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# Payment for ecosystem services in Japan

## Contents

Japan indicated[1] that some cases have been introduced at the following website: http://www.biodic.go.jp/biodiversity/shiraberu/policy/pes/en/index.html

## Conserving water through upstream-downstream relationships

Mountains stretch vertically from north to south in the center of the Japanese archipelago. The forests which cover these mountains absorb rainwater through pores in the sponge-like soil, therefore purifying and retaining rainwater. Also, when water permeates through the soil, it passes through rocks and stones which enrich it with minerals, producing good-tasting water. Water originates in the mountains and flows through river and groundwater systems out to the ocean, providing drinking water and water for agricultural and industrial use along the way, as well as supplying the minerals that ocean organisms need for their development. It is important for man that forests, rivers and groundwater veins maintain these functions.

In Japan, communities along many river systems have sought ways to involve downstream beneficiaries using the river water in activities upstream to maintain and manage forests. Such efforts date back to the end of the 18th century, when waterworks and electric power companies offered grants to upstream forestry workers for their afforestation and silviculture activities (Kumazaki, 1984). Today, a diversity of undertakings is seen in different river systems.

This section will introduce two transborder water conservation efforts in which downstream beneficiaries of the water source recharging services and water purification service, provided by forests, have assumed the costs required to maintain and manage forests upstream. It will also introduce the groundwater conservation efforts of a private company that uses pumped up groundwater to return the same amount of water into groundwater veins.

## Yahagigawa River water source forest profit-sharing afforestation project

•Year started: 1991

•Location: Water source area of Yahagigawa River on the northern slope of Mt. Chausu

•Actors: Anjo City, Aichi Prefecture and Neba Village, Shimoina County, Nagano Prefecture

Background

The Yahagigawa River runs through three prefectures, namely Nagano, Gifu and Aichi Prefectures, out to the Mikawa Bay, which is connected to the larger Ise Bay on its west side. It is 117 kilometers long, and its river basin (River basin area refers to all land surfaces from which rainfall is drained into a river system and is separated from adjacent basins by a drainage divide) covers an area of over 1,800 square kilometers, with two villages in Nagano Prefecture and two cities in Gifu Prefecture located in the headwaters, and eighteen municipalities in Aichi Prefecture, in the middle and lower basins.

[1] Japan (2012). Preliminary Report for the “Strategy for Resource Mobilization”, submission to the Secretariat of the Convention on Biological Diversity

From the mid-1960s, the river became contaminated as a result of industrial discharge and golf course development in the upper basin area, therefore inflicting damage to rice crops and coastal fisheries and triggering a conflict of interests among upper and lower basin communities. In order to resolve these issues, in 1969, eighteen organizations, namely six agricultural organizations, seven fisheries organizations and five municipalities, downstream joined hands under the common slogan - one river basin, one destiny - to organize the Yahagigawa River Basin Water Quality Conservation Committee. Their campaigning resulted in a water basin management system guided by public initiative in which local administration is required to consult with the committee before implementing any development projects in the river basin. This method came to be known as the "Yahagigawa Method" and presented a model for other similar campaigns to follow[2].

Neba village, located in the uppermost part of Yahagigawa River, joined the Yahagigawa River Basin Water Quality Conservation Committee in 1979, after which Neba Village has lent land to Anjo City's Mt. Chausu Outdoor Recreation Center and has won the support of people from Anjo City in its "Furusasto-no-Mori Profit-Sharing Program[3]." Therefore, a good relationship was fostered between the two municipalities located at both ends of the river.

Outline

In Neba Village, the local forestry office began planting forests for timber in the Taisho era (1911-1925). In the mid-1950s, the forests were ready for cutting, and the local forestry office began to harvest the timber. Until the mid-1960s, in particular, the village prospered on timber profits of hundreds of millions of yen. However, the deregulation of wood imports in the 1960s caused wood prices to drop, and the village was no longer financially capable of restoring the land that would be returned to it after the forests were completely cleared. Furthermore, the disadvantages of tree felling, including the destruction of the landscape, avalanches and the degradation of water source areas, were also revealed, and immediate countermeasures were called for.

