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The Purpose of Roadside Trees

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ABSTRACT

Roadside trees are planted along streets and roads in urban areas with a variety of purposes, such as improving the landscape and mitigating the effects of vehicle exhaust emissions. Nonetheless, in recent years, it has been frequently observed that roadside trees or their branches and leaves are cut or thinned because of the disadvantages they pose, thereby reducing the number of trees. We believe that roadside trees have both advantages and disadvantages, therefore, in this paper we discuss whether or not it is better to do without roadside trees and their branches and leaves altogether.

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INTRODUCTION

Roadside trees are planted along streets and roads in urban areas. In Japanese, the expression "namiki" (literally: row of trees, or lined-up trees) refers to trees standing side-by-side along streets. Because many trees stand side by side along roads in urban areas, such roadside tree groups are sometimes called city lined-up trees. Roadside trees serve several purposes, such as improving the landscape and mitigating the effects of vehicle exhaust emissions. Further, many roads are purposedly maintained owing to the effects of plants on people. Thus, for example, flowerbeds and grass are planted and meticulously conserved, although they are not roadside trees. In Japan, just as urban areas have developed public places where greenery (i.e., green spaces) is intentionally planted, many roads are also greened, as is the case with roadside lined-up trees[1)]. However, in recent years, it is often seen that the shortcomings of roadside trees are frequently emphasized over the advantages attributed to them, and whole trees or their branches and leaves are cut or thinned out, effectively limiting the number of trees. Thus, for example, when many wild birds perch on branches, the high peach of their voices becomes a noise and their droppings may cause damage to passersby walking under the trees. As roadside trees are thought to have both advantages and disadvantages, this study examined whether it is better to eliminate roadside trees altogether, with their branches, and leaves. Additionally, we provide our views on whether trees should be planted along roads when new roads are constructed. Whether or not street trees should be eliminated depends on what is considered as their advantages and disadvantages. However, as it seems that what is emphasized depends greatly on the occupation of the reader and the living environment, this paper will limit itself to summarizing our views on this issue.

Effects of roadside trees

Roadside trees have been used for various purposes since ancient times. If we look back at the history of Japan, according to a record, around the 7th century, Empress Komyo the spouse of Emperor Shomu, planted peach and pear trees along roadsides in public places to prevent the poor from starving to death[2)]. Previously, a tree-lined road was made with camphor, mulberry, tachibana, and willow trees to distinguish between roads and guide people[3)]. Two centuries later, a record dating back to the 9th century, cites that the famous military commander Nobunaga Oda

built a tree-lined street to ensure safe and comfortable transportation for travelers; presumably, in view of the fact that trees provide shade to prevent sunstroke, falls from cliffs, as trees mark the extent of roads and prevent falling rocks from hitting people, and protect against wind and snow.[3)] In addition, pine, cedar, and zelkova trees were planted during the Edo period as markers, or guideposts to indicate travel distances and resting areas[2)].

Table 1 summarizes the effects (advantages) of roadside trees frequently mentioned today. The main purpose of roadside trees is to improve the landscape, and preserve and embellish our living environments. Even if not a tree, the presence of greenery (plants) calms and soothes people's hearts and minds, bringing about the same relaxing effect as the so-called ‘shinrin yoku,’ or ‘forest bathing.’ Furthermore, plant leaf photosynthesis plays a major protective role. Specifically, gas emissions from running cars contain carbon dioxide, dust, and trace amounts of hazardous chemicals. Tree leaves absorb much of this pollution and use some of the chemicals in their biological processes or simply sequester them, thereby effectively reducing their presence in the air and their harmful effects on public health without diffusing hazardous substances to other places.

Harmful effects of roadside trees

However, there are also legitimate reasons for believing that it might be better to eliminate roadside trees or replace commonly planted species with others. An overview is provided in Table 2. The main reason is that damage increases in the event of a disaster, and as trees are living organisms, they grow and change in size, increasing their height and the number of branches.

