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Proposition in order to Promote the Practice of the Environmental Conduct by the Individual — Promotion of Environmental Education and the Utilization of Environmental Monitoring Data —

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1 Introduction

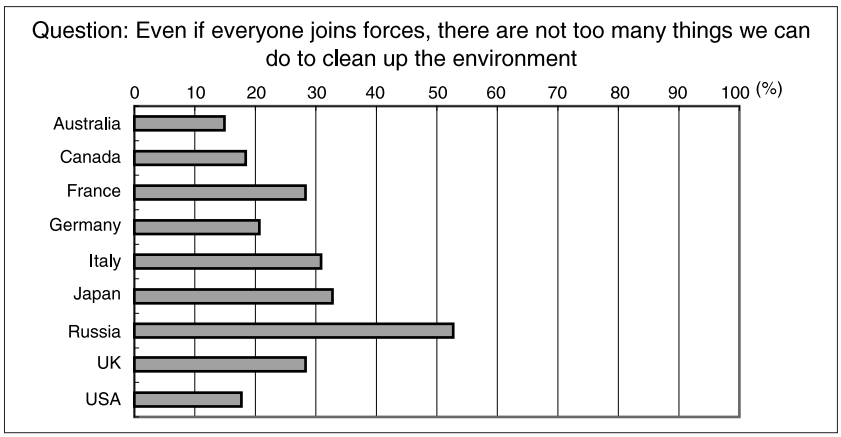
In 1997, Japan agreed to the greenhouse gas reduction goals of the Kyoto Protocol. Japan's goal is to reduce emissions for 2008-2012 to 6 percent below the 1990 level. From 1990-2002, CO2 emissions by different sectors changed as follows[1]. While the industrial sector showed a 1.7 percent reduction, the industrial process sector a 14.0 percent reduction, and the energy conversion sector a 0.3 percent reduction, the waste sector showed a 43.2 percent increase, the household sector a 28.8 percent increase, the transport sector a 20.4 percent increase, and business and other sectors showed a 36.7 percent increase. Although the industrial sector still accounts for the largest portion of this total, raising environmental awareness and promoting the understanding of all members of the public is important in order to meet the Kyoto Protocol goal. In order to address various environmental problems such as air pollution other than global warming, water pollution, waste and so on, it is extremely important that individual members of the public break away from the idea that these are "somebody else's problem" and instead see themselves as personally involved and take action accordingly. A survey of the public's attitudes towards energy and environmental issues, however, found that young people (in their 20s) in particular had a low level of environmental awareness. The dissemination of environmental education that informs individuals that their efforts are highly significant is therefore an issue requiring prompt action.

A major objective of environmental education is the promotion of individual environmental conservation activities addressing various environmental problems such as global warming, air pollution, water pollution, waste, and so on. This process comprises three stages, (i) understanding of environmental conditions and awareness of environmental issues, (ii) understanding of concrete actions that can be taken by individuals, (iii) implementation and continuation of individual environmental conservation activities. This report discusses the measures needed to promote environmental conservation activities by means of environmental education.

2 The need to enhance environmental education

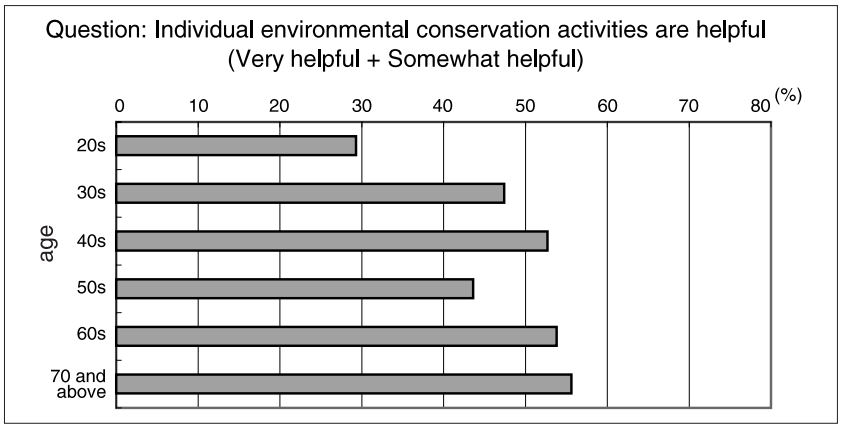
2-1 Results of environmental awareness surveys

