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**LIVING IN HARMONY WITH NATURE –
A CASE STUDY OF JAPAN**

by

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1. Urban ecosystems as a subsystem of natural ecosystems.

The explosive development of modern human activities such as technology, industrialization, and urbanization in developed as well as developing countries have brought monumental economic richness and material civilization to today's world. As a result however, not only our natural environments as the basis of mankind's existence, but also our spiritual world and human cultures have been impoverished and are threatened with destruction.

If we continue in this direction into the 21st century with only economic and technical increases, using mainly non-living materials for the development of our civilization and enlargement of our urban areas, then our future will become ecologically bleak and dangerous.

On the one hand, we must certainly develop our technology and its multidisciplinary scientific research basis. On the other hand, though, we must not only develop technologically and economically, using available energy sources, but we should also restore the "living materials" in our ecosystems, such as vegetation and other living beings.

Even as we gain much technological and economic wealth, we are still faced with a fate of being able to survive only within the framework of healthy, harmonic biocoenoses and well-functioning ecosystems. Man has the capacity for such mental

activities as philosophical and religious thought and beliefs, unlike other living beings. Continued development of this talent and activity by man can only be guaranteed in a natural or nearly natural environment with healthy ecosystems, as shown by the rise and fall of human civilizations and urbanizations for the past several thousand years.

Our technologically highly developed urban ecosystems can develop ecologically only as subsystems of the global natural ecosystem. Throughout the long history of man, even long before the Stone Age, man's attitudes were always somehow "against nature". These attitudes must be changed to an attitude of "living together within nature". Coexistence with nature, other life forms, and also other humans, populations, cities, and so on is an ecological, scientific fact. This is, however, also a main component in traditional East Asian religious teachings such as Buddhism, particularly in many schools in Japan.

2. Environmental protection forests as an example of restoration and redevelopment of the urban ecosystem.

For more than thirty years I have been studying the vegetation and landscapes of Japan throughout the entire archipelago from Hokkaido in the north to the Ryukyu Islands, 3000 kilometers to the south, in comparison with other countries (Miyawaki, 1979, a,b, '84). Based on ecotechnological field studies, we have attempted to restore living urban environments of urban and industrial areas such as Tokyo, Yokohama, Osaka,

and Nagoya. In these areas, monotonous urban deserts constructed on dead materials such as cement, iron and various petrochemical derivatives have resulted from the enormous development of technology (Miyawaki, 1975, 1981, 1982; Miyawaki, et al., 1980-1988).

If we want to use the important main living component of ecosystems, i.e., the vegetation as living construction material for the redevelopment of healthy urban ecosystems, then this must be based on precise vegetation-ecological research in the field, as described in the flow chart (Figure 1).

In the last eighteen years, from Kushiro in northeastern Hokkaido in the north to the Ryukyu Islands in the south, 122 locations have been restored by construction of new environmental protection forests ("native forest"). This ecotechnological method for restoring new urban ecosystems represents a traditional Japanese method for creating or preserving small groves or forest patches around temples, shrines, etc. This was done in Kyoto, Kamakura, and other parts of Japan, wherever there was some object of religious or other spiritual honor. This thus represents an example of how new ecotechnology and ecological science can be successfully combined or integrated with traditional forms and functions of local culture and religion (Miyawaki, et al., 1977, 1988).

Monotonous uniformity of our living places, especially large cities built of dead materials, is an advantage for urbanization and the rapid increase of artificial production in factories. It

is often a disadvantage, however, for living beings and especially for our spiritual life and human thinking. Here we must preserve the diversity and recognize the unity of diversity in nature as well, since nature is so very diverse. (In all the world, for instance, we cannot find two people or two faces exactly alike.)

We seek a harmonious course of development with nature, with its local, potential, natural vegetation and animal communities having dynamic diversity and uniformity. Restoration and redevelopment of native forests in Japan involve not only vegetation but also soil fauna and animal communities. Environmental protection forests enable various kinds of animals to live, not only above the ground, but also beneath the ground surface. These soil, animal communities play important roles in decomposing organic debris in the ecosystems and in improving soil structure (Figure 2, Aoki, Harada, 1985).

