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ORIGINAL ARTICLE

An Expert Dispatch System for Green Space Conservation in Small Scale Developments

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***Abstract*:** Land-development greatly loses the habitat of the creature. For the selection of plants after land-development, many alien species have been used for reasons of visual beauties, ease of maintenance, rapid growing of plants, low expenses, etc., which might lead to loss of local biodiversity. Consequently, disputes are occurring between the protection of the local nature and land-development. To achieve the Aichi Targets in the Convention on Biological Diversity adopted in 2010, Aichi Prefecture in Japan established a new system. Two experts specialized in the botanist, the ecologist or the "biotope planners and builders (private-sector qualification)" are selected. They instruct and advise to developers in case of small-scale development. Because this new system is arbitrary and there is no obligation to follow it, sometimes developers do not use this system or they may not carry out advices.

This research would extract the outcomes and problems of the expert dispatch system, which is a means for green space preservation in small scale development, and also make new proposals for land-development while implementing biodiversity conservation. In order to extract the outcomes and problems, we conduct a interview survey to administrator and developers as follows: 1) Effects of system utilization. 2) Status of implementation for advice. Finally, we propose the following three points to develop land while conducting conservation of biodiversity. 1) How to increase the number of users. 2) Utilization of dispatch system that advice is effective. 3) A system to ensure the quality of the green space.

This system is the first attempt by Japanese municipalities, but it is the available system that is easy to introduce in the municipalities of the world.

Keywords: Land-development, conservation system, biodiversity, expert dispatch system

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1. Introduction

Land-development greatly loses the habitat of the creature. In selection of plants for mitigation after land-development, many alien species have been used for visual beauties, ease of maintenance, rapid growing of plants, low cost, and other, which might lead to loss of local biodiversity. Consequently, conflicts are occurring between the conservation of the nature and land-development in the area.

In Japan, in order to regulate wild land-development in the 1960's, rules were set up based on green spaces ratio to development area. However, there are no legal rules, except concerning the quality of the green space other than the Invasive Alien Species Act (2005).

In 1997, the Environmental Impact Assessment Law came into effect, and at the time of large - scale land-development, there was a system to incorporate expert opinions. Waterfront spaces such as small green spaces and ponds are precious habitats of creatures as stepping stone biotopes. A network between habitats is formed by the stepping stone biotope （Blab.j.1985b）.

Networking the backyard habitat over 0.1ha, street trees and utility rights of ways found in a city can provide an important stepping stone biotope (Rudd et al. 2002).

However, for small-scale developments, there is no institution that experts can intervene, and many areas have been developed without consideration of local biodiversity. A seven-step framework for regional planning to preserve biodiversity is proposed by Craig R. et.al (2002). Jeffrey C. Milder (2007) presented practical examples on the "conservation development" method combining land-development, land conservation and income generation while functionally preserving conservation resources.

Although methods of conservation have been studied in this way, there are few papers relating them to the administration system. In Japan, as a system to dispatch experts at development time in order to balance development with natural environment conservation, there is a Nature-Oriented River Works adviser system in Japan (MILT.2005). At the time of disaster restoration, if there is a request from a river administrator, it is a mechanism that experts can advise on river constructions while restoring the natural environment. However, at the time of small-scale land-development, there was no system in which experts expressed opinions. Therefore, Aichi Prefecture adopted a system to dispatch experts to raise the quality of green at the time of land-development of 1 ha or more as the first attempt in Japan.

2. Objectives and Method

At the Conference of the Parties to the Convention on Biological Diversity (COP 10) held in 2010, we adopted the Aichi targets. In the process of this conference, Aichi Prefecture created Aichi Prefecture's original mechanism of harmonization between development and biodiversity conservation, "Aichi Method." In order to disseminate it, we have formulated the “Guidelines for conservation and rehabilitation of the natural environment”.

"Dispatch of experts" is implemented based on the guidelines, and this expert organizes the tasks for maintaining and improving the quality of nature, and gives guidance and advice such as verifying the results. The expert dispatch system is the first attempt at a Japanese municipality, but it is probably rare also in the world. This mechanism could be easily introduced different countries.