As for the impact in case of disaster, when roadside trees fall down at the time of a disaster, the damage of the disaster itself increases. Fallen trees disrupt traffic by blocking doorways and roads, and causing traffic jams, which in turn hinder evacuation and rescue activities. Roadside trees with branches and leaves are more susceptible to wind than traffic lights, utility poles, and streetlights, as these man-made objects have already been improved against the effects of wind. Roadside trees can fall within artifacts[3)]. Owing to these risks, many local governments prune trees before typhoon (strong winds) season. In the case of a typhoon or sudden torrential rain, it is difficult to prune trees in advance to control the damage, while excessive pruning damages

trees, which is equally undesirable. During disasters, such as typhoons and earthquakes, the resulting fallen branches and leaves cause flooding of fields and roads, and they obstruct the passage of emergency vehicles such as ambulances and rescue workers, thereby hindering rescue activities[3)].

Roadside trees grow over time, becoming taller and increasing their branches and leaves; moreover, these changes can have negative effects. Thus, for example, roadside trees can narrow the roads and interfere with smooth traffic[1)]. As some people are opposed to cutting down trees, when roadways, sidewalks, and motorways are expanded and maintained, trees are transplanted, which is often very difficult to accomplish; therefore, maintenance may be hindered. Additionally, the branches of roadside trees sometimes obscure buildings, and block signboards and signs for moving vehicles. Although a certain amount of shade is necessary, excessive shading increases the need for lighting and lighting costs, hinders the growth of other plants, and lowers solar power generation. As tree roots extend, the ground may be raised, and the road surface and sidewalks may become uneven and damaged. To make things worse, due to increasingly precarious financial conditions, some local governments are unable to allocate the necessary resources to conduct inspections, pruning, and cleaning. Additionally, traffic is often obstructed during the course of these operations. Lastly, many wild birds use road trees for shelter, and can in fact turn quite noisy with their loud chirping; furthermore, they can cause damage and hurt passersby owing to falling feces and airborne infectious diseases. Covering and thinning of branches is sometimes performed to reduce the number of, or eliminate places where these birds can find shelter.

CONCLUSION

Here, we have aimed to extensively explain the advantages and disadvantages of roadside trees. Depending on which content should be emphasized, a person can conclude that new roadside trees should not be planted, or that roadside trees should be maintained as they are. Even without knowledge of the details, many citizens agree that it is better to have roadside trees than not to have them (Fig. 1). These people remind us that roads are meant not only for cars, but for walking and bicycling as well, that a pleasant scenery and being able to feel close to plants can have a large positive impact at large. In contrast, heavy pruning, whereby almost only the trunk

remains after many branches and leaves are pruned, and the view without roadside trees constitute a negative image with no beauty in it that cannot have a positive effect on people´s state of mind[4)].

There are several points to note in these remarks: Many people use roads planted with roadside trees or just look at them, and few people live nearby or actually suffer from disasters[1)]. There is a possibility that people's impressions would change greatly depending on whether they live near a street with line-up trees. However, regardless of whether they take into account living in the neighborhood or not, it seems that many think it is better to have trees along the streets[5)].

While considering what people have in mind when they favor the thinning of branches and leaves while maintaining the trunk of a tree, it is true that too many branches and leaves obscure road signs and obstruct traffic. However, branches and leaves also block direct sunlight and prevent heat; therefore, if people want to enjoy their benefits, it is not conducive to thin them excessively. Further, depending on the ideas and budget of the local government, there are cases in which excessive pruning is conducted with the anticipation that leaves and twigs will increase over time after several months. Moreover, in some cases, only the trunk is left to maintain the name of the roadside tree. Owing to the difficulty of repeated pruning, it appears that dropping almost the entire branch at once is more convenient.