Neba Village decided to cancel future logging operations in 48.21 hectares of forest that had been scheduled to begin in 1991. However, the village could not convince the local forestry office to suspend its plans and finally decided to purchase the local forestry office's rights for 101.12 million yen in

[2] The Yahagigawa Basin Water Quality Conservation Committee established the Yahagigawa Basin Exchange Promotion Organization for the purpose of coexistence in the Yahagigawa river basin and regional development in 1991. In 1978, Aichi Prefecture and twenty municipalities in the prefecture established the Yahagigawa River Water Source Fund, which is operated on interest on a fund of 585 million yen comprising contributions from each local government and annual contributions totaling 40 million yen. The fund grants financial support to municipalities undertaking water source management projects, research and exchange programs, in the Yahagigawa river system.

[3] A program to plant a forest mainly of hinoki cypress on 10 hectares of land offering 150 shares of profit at 600 thousand yen per share. Under the program, after thirty years, the village and the membership, collectively, would be entitled to 50 percent of profits, respectively.

compensation for its share of prospective profits from selling Japanese cypress timber among others, in order to promote forest conservation plans to recharge water recharge and control erosion.

Neba Village asked Anjo City, with which it shared a long history of cooperation in watershed management, to jointly manage the forest, later named the "Yahagigawa River Water Source Forest," under a profit-sharing afforestation scheme[4]. Acknowledging the need to conserve the forests in the headwaters of the Yahagigawa River, Anjo City agreed and signed an agreement to purchase the rights of the local forestry agency. The profit-sharing afforestation agreement was the first contract of its kind to be concluded after the Forest Act was amended in 1991 to include the promotion of forest management agreements. The main elements of the agreement are provided below:

1) Anjo City will pay Neba Village a total of approximately 145 million yen to cover stumpage prices and rent.

2) Stumpage shall not be felled for thirty years (through March 31, 2022).

3) All forest management costs, including costs required for tree thinning are shared between the two municipalities. Any profits gained upon selling lumber are also divided.

**Payments for ecosystem services:**

145 million yen (the equivalent of estimated profits that would have been gained by local forestry office + land rent[5]

### River basin tariffs for trans-border water source management in Fukuoka City

•Year started: 1997

•Location: Fukuoka City, 17 local governments in Oita & Kumamoto Prefectures

•Actor: Fukuoka City Waterworks

**Background**

Fukuoka City is the only major city in Japan without a first-class river flowing through the city. It has relied on intake from the Chikugogawa River running outside the city, seawater desalination and dam developments in and outside the city (five out of eight dams being located in neighboring municipalities).

[4] A scheme under which forest owners, parties planting and managing the forest and parties assuming the management costs conclude a two-way or three-way contract in which a forest is planted, managed and felled, after which profits are shared among the parties.

[5] An equivalent of land rent for approximately 48 hectares of land for 30 years. By paying the land rent, Anjo City gained superficies on the land.

However, faced with the problems of an aging and declining population and forestry workforce as well as stagnant wood prices, the water source forests have become degraded, therefore impairing their water recharge functions to the extent that maintaining a stable water supply has become jeopardized.

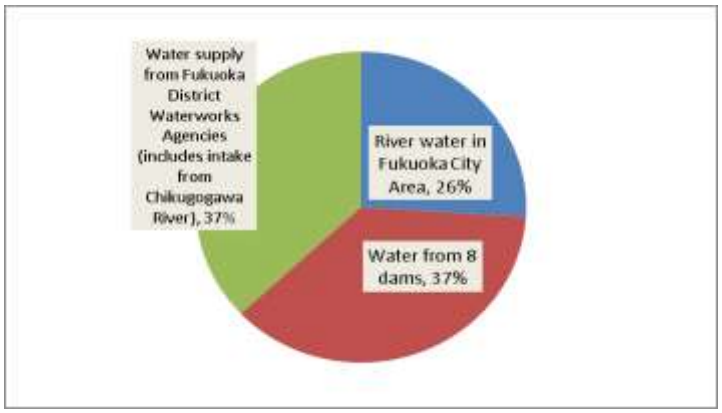



Figure 1. Water intake by source (based on average of 2004-2008)

**Outline**

Against this backdrop, Fukuoka City established the Fukuoka City Foundation for Water Resource Preservation Projects in 1997. It was built upon Toyota City's pioneering example[6] and reserved 1 yen – 0.5 yen from water charge revenues and 0.5 yen from the city's general account - per ton of water consumed in the city from 1997 through 2006 in a water source conservation fund (fund balance approximately 1.06 billion yen as of March, 2009). It currently allocates 100 million yen from the fund annually for the projects named below.