In this research, we summarize the outcomes and tasks and aim to propose several mechanisms for further conservation and regeneration of the natural environment in land-development. The author discussed the effective and differences of the expert dispatch system referring to the results of survey on

implementation of “Guideline for Preservation and Regeneration of Natured Environment”.

We conducted discussions individually with administrative staff, developers, and dispatched experts (June 2017). The author is also one of the experts dispatched.

3. Evolution of green space conservation system in large-development

The rough history is as shown in Table 1. Many green areas were developed and lost by the 1960s. As a result, in order to conserve the remaining green space, in 1973, "the Ordinance on the Conservation of the Natural Environment and Promotion of Greening" was enacted in Aichi by the prefectural government. In doing so, when carrying out development over 1 ha to preserve the natural environment and secure green spaces, the developer was required to notify the prefectural government in advance (large-scale development notification system). There is a rule to secure green spaces in the system. For example, land-developments for dwelling offices or warehouses, in urbanization area by urban planning law, are required to save more than 5% greenery. Developments for factory sites are required 20% including buckled forest ground wider than 5 m surrounding area. Developments, for golf courses or outdoor facilities such as stadiums or amusement parks, need to save more than 20% of green area including the forest zone wider than 20 m (the lawn area is not seemed a green area). Also, in the planting of recovered green spaces, you must choose from the following three. That is, there are three points, two tall trees or more per $10m^2$, six shrubs or more, or one tall tree and three shrubs or more. In addition, when implementing land-development of 20 ha or more, survey of natural environment by academic experts is necessary.

In 1997, the Environmental Impact Assessment Law came into force, and conservation measures against large-scale development exceeding 100ha (Aichi prefecture by ordinance 75ha) have been implemented. The 10 the Conference of the Parties to the Convention on Biological Diversity (COP 10) was held in 2010, and the Aichi Biodiversity Targets were adopted. For that purpose, Aichi prefectural government has formulated "Aichi Biodiversity Strategy 2020" in 2013. In this strategy in order to harmonize land-development and conservation of biodiversity, original "Aichi method" is advocated. To realize "Aichi where harmony between nature and people", we will form and develop "ecosystem network" by collaboration of various stake folders. Apply "Aichi original mitigation" when developing. And to understand and conservation nature, it is to make "promotion tool" easy for everyone to use.

Table 1.The rough History of implementing expert dispatch system

Year	Implementation
1973	"Ordinance on conservation of natural environment and promotion of greening" established Launch of "Large-scale development Reporting System" ·Development over 1 ha: Developers shall report in advance in order to preserve natural environment and secure green spaces. ·Development of over 20 ha: Natural environment survey by academic experts is necessary ·Green area ratio, regulation of the number of forests, etc.
1997	Environmental impact assessment law enforcement
2010	Convention on Biological Diversity COP 10 Holding Aichi Biodiversity Targets adopted
2013	Formulation of "Aichi Biodiversity Strategy 2020"
	Start of expert dispatch system

4. A method for conserving green spaces

"Propulsion tools" are three methods to realize "Aichi mitigation " and " Ecological network ":

1) Biodiversity potential map
2) Aichi mitigation quantitative evaluation method
3) Ecosystem network checklist

4.1 Biodiversity potential map

We select 17 species of animals and plants that live in Aichi Prefecture, as indicators, and show their potential habitat on the map. And to network them, you can grasp what kind of environment is necessary and where you can make it. This is a useful tool to establish a conservation plan.

4.2 Aichi mitigation quantitative evaluation method

It is a method to evaluate lands considering the quality of the green area, and it can be used to compare the status of the land before and after the development.

4.3 Ecosystem network checklist

At the time of development, confirming the points to consider for ecosystem, developers can reduce the impact on the natural environment caused by their development projects.

5. Contents of expert dispatch system

To implement these "Aichi methods", we have formulated the "Guideline for conservation and restoration of the natural environment". Based on the guideline, the expert dispatch system was established. Experts for raising the quality of the green area are appointed by the governor and dispatched to the site at the time of land-development to implement advice.