When it comes to considering the significance of cutting the entire tree as a result of its growth, we must remember that roots are continuously enlarging and often come to hinder passage, making maintenance an even more difficult task (Table 2). Additionally, trees may become decrepitated, insect pests may live inside the tree, which may become diseased, or insects may enter a pathological state because of stress[6)]. The idea is that people take measures in advance rather than allow trees to collapse naturally at any time without warning. Considering all these factors, it may be necessary to build a good relationship with roadside trees. The decision to plant new road trees is determined by the financial situation of the local government. This is because, in addition to planting the trees, maintenance costs are high. One way to reduce the frequency of felling as much as possible is to carefully consider the tree species to use as roadside trees[7)]. The degree of growth varies depending on the local climate. If people do not want to dispose of fallen leaves, they can select as many evergreen trees as possible. If people

want to see greenery all the time, one way is to plant different tree species. Planting only one type of ginkgo or zelkova tree may contribute to differentiate the area from others or to turn it into a tourist destination, as for example, if the name of the tree is attached to the name of the street) [1]. It is thought that the diversification of street tree species will increase in the future[7]. However, in many cases, the benefits of roadside trees cannot be obtained unless pruning is performed (Table 1), because sunlight cannot be blocked and leaf photosynthesis cannot efficiently occur under excess shading. We conclude that, by choosing the best type of tree to plant along roads based on a thorough understanding of its needs and growth habit and phenology, it is possible to prevent situations such as cutting it in the middle and meet the needs of those who want to enjoy the benefits associated with road trees[8]. As shown in Table 1, it is necessary to thoroughly understand the significance of roadside trees, and maintain and manage them properly.

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Table 1 Effect of roadside trees

Large category	Middle category	Small category
Landscape improvement*	Formation of a good landscape* Creation of a beautiful tree-lined road* City and street symbols and landmarks Blindfold effect	
Living environment conservation	Noise reduction* Air purification	Mitigation of heat island effect Carbon dioxide absorption
Green shade formation	Block direct sunlight Reduce heat* Prevent snowfall Keep strong winds down Prevent dust Keep out the rain	Reduced cooling costs*
Traffic safety	Block out glare Prevent the influence of headlights Struts and guardrail effects	Separation of sidewalks and roads*, aid in identification* Prevent cars from entering sidewalks Prevention of on-street parking
Natural environment conservation	Prevent soil erosion	
Disaster prevention	Prevent flying sand Prevent a snowstorm Prevent the spread of fire	
Economic benefit*	Contractors for planting and pruning benefit Simple pruning and cleaning of dead leaves of deciduous trees can also be used by silver human resources	

* Roadside trees may have both beneficial and harmful effects.

Based on references 3), 6), and 8).

Table 2 Harmful effects of roadside trees

Classification	Overview
By fallen tree	Roadside trees fall down (break) due to strong winds, earthquakes, disease (life expectancy) and snowfall, and may take the lives of pedestrians and damage buildings and cars.
Flood damage	During typhoons and torrential rains, roadside trees drop their branches and leaves due to rainstorms, clogging drainage ditches on the roads, causing flooding and flooding, and causing flood damage (extending damage).
By falling objects	Street trees may drop fallen objects naturally or due to strong winds, accumulated snow, or disease.
As an obstacle	Street trees make traffic lights and road signs difficult to see, they block light from streetlights and make it hard to see people (children) and animals (wild animals) jumping out. When entering or exiting a car, they reduce visibility, block visibility, and cause accidents.
During rescue operations	In the event of a fire in a house, roadside trees can interfere with water spraying to extinguish the fire (water spraying position angle etc., are restricted, making it impossible to spray water from the best position) and rescue activities using ladder trucks.
Against sunshine	Roadside trees have shade effects such as preventing temperature increase of roads and neighboring buildings, but their branches and leaves can cause problems with sunlight (sunshine disturbance).
By roots	Due to the growth of the roots of roadside trees, troubles such as clogging of sewer pipes due to roots entering through joints of sewer pipes often occur.
About ventilation	Roadside trees make it difficult for air to pass through, which can affect room ventilation.
About maintenance	Trees on roads require more careful maintenance than trees in forests and parks in terms of safety, ventilation, falling objects, and root damage. For this reason, the cost of maintenance per tree is usually higher than that of trees in forests and parks.
Against radio waves	Roadside trees can cause poor signal reception (radio interference) and interfere with TV reception.
By pollen	Since pollen is an allergen, roadside trees that scatter pollen may cause allergies attacks such as hay fever and asthma in some people.
Regarding the view	Roadside trees can impair the view from windows.
Against the landscape	Planting trees that do not suit the landscape or environment, planting them in inappropriate locations, or neglecting their maintenance can cause the landscape to deteriorate.
By the animal	Pests such as caterpillars can occur in large numbers on roadside trees. Bird and cicada droppings and urine also cause harm.
By drugs	Pesticides and insecticides are sometimes sprayed on roadside trees as a countermeasure and prevention against pests and diseases. The chemicals used can have an adverse effect on people, the animals and plants they grow.
Becoming a famous place	Roads lined with beautiful trees, such as cherry blossoms and trees lined with lights, and tree-lined roads that have been used as filming locations or models for literary works, movies, dramas, manga, and anime, have become tourist destinations, attracting many onlookers. As a result, traffic jams, noise and garbage problems may occur.