The fund is used to improve water source forests and to implement exchange programs and collaborative projects with headwater areas in order to improve water recharge capacities, revitalize headwater areas and enhance partnership and mutual cooperation among local governments located upstream and downstream. Furthermore, the city promotes programs that seek to raise awareness among the citizens of Fukuoka, located downstream, of the current status of the city's water sources and the importance of water.

- Improving water source forests

Fukuoka City improves water source forests in catchment areas (Extent or area of land where rainwater drains downhill into a dam body of water) near the dams developed within the city to source drinking

[6] Toyota City Fund for Water Source Recharge Project collects an add-on of 1 yen per each ton of water consumed to be reserved in a fund designated for water source conservation and water quality management. Consumers can witness the odd pricing on their water bills and therefore be conscious of the fact that they, as beneficiaries, are shouldering a part of the water source conservation activities. Fukuoka City's approach differs from that of Toyota City in that it considers the costs for watershed protection inclusive of the water tariff instead of imposing an extra fee.

water only, namely the Magaribuchi, Sefuri and Hase Dams, by planting broad-leaved forests, clearing underbrush and tree thinning. For local dams, the Waterworks Bureau is engaged in efforts to purchase forests in catchment areas in order to enhance water recharge capacities and prevent water contamination from excessive development. As of fiscal 2008, approximately 30 percent (505 hectares) of the catchment areas of the three local dams has been bought by the city. For the appropriate management of these forests, the city formulated the Fukuoka City Water Source Forest Management Plan covering 60 years in fiscal 2004.

1) Magaribuchi Dam: The water source forest stretches over approximately 1,000 hectares, 40 percent of which is owned by Fukuoka City. Planted forests account for 60 percent, another 60 percent of which are young trees aged under 40 years.

2) Sefuri Dam: The water source forest covers an area of approximately 510 ha, approximately 50 percent of which is privately owned. Fukuoka City possesses only 4 percent. Seventy percent of the forest has been planted.

3) Hase Dam: The water source forest covers an area of approximately 130 hectares. Fukuoka City owns approximately 40 percent. Planted forests cover approximately 30 percent of the area and 80 percent of the entire forest area are aged trees of over 40 years.

Water source forests located outside of the city are managed with the cooperation of local governments.

- Exchange program with water source area

In pursuit of fostering close relationships with water source areas, Fukuoka City invites its citizens to take part in silvicultural management activities and events to dig for potatoes or make rice-cakes with local people. It also offers grants (up to one-half of total costs with a maximum of 500 thousand yen) in support of civil activities to plant trees and clear underbrush as well as other interactive programs.

- Contributions to Fund for River Basin-based Partnership among Municipalities in the Greater Fukuoka Area[7]

Fukuoka City contributes to a fund established by the Partnership for Public Administration in the greater Fukuoka area to cooperate with neighboring local governments in shared activities in water source areas.

[7] Established in 2005. Nineteen municipalities of the greater Fukuoka area jointly engaged in projects for common water sources or river basins. Funding is provided for programs to strengthen ties with inhabitants of water source areas through recreation events and water source management projects as well as grants for environmental NPOs. Sixty million yen is collected annually (30 million yen is accumulated and 30 million yen is allocated to projects), 40 million yen of which Fukuoka City contributes. Fukuoka City Fund for Water Source Recharge Project accounts for 32 million yen and the remaining 8 million yen is provided from the city's general account.

