

Digital Earth and Decreasing and Preventing Disaster and Sustainable Development

Guo Qisheng Wang Yuquan Xue Qing Yang Ligong Wang Jingye

(Armored Force Engineering Institute, Beijing 100072)

ABSTRACT The important influence to sustainable development is presented, and the application of digital earth in decreasing and preventing disaster and in sustainable development is discussed.

KEYWORDS Digital Earth, Decreasing and preventing disaster, Sustainable development

1. Introduction

The disaster occurs frequently in China. Every disaster causes great losses to country and people's lives and possessions, and the negative influence on the country's economy and social sustainable development that could not be underestimated. Disaster is an important influencing factor to sustainable development, but action in a short period is the major factor of causing disaster. Formation of many disasters has connected with man's action in different degree. Therefore, decreasing and preventing disaster is an assignment and precondition in building the society of sustainable development. Making systematic study of decreasing and preventing disaster, building necessary information system of predicting and forecasting disaster and constructing country's and area's rescuing system, are guarantees in overcoming actions in a short period, and in making rescuing action responded rapidly, decided rightly, acted harmoniously. One of important purposes in digital earth is to exert an important action in decreasing and preventing disaster. This paper firstly analyzes an important influence of decreasing and preventing disaster on sustainable development, then make an initial discuss of "digital earth" studying fruit in the application of decreasing and preventing disaster and sustainable development.

2. The Occurrence of Disaster and its Influence on the Sustainable Development

2.1. Disaster is An Important Restricting Ractor to Sustainable Development.

Population explosion, resources shortage, environment depravation and zoology unbalance are four apparent factors educing sustainable development^[1]. Thereinto, the latter three factors have connected with disaster in different degree. Every disaster causes great losses to country and people's lives and possessions, and can't underestimate the influence in the negative sides to country's economy and society's sustainable development. A big disaster has a severe influence to the whole national economics, even more direct

and severe influence on the area where disaster occurred, sometimes its aftereffects is indeed destructive. For example, the special flooding disaster in upper and middle reaches of Changjiang River, Songhuajiang River and Nenjing River area, caused direct economic losing up to 1666 hundred millions yuan^[2]. It is obvious that disaster is an important restricting factor to sustainable development.

2.2. Action in A Short Period Is the Major Factor of Causing Disaster^[3]

In the development of human society, with population increment and the need for high life quality, especially from industrial society period, such actions in a short period which are being done intentionally and unconsciously as exceeding mining, watering, cutting, opening up wasteland, inning, and letting off waste water, waste gas and rubbish that exceed natural cleaning ability, have caused environment polluted, water resource shortage, soil erosion, vegetation destruction and disaster frequency. For instance, soil erosion is the result of one-sidedly pursuance of short period economic benefit; Flood has largely connection with unreasonable utilization to natural recourses. Exceeding cutting in confusion in upper reaches causes vegetation destruction, soil erosion, riverway and lake jam. Large inning in lower reaches falls dawn distributing flood capability. Many coasts are due to instability caused by engineering construction digging hillsides. Still, water table falling, underground sea inbreaking, acid rain, drought, soil sandage have relation with man's action in a short period.

2.3. Decreasing and Preventing Disaster Is An Important Assignment in Building the Society of Sustainable Development

Resources, environment and zoology are sustainable development's bases. Disaster causing resources shortage, environment depravation and zoology unbalance are important restricting factors sustainable development. Therefore, in order to retain society's sustainable development, we must develop studies of all kinds of disaster occurring law

and harm characteristic. Especially we should strengthen multi-subjects' complicated study to disaster problem, strengthen disaster prevention countermeasure and make scientific measures of decreasing and preventing disaster, to decrease and prevent disaster by every means.

3. Digital Earth Applies in Decreasing and Preventing Disaster^[3-5]

3.1 Digital Earth Supplies Technology Platform for the Research of Disaster's Nature.

Natural disaster is an open complicated system. It is difficult to recognize some essence rule by experiment. Digital earth supplies an information platform of nature and society system on earth and a technological platform to simulate this system for people. They makes people able to simulate disaster's occurrence and development in computer's environment as possible as true and interaction rule between disaster and human society, makes people better understand some essence law (for example disaster mechanism), then to supply basis for disaster's prediction.

3.2. Digital Earth Provides Data and Technique Platform for the Decision-Making of Dynamic Supervising, Preventing and Decreasing Disaster.