Figure 1 shows the results of an international comparison of environmental awareness reported in the Quality of the Environment in Japan (2004 edition)[2]. As shown in Figure 1, more Japanese people hold the opinion that "individual efforts cannot do much to clean up the environment" than do people from the other countries surveyed. Figures 2 through 4 show the results of the Ministry of the Environment's FY 2003 Survey



Prepared by the STFC based on Reference[2]

Figure 1 : Attitudes regarding the effectiveness of individual environmental conservation activities (international comparison)

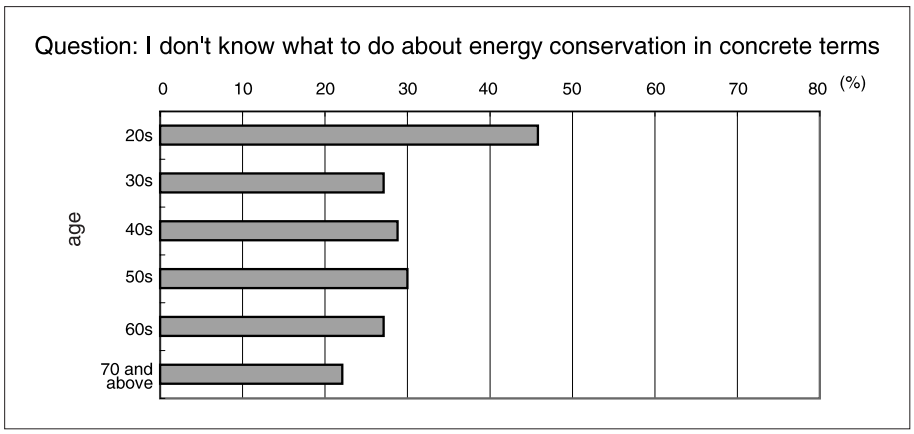


	All	Gender		Age					
		Male	Female	20s	30s	40s	50s	60s	70 and above
Number of samples (N)	1171	545	602	109	169	201	280	258	135
Very helpful	2.0	2.6	1.7	1.8	1.8	2.5	0.7	1.9	5.2
Somewhat helpful	46.1	45.0	46.7	27.5	45.6	50.2	42.9	51.9	50.4
Not really helpful	28.8	33.0	25.1	34.9	32.5	27.9	32.9	26.0	17.0
Not helpful	1.8	1.8	1.7	3.7	1.2	1.5	0.7	2.3	2.2
Don't know	18.9	16.0	21.8	30.3	18.9	17.9	20.4	13.6	19.3
No response	2.4	1.7	3.2	1.8	0.0	0.0	2.5	4.3	5.9

Prepared by the STFC based on Reference[3]

Figure 2 : Attitudes regarding the effectiveness of individual environmental conservation activities (Japan: by age group)

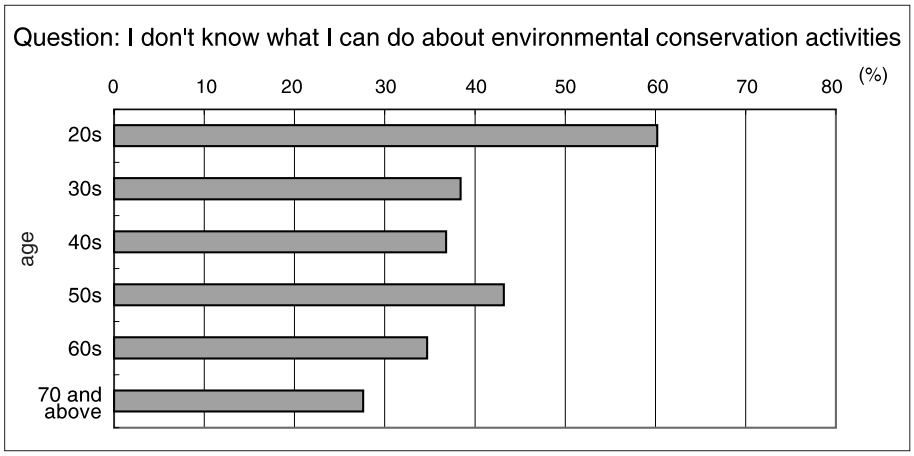
of Environment-conscious Lifestyle[3]. Figure 2 shows a breakdown of the survey results by age, regarding the effectiveness of environmental conservation activities carried out by individuals. The younger age group (20s) contained very few who believed that individual environmental conservation activities are helpful. Figure 3 shows the results of an attitude survey carried out on energy conservation by age group. Over 90 percent of respondents across a broad range of age groups, believed that energy conservation is good for protecting the environment and saving resources, and saw energy conservation as essential. In response to a question regarding actions they were actually taking, however, the answers "I don't know what to do in concrete terms" and "It is troublesome and takes time and effort" were especially common among young people in their 20s. Figure 4 shows the results of a survey on attitudes towards environmental conservation activities. Across a broad range of age groups, over 90 percent of those responding



