APPROACH OF CONSERVATION OF NATURAL ENVIRONMENT IN THE HACHIOJI JUNCTION

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ABSTRACT

The Hachioji junction is a traffic hub in the western part of the Tokyo metropolitan area. It links the Chuo Expressway with the Ken-O Expressway, a loop connecting locations about 50 kilometres around Tokyo. The Hachioji junction was built in an environment rich in nature at the foot of the Kanto Mountains. To conserve this environment, a decision was made to restore vegetation, using young trees grown from seeds collected in the area, on the slopes of the Hachioji junction. And we are reforesting with seeds from local vegetation. This was the leading case in Japanese expressways. Local gene seedlings are grown from seeds of indigenous plants around the expressway construction sites. The seedlings are planted back in their native environment, which helps prevent migration of plants from other areas and minimize changes in plant species composition as well as genetic disturbance.
Ten years have passed since the restoration. Trees have grown large, forest is formed, and various plants and animals have come back to the place. To understand the situation after seedlings had been planted, the follow-up survey of the slope was executed. As a result, it has been understood that these places approach the ecosystem of a surrounding forest. We report about the investigation and result.

1. INTRODUCTION

Central Nippon Expressway Company (hereinafter “C-NEXCO”) has long been engaged in development and management of expressways that contributed to the people’s life and economy in Japan. At present (as of April 2010), C-NEXCO is in charge of approximately 420 km of new expressway construction and some 1,760 km of its operation. In construction and operation, C-NEXCO endeavours to build the sustainable society, working so as to achieve broad adoption of the 3R(Reduce, Reuse, Recycle) concept concerning resources and to prevent global warming, with engineering environmental load reduction and strengthening of collaboration with local community.

When an expressway is planned for an area of significant natural beauty, the route is designed to minimize the impact on nature. Road construction inevitably changes the local topography, but the aim is to minimize topographical changes and to conserve ore restore the natural environment as far as possible.
In case that expressway construction is executed in the region richly-endowed with natural environment, we have made an effort for ecosystem conservation through Silva slope with “local seedlings” since 1996. We collect the seeds of indigenous trees at the expressway construction site, and moreover, nurturing the seeds into seedlings, we plant the seedlings back in the expressway construction site.
This local seedlings system is an advanced approach as the technology of greening on the expressway of Japan.

2. COMPOSITION OF SYSTEM

The feature of local seedlings system is the following three points.

2.1. Composed of the stage of seed collection, nurturing and curing, and slope construction

As shown in the figure 1, before construction starts, seed gathered from planned construction site in expressway are sent to the greening technology center. The greening technology center is nurturing and curing the seed. The germinated and grown seedlings are planted in their region a few years later.
Moreover, Residents are actively encouraged to get involved in seed collection and seedling planting.
The place where the local seedlings was needed was in nationwide various places, and to ensure the seed collections of various places, C-NEXCO maintained the manual of the collection method, time, and the preservation method.

2.2. Development of unit seedlings

Seedlings units are used for landscaping in difficult conditions such as on cut slope. They are grown in a special medium-filled bag consisting of an upper impervious sheet and a porous base sheet.
Seedlings units have their own soil that lasts until settling at the final planting site, so there is no need to excavate holes for planting. They are planted simply by affixing the four corners of the bag to the slope with pegs or equivalent.

Fig.1 growing procedure of local seedlings

2.3. Adoption of local seedlings

As a feature of local seedlings,

(1) Seedlings are planted back in their native environment, which helps prevent migration of plants from other areas and minimize changes in plant species composition as well as genetic disturbance.

(2) The species diversity can be mortgaged by introducing the colony composition species.

(3) Forest restoration and creation of living and growth environment of flora and fauna.

From these, local seedlings can contribute to the conservation of biodiversity and the restoration.

3. INVESTIGATION

In that 10 years have passed since local seedlings were planted in Hachioji junction, we follow up natural re-vegetation with help from the professional of planting. We report on the result of the investigation and the evaluation in 2008 and 2009.