Digital Earth may provide the relevant information for the decision-making of dynamic supervising, preventing and decreasing disaster and so on. The data of geography space and other information that are stored in Digital Earth can be transferred expediently at any moment, so it will provide analytic basis for the disaster range and the affected area. E.g. fire or potential fire, it is simulated and analyzed in advance by making use of the information which be provided by Digital Earth, which is benefit for taking the effective prevent step. When we simulate a fire in some area, the first one, we should acquire all information, including terrain, soil, vegetation and so on. Then we should add some exterior conditions, for example wind power, climate, temperature and so on. So we can simulate the development of fire of the area and foresee possible damage in case of fire. Especially we may establish the most excellent preventing step and the most effective scheme of putting out the fire and avoiding the personnel casualty and the loss of social wealth.

The more advanced function of Digital Earth is disaster forecasting. For example drought, if we use its mathematics model to simulate it, not only we can forecast the frequency and degree of drought in some area in one year or several years, but also forecast the latter development of drought, so the

government department can make correct decisions in time. The virtual reality function of Digital Earth may also simulate scene on the time of drought, and make people feeling being in the disaster area in body, and easily moving to the place interested at any moment to find out the local situation. Accordingly the correct judgement and decision-making to lighten loss of drought could be made.

Besides, Digital Earth make for digital weather forecast, climate numerical value simulation, digital seismology, fine agriculture and the research of emergency response system in digital city, and will provide valuable and efficient in preventing and decreasing disaster.

3.3. Digital Earth Supplies Basic Data and Technical Platform for Evaluation to Disaster Situation.

The difficulty in evaluation to disaster situation lies in shortage of exact basic data. Digital earth can supply concerning context data in disaster area. Using GIS and computer simulation technology, comprehensive analyzed these data from remote sensing and ground inspecting when disaster occurs, we can evaluate the loss of disaster, situation of disaster development and influence in environment and sustainable development caused by disaster.

After the disaster, digital earth can help us est-ablish and implement scientific and logical renew scheme and long-term decreasing disaster layout aimed at natural environment characteristic and society economic development status, to implement district sustainable development.

4.The Influence of Digital Earth Upon Sustainable Development

Digital Earth make for the research of essence rule of disaster, the dynamic supervising and preventing of disaster, the evaluating of the situation of a disaster and the decision-making of decreasing disaster, so it will have a active effect on sustainable development. In addition, Digital Earth make the information on earth become digital, so it may provide the technique means for making the stratagem of social sustainable development. If we constitute our own stratagem of sustainable development by establishing mathematics model of the connection of factors including our population, resource, environment and so on and social sustainable development, and by making use of relevant information of Digital Earth, it may accelerate harmonious development between our economy and society.

The sustainable development has been recognized by all over the world. China is a

developing country, we must develop our economy, but at the same time we are faced of controlling population, saving resources and protecting environment. So we should think more of the sustainable development. In 1994, China government authorizes and issues 《Chinese Agenda in twenty-first century---The White book of Chinese population, circumstance and development》, and put forward the total stratagem of the sustainable development in China. In 1996, the 《Economic and Social development of “the ninth five years” scheme and perspective goal design in 2010 of the People’s Republic of China》 was implemented; In 1997, “973” project was carried into execution. At present, a large number of consultation items have been developed or will be developed about implementing the stratagem of the sustainable development. These entire sustainable development consciousnesses combining with the research of Digital Earth will propel the sustainable development in China a new height.

5. Conclusions

Disaster is an important restricting factor to sustainable development. Decreasing and

preventing disaster is the assignment and precondition of sustainable development. Develop “digital earth” study, building disaster prediction system which greatly decrease and prevent disaster are powerful safeguard to society’s sustainable development.

References

- [1]Yan Lei: “Base of Sustainable Development----The Structural Control of Huge Resources, Circumstance and zoology System,” HuaXia Publishing Company, Beijing, China, Apr.1998
- [2]Chen Liangfu: “Digital Earth and Global Change,” China Journal of Image and Graphics, Vol.4[A] Supplementary Issue, Apr.1999
- [3]Bi Siwen: Science of the Earth System and Sustainable Development, Geology Publishing Company, Beijing, China, Apr.1998
- [4]Chen Shupeng: “One Hundred Questions of Digital Earth,” Science Publishing Company, Beijing, China, Apr.1999
- [5]Wang Le et al, “The Design and Implementation of Emergency Response System in Digital City,” China Journal of Image and Graphics, Vol.4[A] Supplementary Issue, Apr.1999