	All	Gender		Age					
		Male	Female	20s	30s	40s	50s	60s	70 and above
Number of samples (N)	1267	586	652	118	177	212	287	288	163
I think it is good for protecting the environment and saving resources	91.6	91.1	92.7	94.9	97.2	98.6	96.2	86.4	77.3
I don't know what to do in concrete terms	29.2	26.7	30.9	45.8	27.1	28.8	30.0	27.1	22.1
It is troublesome and takes time and effort	25.5	25.0	25.7	33.1	30.5	26.0	27.5	18.4	22.7

Prepared by the STFC based on Reference[3]

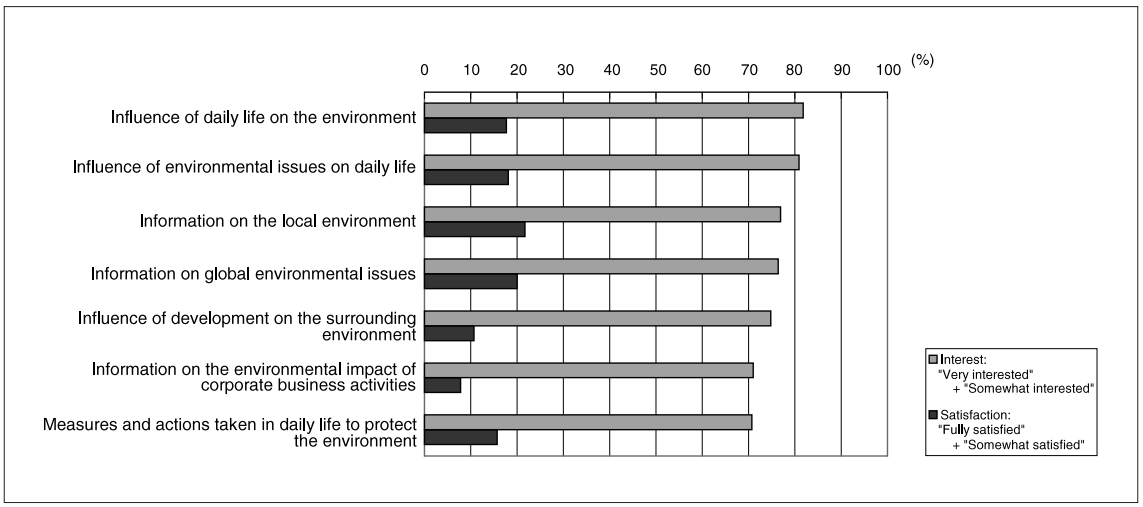
Figure 3 : Attitudes regarding energy conservation (by age group)



	All	Gender		Age					
		Male	Female	20s	30s	40s	50s	60s	70 and above
Number of samples (N)	1267	586	652	118	177	212	287	288	163
I should do what I can to protect the environment	94.5	93.8	95.2	94.9	99.4	97.7	97.9	91.3	85.2
I don't know what I can do	38.7	37.5	40.1	60.2	38.4	36.8	43.2	34.7	27.6
Even if I do something, I can't see it having any effect	37.2	33.5	40.6	61.1	48.0	43.3	37.2	27.1	19.0
It is too hard to do something regularly and continue it for a long time	42.1	42.0	43.0	64.4	52.0	47.1	41.4	34.4	27.0

Prepared by the STFC based on Reference[3]

Figure 4 : Attitudes regarding environmental conservation activities (by age group)



Prepared by the STFC based on Reference[4] (N=1,267)

Figure 5 : Interest in and satisfaction with environmental information

believed that "I should do what I can to protect the environment". In response to a question regarding actions taken, however, the response "I don't know what I can do", "Even if I do something, I can't see it having any effect", and "It's too hard to do something regularly and continue it for a long time" were particularly common among the younger age group (20s).