5.1 Flow of expert dispatch system

The flow is as shown in Fig.1.
Two experts are dispatched, which is a one-day tour.
Experts advise directly on the scene and submit reports and proposals to the prefecture. The prefecture adds its own views to it and hands it to the business operator.

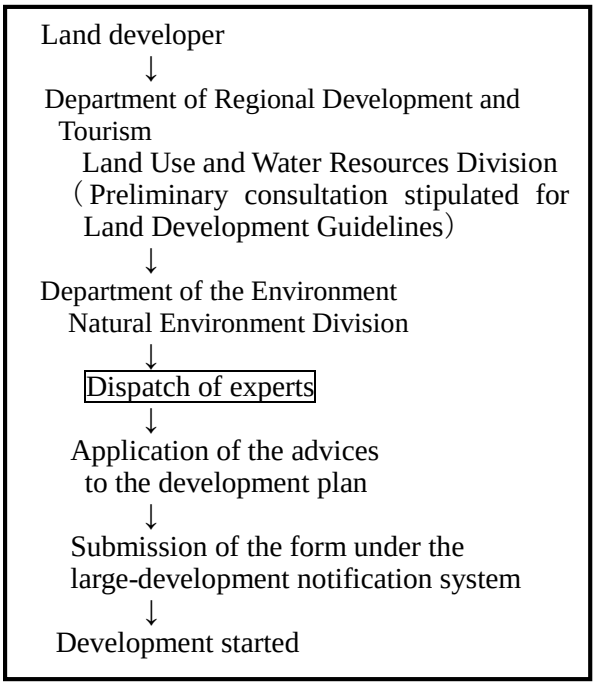


Fig.1 Flow of expert dispatch system in Aichi Prefecture

5.2 Experts to be dispatched

A promotion committee was established to realize "Aichi Biodiversity Strategy 2020". A total of 18 members of that member, three women, and fifteen men, are professionals who raise green quality.
Its expertise includes ecology, researchers of plants, animals, biotope managers and so on.
I am appointed to this member as a biotope manager.

6. Questionnaire on expert dispatch system

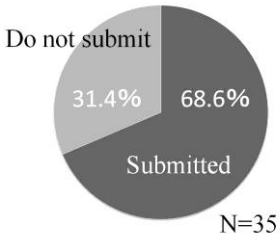
In July - August 2016 Aichi Prefecture conducted questionnaires on survey on implementation of “Guideline for conservation and restoration of natural environment”.

This questionnaire was conducted for organizations (developers, municipalities, etc.) who wish to submit 63 notification of large-scale development from April 2013 to July 2016. The number of responses was 35 organizations, including public entities 14 and private

enterprises 21, with a response rate of 56%. In the questionnaire, the results on the expert dispatch system are as follows.

6.1 Submission notification of large-scale development

Of the 35 organizations, there were 24 organizations (68.6%) who notify large-scale developments. (Fig. 2)

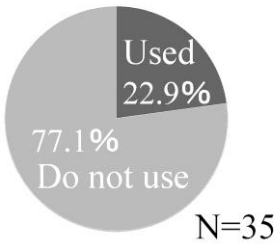


*Drawing from Aichi Prefecture : Efforts survey based on guidelines for preservation and revitalization of natural environment.

Fig.2. Submit large scale development notification

6.2 Use of expert dispatch system

There were only 8 groups (22.9%) using the expert dispatch system (Fig. 3).



*Drawing from Aichi Prefecture : Efforts survey based on guidelines for preservation and revitalization of natural environment.

Fig. 3 Use of expert dispatch system

6.3 Effect of utilization of expert dispatch system

50% was evaluated as effective. The reason for "I do not know" 37.5% is because it takes time until the living things are confirmed after greening (Fig. 4).

*Drawing from Aichi Prefecture : Efforts survey based on guidelines for preservation and revitalization of natural environment.