## Conserving water by recharging groundwater in Kumamoto

•Year started: 2003

•Location: Middle basin area of Shirakawa River in Kumamoto Prefecture

•Actor: Semiconductor manufacturer

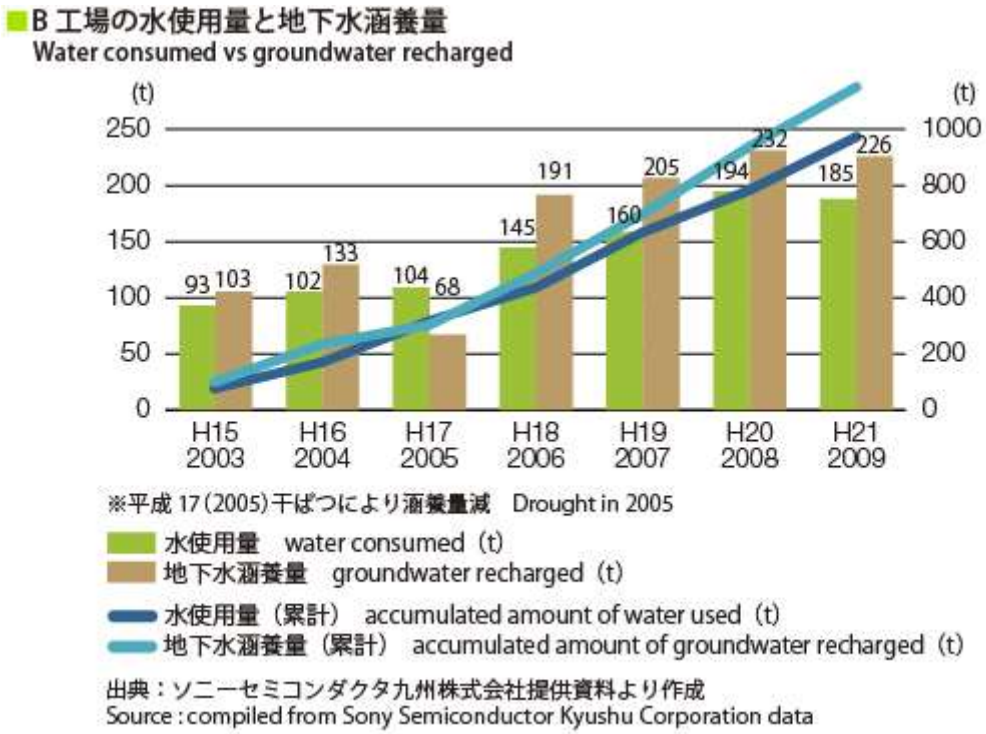
Kumamoto City and surrounding municipalities depend on groundwater for 100 percent of its drinking water. The Kumamoto area[8], which spreads from the western flank of Mt. Aso-Somma out to the Kumamoto Plain and the surrounding plateau area, is known to have a recharging capacity of 640 million square meters per year of water, one-third of which rice paddies account for. The middle basin area of Shirakawa River (Kikuyo Town and surrounding areas), in particular, can recharge 5 – 10 times more water than other areas. In recent years; however, the groundwater level has lowered as a result of policy-driven reduced rice production and urbanization, which has increased asphalt and concrete surface that do not absorb as much water, in and around Kumamoto City.

A semiconductor manufacturer began operations at its plant in Kumamoto in October, 2001. This aroused local concerns over the impact that the cleaning process of a semiconductor plant pumping up large quantities of groundwater would have on the groundwater resources of the area. A proposal was brought forth by a local environmental NGO, "Kumamoto Environmental Net-Work," when it attended an environmental summit held by the company, mainly for group companies. It was welcomed by the company, therefore making it the first company in Japan to recharge groundwater and become water neutral – to "fully return the groundwater it used." The innovative groundwater recharge scheme was launched in cooperation with Kumamoto Environmental Net-Work, a local agricultural cooperative and land improvement districts, and has successfully evolved into covering a wider area, involving other local firms as well as the Kumamoto City government, which has incorporated it into the municipal water conservation program.

**Outline**

The semiconductor plant asks volunteering local producers to flood rice fields that are currently used for other crops due to the governmental policy to reduce rice-planting acreage between crops or organic rice paddies after harvest with water drawn in from the Shirakawa River to let it permeate back into the ground. The accumulated amount of water that has been used by the plant as of 2009 (9.8 million tons) has been successfully recharged (estimate of 11.6 million tons). Cooperating producers are paid a fee of 11,000 Japanese yen per 1,000 square meters to cover management and preparation costs.

[8] Fourteen Municipalities, namely Kumamoto City, Kikuchi City, Udo City, Koshi City, Jonan Town, Tomiai Town, Ueki Town, Ozu Town, Kikuyo Town, Nishihara Village, Mifune Town, Kashima Town, Mashiki Town, Kosa Town (total population of 976,027 people in a total area of 1,041 square kilometers, as of 2005). Kumamoto City is the capital city of Kumamoto Prefecture and home to a population of 724,560 (as of July 1, 2010) people, or 40 percent of the prefecture's total population.




**Payments for ecosystem services (1)**

| Days of off-season flooding | Payment to partner producers |
|---|---|
| 30days | 11,000Yen／1000m$^2$ |
| 60days | 16,500Yen／1000m$^2$ |
| 90days | 22,000Yen／1000m$^2$ |

Studies by Professor Tsutomu Ichikawa of Tokai University's School of Industrial Engineering have revealed that the spring water in Lake Ezu[9] has recently resumed an upwards trend, indicating signs of recovery in Kumamoto's groundwater resources.

