade-off relations in resource allocation between development and environmental preservation;
- (b) In the short term, even without considering environmental preservation, development will achieve economic growth; however, in the long term, such development will lead to environmental degradation and extensive funding will be needed to restore the environment;
- (c) Environmental degradation is due to land-use conversion and the discharge of pollutants beyond the regenerating capacity of forests and the cleaning capacity of rivers and the atmosphere. In order to control degradation, afforestation and economical uses of energy and other resources are required;
- (d) Policy choices will depend upon the institutions involved in the planning process;
- (e) Three specific types of institutions are arranged by combining power balance between centre and local government and environmental integration policy.
- (f) In the simulation exercise, training participants will be divided into three groups corresponding to the above types of institutional arrangements. Each group will perform the role of a particular institution and will formulate a plan. The differences between the groups' plans will be noted and the planning influences on

- the interactions between development and the environment will be examined;
- (g) Sustainable development refers to the balance between economic growth and environmental preservation. Each player may achieve a level corresponding to his/her conceptualization of sustainable development; and
  - (h) It is not the purpose of the exercise to provide a working definition of sustainable development; rather it is intended to have the players exposed to study different types of institutions involved in the planning process.

#### 1.4 Sustainable development in PANGAEA

The concept of "sustainable development" was proclaimed at the Earth Summit and it has been widely accepted and supported by both developing and developed countries since then. It is now generally recognized that anyone involved in development tasks needs due consideration on "sustainable development" in the pursuit of their objectives. According to Agenda 21 adopted by the Rio de Janeiro Summit, it defines that "sustainable development" is "to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs." The World Commission on Environment and Development also states in its report entitled *Our Common Future* that "sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs. Thus, in the final analysis, sustainable development must rest on political will."

While it is easy to see that we need "sustainable development" approaches, we cannot pretend that it is similarly simple and straightforward to see sustainable development processes. In PANGAEA exercise, there are four key controlling factors for achieving sustainable regional development as illustrated in 'Figure 1' below, namely, (a) capacity, (b) distribution, (c) pace, and (d) efficiency.

They can be captured in the following terms:

- (a) Capacity: Total development volume, beyond which development should not be attempted;
- (b) Distribution: Spatial allocation of development, which contains development within the carrying capacity of the respective localities by deconcentration;
- (c) Pace: Development speed, which secures the destruction pace to be slower than the regeneration pace; and
- (d) Efficiency: Energy/resource conserving development, which enables lower consumption of energy and other resources per development input.

The total development volume, of course, is a decisive factor affecting the carrying capacity of the environment. Therefore, a balanced development input in terms of the *capacity* should always be considered. This balanced input applies not only to the project investments by the central and local governments but to the foreign direct investments as well.

Even though the same development volume, which is apparently within the *capacity*, is implemented, its effects would be totally different, depending on how it is managed in

time and space as well as the resource/energy efficiency. This is a very important point for deliberating sustainability in development planning. If the development activities were concentrated in a certain area, they would easily go beyond the carrying capacity of the environment in that specific area. If the same volume of development were properly *distributed* in several other areas also, the volume in each area would remain within the respective carrying capacities.

The concentration and distribution of development volume also apply to the dimension of time. If development took place at the speed surpassing the nature's regeneration pace, it would go beyond the unretrievable level of the nature. If, on the contrary, the development *pace* were controlled so that the regeneration would go on in the future, sustainable development would be successfully achieved.

Another important notion for environmental sustainability is resource/energy saving development. In other words, *efficiency* of development in terms of energy and resource consumption. When the energy or resource consumption per unit development is smaller, more efficient development would be attained in the sense of sustainability.

Thus players are requested to formulate the project investment plan with careful consideration on these factors. (Refer to the UNCRD discussion paper series No. 98-3, entitled "Planning Dimensions of Sustainable Development", written by Hideki Kaji)

## **2. Modeling Institutional Framework**

### **2.1 Institutional setup**

As indicated earlier, PANGAEA gaming provides three different institutional setup. In grouping the institutional setup for planning, there may be drawn two axes, that is, one along centralized vs. decentralized system and the other along sector-oriented (compartmentalized) vs. integrated system (see 'Figure 2'). In the four bisected parts generated by two axes, there may be placed four types of planning systems. In reality, local governments are too small to apply sector-oriented planning system in the same sense as the national government.