Fig. 4 Effect of utilization of expert dispatch system

6.4 Reason for not using expert dispatch

"We did not know the expert dispatch system" 14 (51.9%), "No guide or suggestion of expert dispatch system" 10 (37.0%). For the other two cases, the reason was that there was no applicable expert dispatching system because it was not before and the "guidelines for preservation and rehabilitation of natural environment" was not formulated. (Table 2)

Table 2 Effect of utilizing expert dispatch system (multiple answers)

N=27

		Number	%
1	I did not know the system	14	51.9
2	There was no information	10	37.0
3	Because the number of items to be addressed increases when using the system	3	11.1
4	I cannot afford the time	6	22.2
5	I feel resistance to the proposal by the system	1	3.7
6	There is no corporate culture	1	3.7
7	The development plan is already based on expert suggestions and knowledge	3	11.1
8	It is not legally binding	2	7.4
9	other	2	7.4
	total	42	

*Drawing from Aichi Prefecture : Efforts survey based on guidelines for preservation and revitalization of natural environment.

6.5 Reason for adopting expert's proposal

Three cases, "The expert's proposal was practicable" 4." Initiating in accordance with the measures of the country and prefecture ", accounted for 63.6% (Table 3).

6.6 Reason for not adopting proposal from expert

"There was no time to accept"8. "Not legally binding" 4. "Proposals did not match the profit" is 2. "Proposal cannot be realized" is 0 cases. For the other

two cases is "There is no applicable" and "The project ended at the time of knowing the system" (Table 4).

Table 3 Reason for adopting expert's proposal (multiple answers)

N=11

		Number	%
1	Proposals etc were realizable	4	36.4
2	Proposal by experts was within budget	0	0.0
3	The charm of the development program improves	0	0.0
4	I had time to accept	0	0.0
5	In-house understanding was obtained	0	0.0
6	There was not a feeling of resistance	1	9.1
7	To implement initiatives that are in accordance with the policies of the country and prefecture	3	27.3
8	I wanted to do social contribution project	0	0.0
9	Other	2	18.2
10	Unanswered	1	9.1
	Total	11	

*Drawing from Aichi Prefecture : Efforts survey based on guidelines for preservation and revitalization of natural environment

Table 4 Reason for not adopting proposal from expert (multiple answers)

N=21

		Number	%
1	Proposal by experts was impossible to realize	0	0
2	Proposal by experts was over budget	2	10.5
3	Because items to be addressed increased	1	5.3
4	Because I did not have time to accept	8	42.1
5	In-house did not gain an understanding	2	10.5
6	For planning based on suggestions and findings by another expert	2	10.5
7	Because it is not legally binding	4	21.1
8	Other（It was too late when I knew about that system）	2	10.5
	Total	21	

*Drawing from Aichi Prefecture : Efforts survey based on guidelines for preservation and revitalization of natural environment

6.7 Things necessary for promotion of Aichi Mitigation

"Foundation of subsidy system and tax incentive system" is 22. "Reduce the green area ratio for the developers" is 6. "Low construction costs" is 5. Voices calling for beneficial monetary were high from the implementing business. (Table 5)

Table 5 Things necessary for promotion of Aichi Mitigation (multiple answers)

N=44

		Number	%
1	Foundation of subsidy system and tax incentive system	22	62.9
2	Information dissemination introducing developers	3	8.6
3	Low construction costs	5	14.3
4	Initiatives in Public Works Initiatives	2	5.7
5	Establishment of legally binding system	2	5.7
6	Reduction of green area rate by providing funding to mitigation banks	2	5.7
7	Reduce the green area ratio for the developers	6	17.1
8	Other	2	5.7
	Total	44	

*Drawing from Aichi Prefecture : Efforts survey based on guidelines for preservation and revitalization of natural environment

7. Current status and issues of expert dispatch system

The expert dispatch system is a simple mechanism that allows experts and land developer to discuss directly to improve the quality of the green area. Extract the current situation and issues.