3.1. Location

The Hachioji junction on the Ken-O Expressway is a traffic hub in the western part of the Tokyo metropolitan area. The Hachioji junction was built in an environment rich in nature at the foot of the Kanto Mountains.

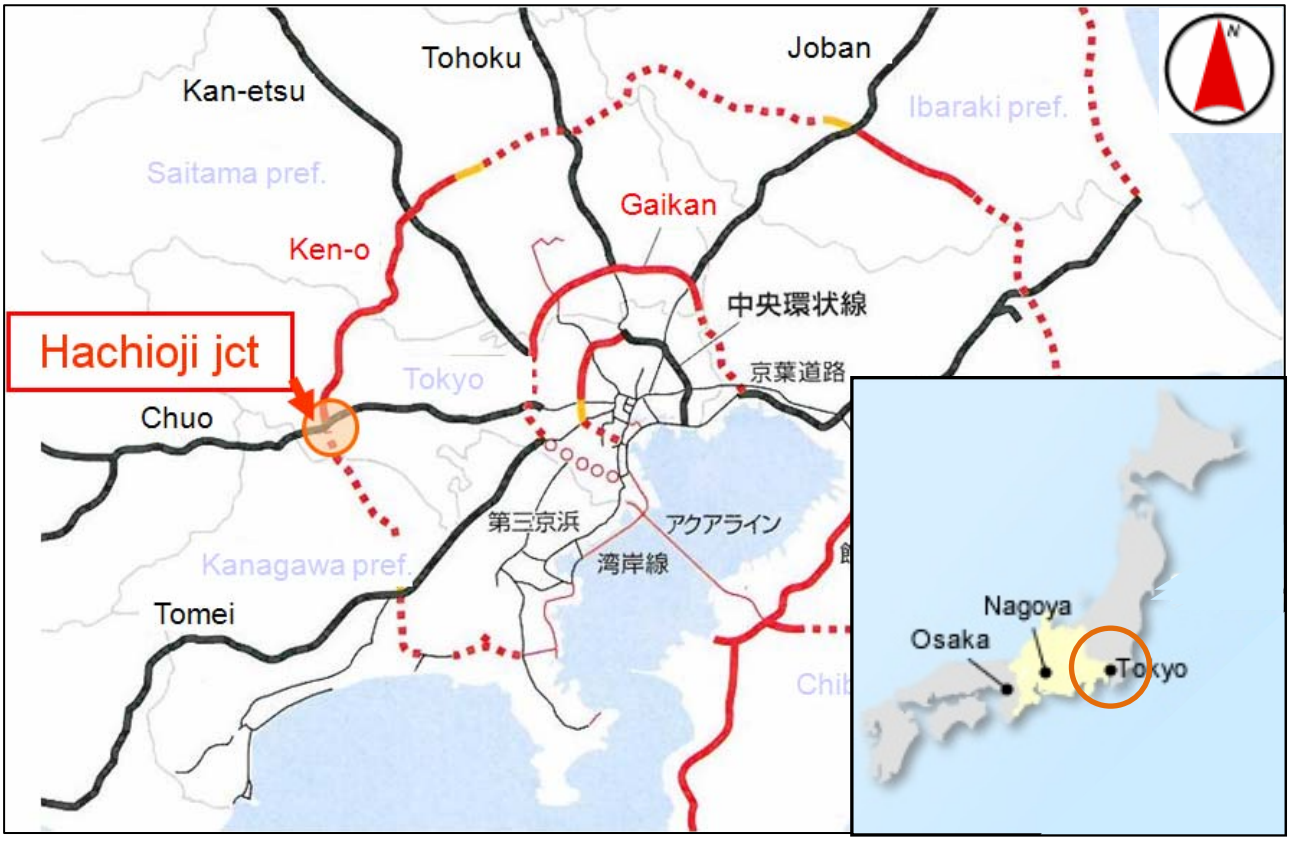
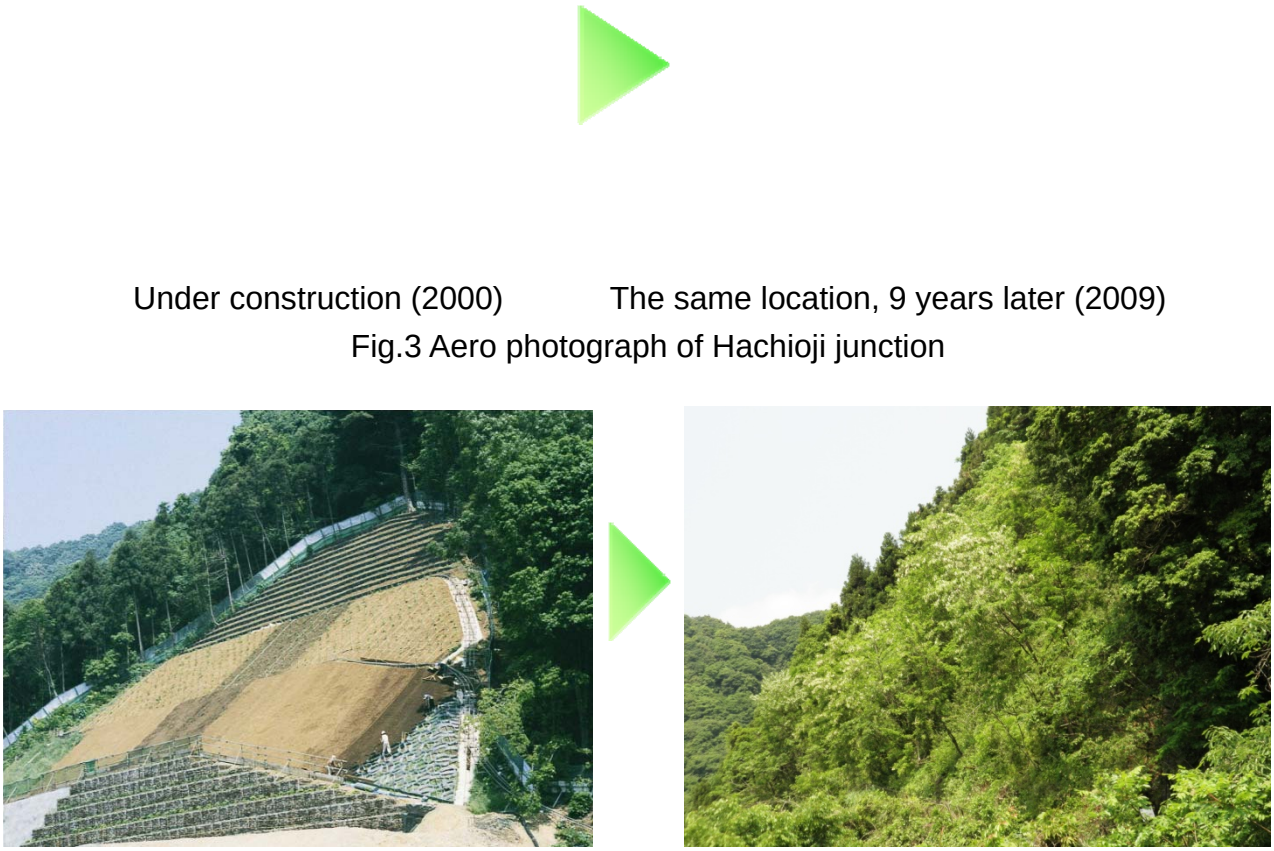


Fig.2 the Hachioji junction location map (2009)

3.2. Past and present condition

Figure 3 shows past and present Hachioji junction. During the construction period in 2000, deforested zones were clearly visible. Seedlings grown from seeds of this area were planted on this slope to restore vegetation.
Ten years after revegetation, planted local seedlings have grown large as shown in figure 4. The revegetated slopes have turned into habitats for wildlife again as shown in figure 5-8.