Figure 5 depicts the results of an attitude survey regarding interest in and satisfaction with environmental information[4]. The level of interest was above 75 percent for several categories, including "Influence of daily life on the environment", "Influence of environmental issues on daily life", "Information on the local environment", and "Information on global environmental issues". In contrast, the degree of satisfaction with the information obtained was low.

2-2 *Measures on environmental education*

The development of environmental education intended to raise people's awareness of environmental issues so they would implement and sustain environmental conservation activities, internationally, began with the UN Conference on the Human Environment in Stockholm in 1972. This was the first international conference on environmental problems. With the importance of environmental issues clearly set forth in the Declaration on the Human Environment agreed upon at the conference, international efforts on environmental education became more widespread, led by UNESCO and the United Nations Environment Programme (UNEP). In 1975, the International Workshop on Environmental Education was held in Belgrade with the participation of 60 countries and 96 experts on environmental education. The Belgrade Charter set forth the importance of environmental education to "develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively toward solutions for current problems and the prevention of new ones", as well as a proper form and framework for carrying this out[5].

To that end, the goals set forth at the 1977 Intergovernmental Conference on Environmental Education held in Tbilisi subsequently became the foundations for environmental education. These goals are shown in Table 1.

As seen in the table, environmental education differs from many other forms of education in that it requires not just learning, but also participation and action. In other words, the fruits of environmental education appear as the actions taken by the people living in a society. They must appear as having some sort of tangible effect[7].

In Japan, environmental education measures spread rapidly after 1985. Since the Environment Agency's roundtable on environmental education clarified basic thinking on environmental education in March 1988, the national government has actively promoted measures

Table 1 : Goals for environmental education (Tbilisi Declaration)

Awareness	To help social groups and individuals acquire an awareness of and sensitivity to the total environment and its associated problems.
Knowledge	To help social groups and individuals gain a variety of experience in and acquire a basic understanding of the total environment and its associated problems.
Attitudes	To help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation to actively participate in environmental improvement and protection.
Skills	To help social groups and individuals acquire the necessary skills for identifying and solving environmental problems.
Participation	To provide social groups and individuals with an opportunity to be actively involved at all levels in working towards the resolution of environmental problems.

Extracted from Reference[6]

for environmental education and environmental learning. Underlying the growing interest in environmental education and environmental learning at that time was the fact that although strict environmental regulations targeting specific pollution sources were effectively curbing industrial pollution, no improvement was seen in urban and household pollution, to which daily life and ordinary business activities are major contributors. Instead of getting better, the situation here was, in some cases actually getting worse.

The 1993 Basic Environment Law specified the "promotion of education and learning related to the conservation of the environment" as being an important policy for environmental protection. Environmental education and environmental learning were thereby accorded great importance under Japanese law.

Improving the public's understanding of energy use, which is closely connected with global warming, also became an important issue. The 26th Ministerial Meeting on the Promotion of Comprehensive Energy Measures, held in April 1997, discussed topics such as the importance of further measures by individuals on energy issues including lifestyle changes, and the enhancement of education on resource and energy issues[5]. The Japan Association of Energy and Environment Education[8] was established in September 2005 and began working to raise the level of energy and environmental education, to increase public interest in energy issues, and to promote public understanding of these issues.