7.1 Usage situation of expert dispatch system

The expert dispatch system began in April 2014. In

the four years up to March 2017, the number of notification of large-development of 1 ha or more was 181 (including notification of 80 due to content change). On the other hand, the number of dispatched experts was 22 in 4 years. In the first year (2013) the utilization rate was 47%, but in 2016 it fell to 8.6% (Table 6).

Table 6 Usage situation of expert dispatch system

Year	Number of dispatched experts (A)	Notification number	Development only (B)	A /B (%)
2013	9	31	19	47.4
2014	4	40	24	16.7
2015	6	46	23	26.1
2016	3	64	35	8.6
Total	22	181	101	21.8

＊ Year : March of the previous year ～ December of the same year

7.2 Barriers issued by experts

1) Because of one-time field visits, there is a possibility of superficial advice.
2) Since experts are not involved in detailed design, there is a possibility that a method different from advice can be used.
3) There is no opportunity to verify the result whether the advice was actually carried out.
4) It is good to visual the contribution to the natural environment to the area by formulation as form.
5) Consideration for experts is too low. Dispatched experts are required to submit a proposal in addition to the inspection of the day. Preparation of reports and proposals is free.

7.3 Barriers issued by land developers

1) In the case of detailed design, we cannot consult with experts at no charge.
2) As native plant seeds and seedlings are not sold, they will plant horticultural species.
3) I am not confident of maintenance etc of the plant planted.

7.4 Barriers issued by the administration.

1) Budget is necessary to implement expert dispatch system. The administration needs to save the budget for this every year, but it is not ensured. Therefore, we cannot dispatch unless we have a budget.
2) Land developers have to go to two departments. Within a limited time, there is no enough time to fully hearing the expert dispatch system. Therefore, it is difficult for land developer to know the existence and significance of it.
3) Mitigation is not obligated. It is carried out on voluntary basis. Dispatches of experts can be only accepted by “good” developers.
4) When planting, the prefecture will recommend native plants matching locality. Conversely, it is difficult for other native plant species to be considered.

8. Proposed mechanism

Based on the above results, we propose the following five points

1) New mechanism to increase users of expert dispatch system
2) New mechanism of expert dispatching system where effective
3) New regulations on the quality of green spaces
4) New mechanism to conserve and supply native species in the region
5) Continuous new budget formulation

8.1 New mechanism to increase users of expert dispatch system

Because governmental departments in charge of

urban development do not know the dispatch expert system in many cases, this system are not well used. Because the department in charge is different, it is inferred that sufficient enlightenment was not made. There is no enlightenment pamphlet of expert dispatch system. I would like to create a brochure and actively use it when the development company inquires to the Promotion Department. Also, it is good that businesses using this system can feel the merits. For example, it is desirable to have benefits such as publicity on initiatives that fulfill recognition and social responsibility (CSR), preferential treatment at the time of bidding, tax incentives, etc.

8.2 New mechanism of expert dispatch system where effective

Experts' proposals have short-term goals and long-term goals. A long-term goal clarifies the vision and results are obtained in a few years or decades, while a short-term goal is to be effective in one year or so. And by creating a road map of a project considering the experts' proposals, the persuasive power to the business will increase and the possibility that the citizen will adopt the proposal will increase.

It is even better if land developer invite experts dispatched during the detailed design. More desirable is, as practiced in Switzerland (Hasegawa.2016), to involve those experts in the project team from its initial stage.

8.3 New regulations on the quality of green areas

Apart from the Red List (a list showing the extent of extinction risk), together with regional stake folders, we give candidates for animals and plants to protect and conserve. We define this as "wildlife protection candidate list".

By expert advice, the necessary biotope is proposed. Its purpose is to protect and conserve the species listed on both lists. By doing so, it is possible not only to effectively improve the quality of the green space but also to reduce frictions with the stake folders.