Under construction (2000)　　The same location, 9 years later (2009)

Fig.3 Aero photograph of Hachioji junction

Right after planting (May, 2000)　　10 years later　(May, 2010)

Fig.4 One of slope of Hachioji junction

Fig.5 Japanese macaques came by from near mountains

Fig.6 In summer, large brown cicadas are singing in the early afternoon

Fig.7 Japanese red pines have sprouted

Fig.8 Wild boar family hitting water

3.3 Selection of investigated slope

Two slopes (A, B) where the different age when the local seedlings had been planted were investigated. Moreover, to set the point near A slope where trees were growing most as a forest situation that became the future target vegetation, it made it to T slope.

slope	construction year	direction
A	2000	SSW
B	2002-2003	ENE
T	existing woods	SSW

Fig.9 Location map on slope in Hachioji junction (2009)

4. RESULT AND EVALUATION

4.1 Evaluation of slope vegetation by tree investigation

We investigated the state of planted local seedlings and tree that grows up from unplanted species.

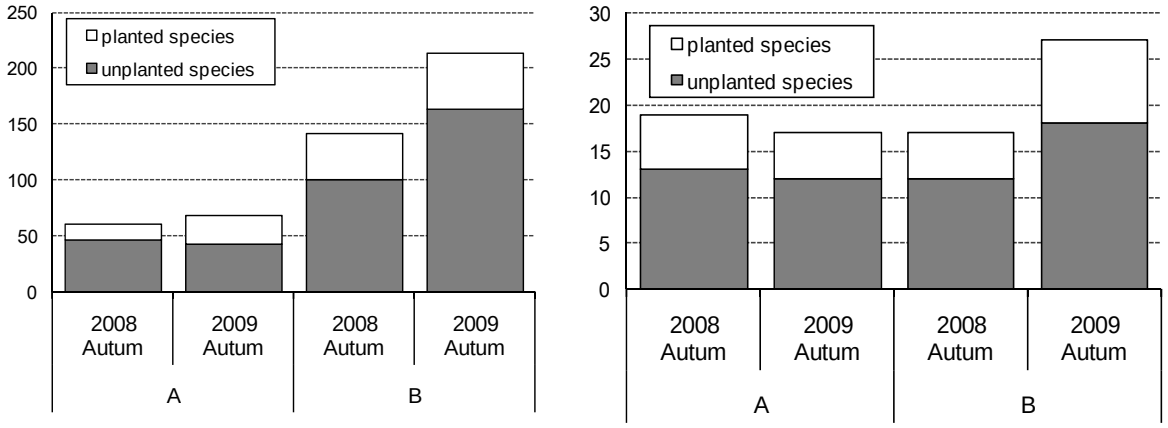
In A slope, the survival rate in local seedlings was about 30 per cent. The planted species are exterminated by the competition with another seed. It is what decreases by the competition, it seems that the survival rate is a proper numerical value as the situation in which about ten years pass.

In B slope, the survival rate in local seedlings was about 90 per cent. There grows comparatively well. It seems that the reason is in the decrease in the competitive rate by the fact that the tree height is not too high.

Next, the planted species and the unplanted species were distinguished, and it was arranged according to kind number according to the number of individuals in Figure 10. As a result, some unplanted species are in the decreasing tendency in the number of individuals though there is no substantial change in the kind number in A slope. The number of unplanted species has decreased gradually in the place where the local seedlings grew.

Moreover, the kind of unplanted species is almost the same as the kind of the next T slope. A slope becomes similar environment with surrounding forest.

The number of individuals and kind number are in the increasing tendency in B slope. It seems that B slope settles down an increase in several years as A slope.