- Water offsetting

Consuming one kilogram of rice is believed to have the effect of recharging 20-30 square meters of groundwater[10]. By buying rice grown in fields that engage in groundwater recharge, consumers can

[9] Lake Ezu was artificially made in the Edo era by banking up the water of a wetland formed by spring water originating in the abundant groundwater resources of the region. Discharging approximately 400,000 tons daily (450,000 tons/day in 1992, decreased to 380,000 tons/ day in 2006), it symbolizes the rich water resources that Kumamoto City is blessed with. It is a favorite relaxing spot for the citizens of Kumamoto and is home to many important species. Professor Ichikawa has surveyed the volume of water discharge from Lake Ezu since 1991.

indirectly contribute to recharging a relevant amount of groundwater, thereby offsetting the environmental impact imposed by using tap water.

Every year, employees participate in planting and harvesting rice grown with reduced pesticides and organic fertilizers in paddies owned by partner producers. By purchasing this rice for 430 yen per kilogram (conventionally grown rice[11] is sold for 300 yen per kilogram) and serving it at the employee cafeteria, the company has set an example of offsetting water through purchasing rice. In 2009, the rice was made available in 5-kilogram packages for individual employees. 535 kilograms were bought, therefore contributing to recharging 11,235 tons of groundwater.


This undertaking has also expanded across the region. Some of the rice grown in the middle basin area of the Shirakawa River using reduced pesticides and chemical fertilizers (half of prefectural standards) is sold as "eco-rice,"[12] under the brand name "Mizu-no-Megumi" (Water's Blessings), launched by a

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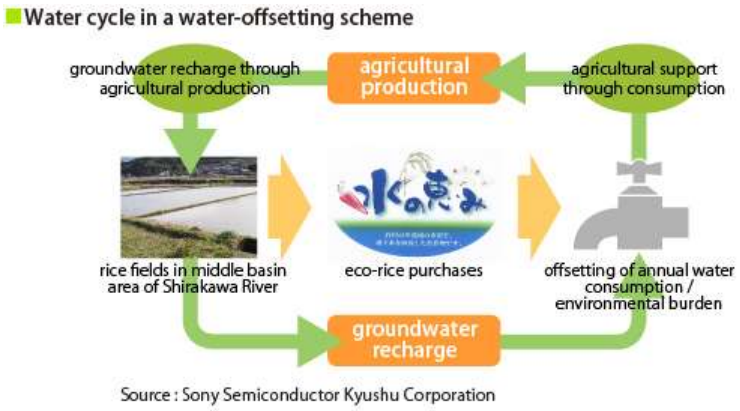
[10] The estimated amount of groundwater recharged is divided by the amount of rice produced in order to derive the amount of groundwater recharged for each ton of rice references produced. For example, according to research conducted by Professor Ichikawa of Tokai University, the groundwater recharged in the four districts along the Shirakawa River that produced eco-rice in 2008 is estimated to be 5.887 million square meters. This, divided by 255 tons, or the amount of eco-rice yield, leaves approximately 26 tons of water offset per one kilogram of eco-rice produced. (NPO Environmental Net-Work Kumamoto (2009) Environmental Net-Work Kumamoto Newsletter No.70, p16)

[11] Agricultural methods using a standard amount of agricultural pesticides and chemical fertilizers as stipulated in regional guidelines determined by the local government.

[12] JA Kikuchi has yet to develop a system to separate rice grown by conventional methods from that grown with reduced agrichemicals. Therefore, a group of members producers of JA Kikuchi have launched a new brand "Mizu-no-megumi" to discriminate some of the local produce made with reduced agrichemicals on a volunteer basis. This brand not only covers rice but other vegetables as well.

voluntary group within JA Kikuchi. Kumamoto City also encourages its citizens to engage in water-offsetting.




### Afforestation activities by fishermen of the sea

In Japan it has been believed from the days of our ancestors that "the forest calls the fish" and many forests on the coastline were protected as "fish-breeding" forests. Studies seeking scientific grounds for such traditional practices have proved that the degradation of forest environments in river basins have prevented forest minerals from the forest from flowing out to the rivers and to the ocean, therefore inhibiting phytoplankton growth, thereby inflicting declining catches.