In order to enhance the quality of the green areas associated with land-development, we propose the following priority:

1) Japan's inherent endangered species
2) Threatened species
3) Species unique to Japan (common species and unlisted in the red list) outside of designated with endangered species.
4) Common species in the surrounding areas outside of designated with endangered species.
5) Native species in Japan
6) As an exception, invasive species, horticultural species, breeding species (animals)

Native species of common species are not worthless. Even if they are common species, there is a high risk of migrating to endangered species by various developments. Therefore, during existing as common species, it is important to secure its habitat as compensation for land development. The existence of diverse common species makes it easy for many other organisms to live. It is necessary to prepare an environment where common species can grow and habitat are kept stable. In addition, in the industrial premises where entry into the premises is severe, the risk of being stolen is low, so conservation of the species specified of the Red List is effective. It becomes a major social contribution for developers, it is recognized by the society as a favorable company, and it also makes us proud of our employees.

8.4 A new mechanism to conserve and supply native species in the region

In particular, traditional wild plants are not only sold not because they contain a lot of unnoticeable flowers. They are easily eradicated as weeds.

Therefore, even if experts advise planting of native

species, they are often not available. By positively planting and maintaining traditional wild plants within the area, it becomes a source of seed. For example, it is in local schools, corporate greenery, street trees and parks. Not only did the conservation area increase when introducing the native species at the time of land-development, it will become a source of species (animal and plant species) in the future. Furthermore, it becomes possible to raise awareness of the local people to the native species.

In order to realize this movement, the existence of an appropriate organization is indispensable. In other words, it is an organization that knows where animals and plants of native species live. In addition, when there are requests from experts, a system that can supply necessary native species is necessary

8.5 Continuous new budget formulation

The present expert dispatch system requires annual budget request by department of the environment of Aichi to prefectural assembly. Therefore, we cannot send experts unless we get budget. It is not a framework of the budget of the Environment Department for each fiscal year but a budgetary measure that can dispatch experts on a continuous basis is necessary. At the time of development of more than 20 ha, we are requesting developers to investigate experts, but in the future they should be expanded at development time more than 1 ha.

If it is difficult, we should establish an organization that understands regional nature and dispatches experts from that organization, getting another budget.

9. Conclusions

The expert dispatch system has made it possible to introduce new perspectives of the quality of the green space and the preservation of the natural environment of the area at the time of land-development. However, there is no legal binding power for improving quality. Therefore, by presenting benefits to businesses that accepted the proposal, it will be easier to accept expert advice.

In Japan, including Aichi prefecture, the goal (short term and long term) is often unclear. In other words, only the means walks alone. This is like walking the road without a goal, which is very inefficient. Here, the idea of back-casting should be introduced. As a result, even if the person moved, the goal will not be shifted no matter how much time passes, and verification/correction will be easy.

Currently, the administration in Aichi Prefecture divided the prefecture into nine blocks, and set up an "ecosystem network council" in order to preserve and conserve each regional characteristic. Many of the experts dispatched are members of this council. One of the experts to be dispatched in the future should be an expert within the council of the area to be developed. The prefecture (the Department of Environment and Department of Promotion) and the council will be able to take precise actions to protect and preserve the natural environment of the region by sharing the content proposed and practiced by experts.

In Japan (excluding the Northern Territories) are Biodiversity Hotspots. Biodiversity Hotspot refers to a place where more than 1,500 unique plant species have been destroyed and more than 70% of the original nature has been destroyed. 34 places, 2.3% of the ground surface area are designated as the place to protect and preserve the world first (Conservation international). Most of them are developing countries. And, in developed countries only Japan is designated the whole land as a hotspot. However, many Japanese live in cities, have little recognition of living in biodiversity hot spots, and lack consciousness to conserve biodiversity. Therefore, it is important to raise interest in the surrounding natural environment.

Such a council is the first attempt in the world. With the leadership of the Aichi prefectural government

administration, local municipal administration, companies, residents, and experts join together to protect and preserve the natural environment of the area.

Although I have just started in Aichi Prefecture, I hope that it will be successfully operated. Then, residents in the area can quickly notice abnormalities in the natural environment close to us and implement countermeasures.

In the future, land-development is expected to progress further in developing countries. In doing so, I hope that this research will be useful as a way to balance development with the natural environment.

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