The national government, on the other hand, needs sectors to perform its services efficiently, considering their volume and diversity. Therefore, three types of the institutional setup remain, namely; (a) sector-oriented and compartmentalized planning system under a strong initiative of the central government; (b) sector-oriented but integrated planning system under a strong initiative of the central government; and (c) decentralized planning system by strong local initiatives.

PANGAEA prepares these three cases of institutional setup to be selected and tried by the players.

Case 1: Centralized planning system with sector-oriented planning

Case 2: Centralized planning system with integrated planning

Case 3: Decentralized planning system with local initiatives

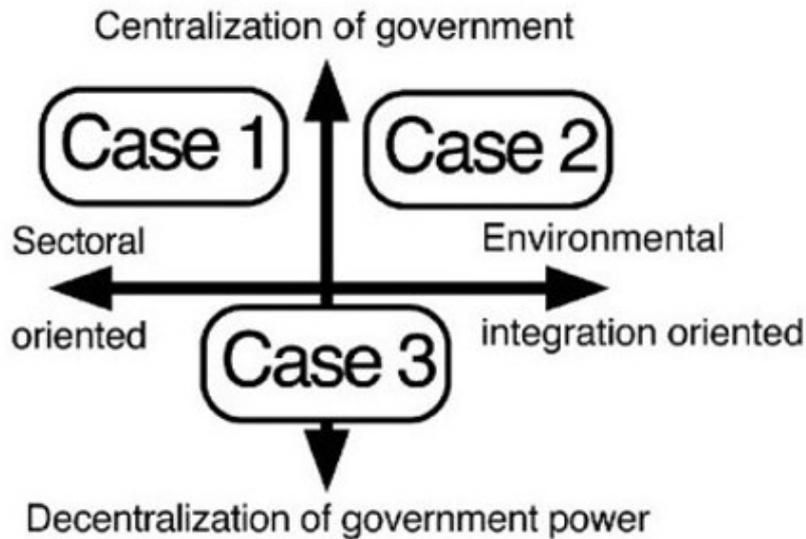


Figure 2: Case definition of PANGAEA gaming

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### Biographical Sketches

**Dr. Hideki KAJI**, Professor of Faculty of Policy Management, Keio University was born in 1942 and graduated from the Tokyo Institute of Technology, (B.E., in 1965, M.S., in 1967, Ph. D. in 1970). He served as a researcher at the Building Research Institute, Ministry of Construction from 1972 to 1974, Associate Professor at T.I.T. from 1974 to 1978 at Asian Institute of Technology Bangkok from 1978 to 1981, and at University of Tsukuba from 1981 to 1985 and Professor at University of Tsukuba from 1985

to 1993. From 1993 to 1998, he served as a Director at the United Nations Centre for Regional Development (UNCRD), where he developed the PANGAEA Gaming Simulation Model as its training tool. Kaji brings with him a wealth of experience as teacher and researcher in the field of Urban and Regional Planning, in particular, a computer based modeling.

**Mr. Yasunori MINAGAWA**, Coordinator of Planning Technology Development Office (PTDO), UNCRD, was born in 1953 and graduated from Tokyo Institute of Technology ( B.E. in 1976 and M.E. in 1978 both in Social Engineering). He served as a researcher on disaster prevention from 1978 to 1985 and as a system analyst on computer systems from 1985 to 1993 at Toyo Information Systems Co., Ltd. Since joined UNCRD in 1993, He is serving as the Coordinator of PTDO which deals with research and training projects on geographic information systems (GIS) and computer-based exercises including PANGAEA. His current interest is a database development for regional development planning.

Hidehiko KANEGAE, (Japanese) born in 1964, received a Dr. of Eng. from Tokyo Institute of Technology in 1994. He is now assistant professor of planning theory, social engineering course of graduate school of decision science and technology, T.I.T.. Prior to this, he served as a researcher of UNCRD where he involved in PANGAEA development project as a sub-leader from 1995 until 1998 and he was also visiting associate professor of Kyushu university. His major field is planning theory and planning information technology. His current research theme is how planning team connects, crosses and makes network their team members' brains toward their target under emergency situation.