3. Conclusions drawn from the study.

The conservation of nature and natural resources in urban and industrial areas is not a serious problem worldwide. I would like to show you some of the ways that we have approached this problem in Japan.

Although small, Japan was once covered with a good variety of natural vegetation zones. These include evergreen, broad-leaved forests in the south and west, summergreen, broad-leaved forests in the north and on mountains, subalpine, coniferous

forests at higher elevations, and small areas of alpine vegetation. Japanese culture was embedded in this green landscape, developing mainly in the evergreen broad-leaved forest region (the laurel forest region). Today, in Japan, a population of 120 million inhabits this narrow land area, mostly in the coastal lowlands. Since the population density is high, many natural plant communities have been replaced by substitute vegetation; or there are areas of little or no vegetation at all. In particular, the alluvial plains and coastal lowlands, once covered with laurel forests, have been largely converted into urban and industrial "semi-deserts" or "deserts".

The "natural", spontaneous vegetation which does occur in such areas is often dominated by anthropogenic, ruderal species, and has formed several substitutional, anthropogenic plant communities. By comparing actual and potential natural vegetation maps on various areas and with various scales, it is clear that there has been a change from natural vegetation to a degraded substitute vegetation.

It is estimated that the evergreen, broad-leaved forests now cover only 0.06% of their potential area (Figure 3). Recent urban and industrial landscaping has caused chaotic mixtures of indigenous and alien (exotic) species. Over 800 of Japan's 6000 plant species are believed to have been introduced from pre-historic time to very recent time. These plant species are often forced into the landscape disharmoniously.

In the 1970's, not only the preservation of nature, but

also the re-creation of rich green environments with biological diversity were proposed, in urban areas, industrial zones, and along transportation facilities. The recreation of relatively natural environments can be realized through the construction of "native forests" with native trees, integrating up-to-date research on the potential natural vegetation and the traditional Japanese method of creating "Chinju-no-mori" (shrine and temple forests). Slowly but steadily, a campaign to introduce "environmental forests" into the largely abiotic environments has taken root in various places throughout Japan.

Examples are:

- 1) steel mills, factories and power stations on reclaimed coastal land
- 2) schools, parks, sewage disposal plants, and other public facilities within urban and industrial zones
- 3) around transport facilities such as airports, harbors, and along streets
- 4) bordering mountain roads and highways.

Restoration of more natural environments through the formation of native forests with evergreen broad-leaved trees, has been positively carried out in these and other situations. Through trial and error, our ancestors managed to find ways to create native forests with native trees in their towns and villages. By combining this traditional method with modern phytosociological and ecological diagnosis (i.e., maps of actual vegetation, and the study of site conditions) and "prescription"

(i.e., maps of potential natural vegetation and habitats), new native forests (Haimatwalder, Miyawaki, 1977 and others) have been created in more than 122 locations throughout Japan (Figure 4).

Preservation of nature and restoration of green environments have now become inseparable aspects of conservation and planning efforts. Our efforts towards native forest restoration, adapting the indigenous vegetation of each location, have borne fruit after periods of only three to twelve years. Although still insufficient, the identification of the indigenous, potential, natural vegetation is expected to contribute to the betterment of the human environment, a better foundation for our uniquely inherent culture, and conservation of the native landscape in each place.

Through our study in Japan, we can conclude that it is necessary to restore biological productivity and recreate native forests and their components such as soil, animal communities. This also advances our socioeconomic redevelopment and guarantees the healthy survival of mankind.

It is earnestly hoped that this attempt to create the "environmental protection forests" will prove to be a model example, not only for other Japanese enterprises, but also for advanced industrial nations as well as for developing countries of the world. The Japanese government, public organizations, private companies and citizens are expected to understand that the inclusion of the environmental protection forest, in the

planning of new urban and industrial facilities, will ensure a more prosperous future since it takes time to create new environments when "living construction materials" are involved. It is sincerely hoped that these plans for the creation of new green, industrial environments shall be put into action throughout the nation as early as possible.

We invite advice and criticism on such evergreen, broad-leaved forest recreation projects, from the viewpoints of both advanced and developing nations, in order to improve ways for creating green environments elsewhere.

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