An effort to address this issue has been established in Miomotegawa River in Niigata Prefecture. Miomotegawa River is sourced in the Asahi mountain range which stretches across Niigata and Yamagata Prefectures. The river flows from virgin beech forests in Asahi district in Murakami City, out to the metropolitan area of the city.

The Miomotegawa River is famous for salmon which was a valuable source of revenue for the Murakami clan, which governed the region in the Edo era (1603-1868). However, salmon was overexploited to the extent that the depletion of salmon resources was feared and the clan decided to implement efforts to protect salmon as fisheries resource. For example, knowing that the salmon was a migratory fish, Buheiji Aoto, a Murakami clan member, devised a way to keep salmon enclosed in a part of the river's sandbar, which was appropriate for spawning, thereby protecting the eggs until they could hatch in the spring.

Also, guided by the idea that in order to conserve the abundant oceans and rivers that foster fisheries resources, rich forests were essential, the Murakami clan had preserved the forests near the outlet of the Miomotegawa River as "salmon-calling forests.[13]" However, recent development has caused the forest environment along the river to diminish and the river water to become contaminated. Against this background, forestry and fisheries industries and nature conservation organizations joined hands to revive traditional practices and pass on the water source forests of the Miomotegawa River to future

[13] Total area of 2.42 hectares, this forest was designated a "fish-breeding" forest in 1911 and henceforth.

generations as "Salmon Forests." They established the Council for the Promotion of Salmon Forest Planting in 1999 and started tree-planting activities the following year.

The Council for the Promotion of Salmon Forest Planting comprises local governments, situated along the Miomotegawa River, relevant national and prefectural government organizations, Niigata Prefectural Fisheries Cooperation, forestry cooperatives that are directly related to forest management, local forest-supporting youth groups, and environmental groups. The Council plants 100 to 200 young beech trees and cuts underbrush every year in the national forests in the headwaters of Sarutagawa River, a tributary of the Miomotegawa River. Murakami City grants 200 thousand yen annually (sourced 20 percent from the general budget and 80 percent from subsidies from Niigata Prefecture) in support of these activities. The number of participants in annual activities have increased from 70 to 80 people in 1999 to over 130 in 2008, and has continued an upwards trend since.

The Council is also focused on environmental education for local children for the purposes of spreading understanding for its activities and fostering a concerned future generation that will engage in ongoing efforts. These undertakings have been appreciated at a nationwide level and the Council was awarded the Chairman's prize in the fisheries conservation category of the 27th National Healthy Ocean-Making Contest. The Council for the Promotion of Salmon Forest Planting has become a pioneering example that inspired the development of seven other groups in Niigata Prefecture.

The Murakami clan's example is actually only one of many local forest-planting efforts that date back to older times. However, such activities attracted much attention when fisheries resources declined drastically in the late 1980s and afforestation campaigns were launched in Hokkaido, Tohoku region and the Noto Peninsula engaging fishermen near the estuaries to plant trees in the river basin or along the coastline. For example, in Kesennuma City in Miyagi Prefecture, when the oyster catch was dominated by "bleeding" oysters that had absorbed red tide plankton, an oyster farmer, Shigeatsu Hatakeyama led other fishermen to plant forests under the slogan "Mori wa Umi no Koibito" (The Forest is the Ocean's Sweetheart) in 1989. In Hokkaido, as well, the "Osakana fuyasu shokuju undo" (Plant trees for More Fish Campaign) was launched in 1988 to engage people across the island in afforestation activities under the slogan, "100 years to restore the natural sea coast of 100 years ago."

Later in 2001, the Basic Fisheries Act stipulated that "the State shall take measures such as conservation of water quality, protection and development of breeding grounds of aquatic plants and animals, conservation and developments of forests and others necessary to improve and conserve the growing environment for aquatic plants and animals" (Article 17). The Fisheries Agency then implemented a five-year plan named the "Fishermen's Forest-Planting Activities Promotion Program" to promote afforestation activities by fishermen under which it supports the undertakings of local afforestation councils, environmental surveys, promotion activities, and volunteer afforestation and silivicultural activities including the distribution of seedlings. This quickly motivated fishermen all over Japan to go up into the forests to plant trees.

Now that the government-led program has ended, forest-making activities by fishermen have been taken over by local governments, some of which fund such programs with tax revenue from forest

environment taxes (see "Forest" section) and NGOs, and continue to evolve in the local context. As of March 2010, 177 programs are implemented in 33 prefectures (Marine Blue 21, 2010).