The main complaints are summarized.

Based on references 3), 5), and 8).

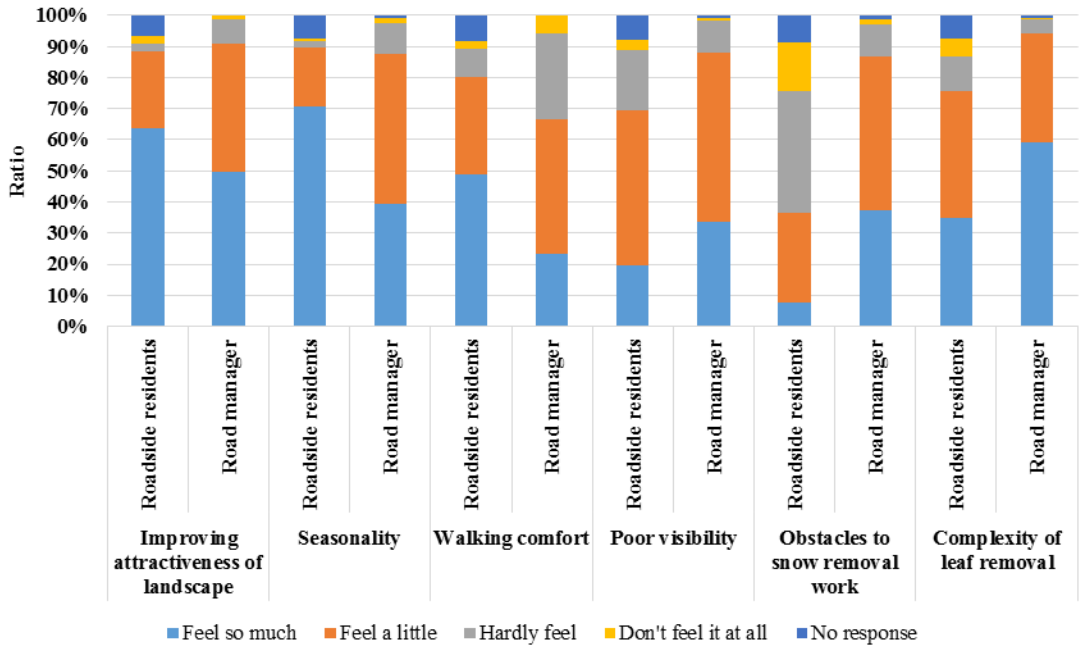

Fig. 1 Evaluation of roadside trees by roadside residents and road administrators

In February 2009, a questionnaire survey was conducted by mail with 2,400 residents in two districts of Hokkaido and by e-mail with 233 road administrators.

Based on the data in reference 5).