Number of individuals Kind number

Fig.10 Breakdown of planted species and unplanted species of seedling

4.2 Evaluation of soil animals' investigation

The evaluation of the richness of nature that uses the soil animals is proposed by Aoki [1]. It evaluates by the total point based on the result of investigation in 200 places in various environments of Japanese various places.

- •Natural forest and religious preserved wood where nature was often kept 60-75 points
- •Mature coppice and secondary forest 55-65 points
- •Young coppice and man-made forest 35-45 points
- •Garden and schoolyard in park and house 25-35 points
- •Planting of road 15-20 points

We investigated the soil animal by three places in each slope. Figure 11 shows the result of the evaluation by Aoki's method.
T slope is natural forest and religious preserved wood where nature was often kept from 66 to 71 points. A slope is young coppice and man-made forest from 35 to 42 points. B slope is garden and schoolyard in park and house from 24 to 26 points.
As a result, A slope confirmed the recovery well. It was able to be judged that B slope had recovered to artificial planting ground.

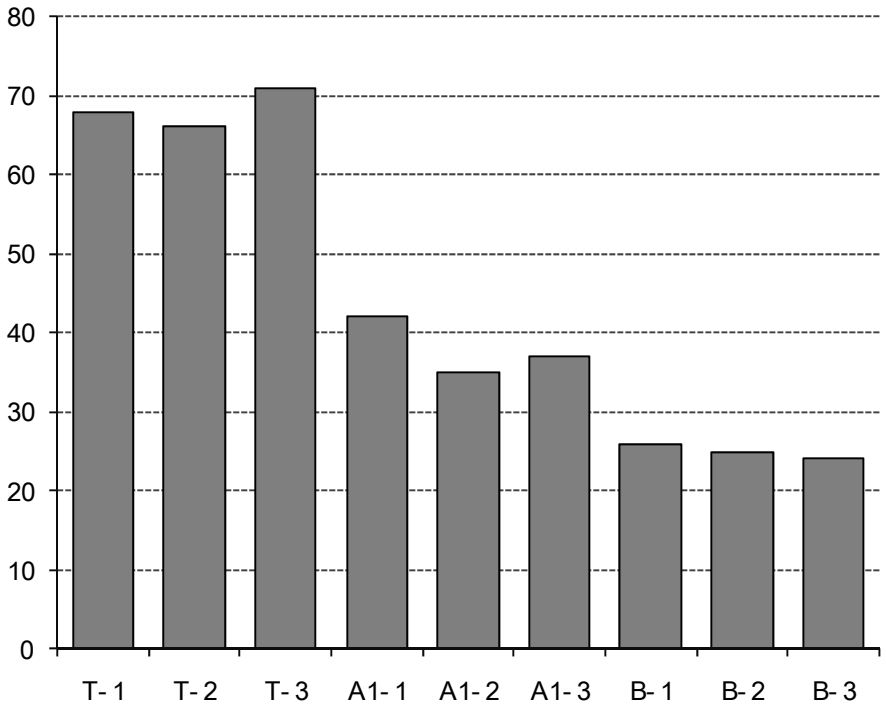


Fig.11 Nature richness based on soil animal communities

CONCLUSION

Greening in the slope by this local seedlings system begins to appear in 2000 Hachioji. We conformed that the local seedlings grew up steadily to recover the nature little by little. The result of the investigation after ten years have passed proves it.

For better relationship between road and nature, 750,000 seedlings of 200 pieces were delivered at the end of 2009; 54,000 seedlings of them were planted in the areas of C-NEXCO.

This local seedlings system is contributing to maintenance and the restoration of the biodiversity along the national strategy by applying to the road slope.

Moreover, this system is contributing to regional alliances and environmental education by people participates positively.

We will stay committed to ensuring habitats of wildlife in our road construction and restoration projects.

REFERENCES

1. Junichi Aoki (1995). Search procedure of nature based on soil animal communities in Japanese.