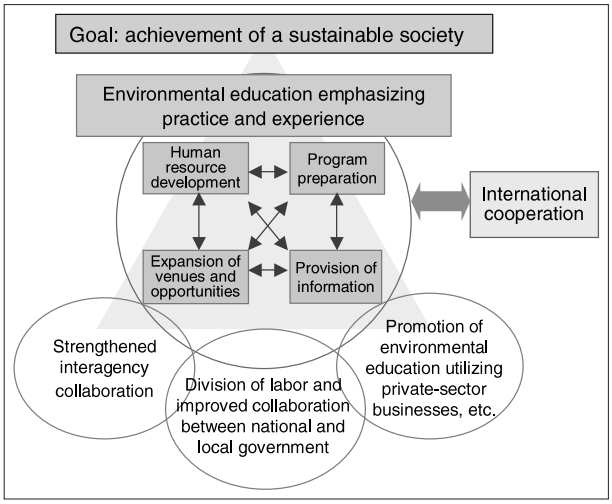
It is vitally important that environmental education for all ages and in all fields, including schools, homes, communities and workplaces, does more than just supply people with knowledge. It must enable people to grapple with environmental issues that they have not previously noticed or have never thought of as being personally relevant. It must enable people to see issues as very relevant to themselves and to give them the ability to address those issues by means of sustained action. Measures taken against environmental issues by means of environmental education will therefore become increasingly important.

3 Japan's environmental education and examples of environmental education in advanced environmental countries

3-1 The state of Japanese environmental education

In order to move towards a sustainable society, environmental education must be actively promoted in various venues for all age groups, from children through to adults. Because it is important to connect environmental education with concrete actions for environmental conservation, methods that emphasize practice and experience are preferable. Figure 6 provides a conceptual diagram of policies to promote environmental education in Japan[9]. The following points are especially important when developing environmental education that emphasizes practice and experience: (i) human resource development, (ii) program preparation, (iii) provision of information, and (iv) expansion of venues and opportunities. As we will describe below, these points are all important for environmental education at the primary and secondary levels, as well as in higher education

and social education. Strengthened collaboration among national government agencies, division of labor and improved collaboration between national and local government, and the promotion of environmental education utilizing private-sector businesses, etc. are also important means of promoting environmental education. Frameworks for international cooperation are also effective and Japan's international cooperation on environmental education currently includes collaboration with UNESCO's Asia Pacific Programme of Educational Innovation for Development (APEID) to enhance and spread environmental education in the Asia-Pacific region by inviting specialists to Japan for seminars and by providing support for the development and dissemination of teaching materials by the Asia/Pacific Cultural Centre for UNESCO[10].



Extracted from Reference[9]

Figure 6 : Conceptual diagram of policies to promote environmental education in Japan

(1) Environmental education in primary and Secondary schools

(i) Systems

Environmental education began to be incorporated into Japan's primary and secondary school curricula for social studies, science, health and physical education, and so on when pollution issues first gained prominence around 1965. The content was subsequently enhanced and the 1989 revision of national curriculum guidelines for elementary, junior high, and high schools emphasized the importance of not just understanding the environment, but of fostering the skills needed to solve environmental problems. In other words, the aims of environmental education were to foster the abilities and attitudes needed to respond proactively to social change, and to encourage experiential learning and problem-solving ability. The 1998 revision of the national curriculum guidelines (1999 for high schools) further enhanced the environmental content of social studies, science, and other classes. The newly established "integrated study" was used to improve and enhance learning about environmental issues through experiential and problem solving-based learning in order to deepen cross-subject, comprehensive learning[11]. Table 2 shows the main content related to environmental education under the 1998 revision of the national curriculum guidelines. During the 2004 school year, 75.3 percent of elementary schools and 52.8 percent of junior high schools studied environmental issues during the "integrated study"[12].

(ii) Attitudes of elementary and junior high school students

Figure 7 shows ideas found in the elementary and junior high school version of the Ministry of the Environment's 2003 Survey of Environment-conscious Lifestyle[13]. The results show that the ideas that "Lifestyles that are wasteful and generate much garbage should be changed" and "I think that environmental problems affect me too" are widespread. The desire to take action in terms of "I want to be actively involved in environmental conservation", however, needs to be encouraged.

As shown in Figures 2-4 above, attitude survey results for young people in their 20s indicated a low desire for involvement in environmental issues. However, if environmental education is further upgraded through various subjects and the "integrated study", based on the 1998 national curriculum guidelines, then the willingness of young people to become more actively involved in environmental issues is expected to increase.

(iii) Faculty attitudes

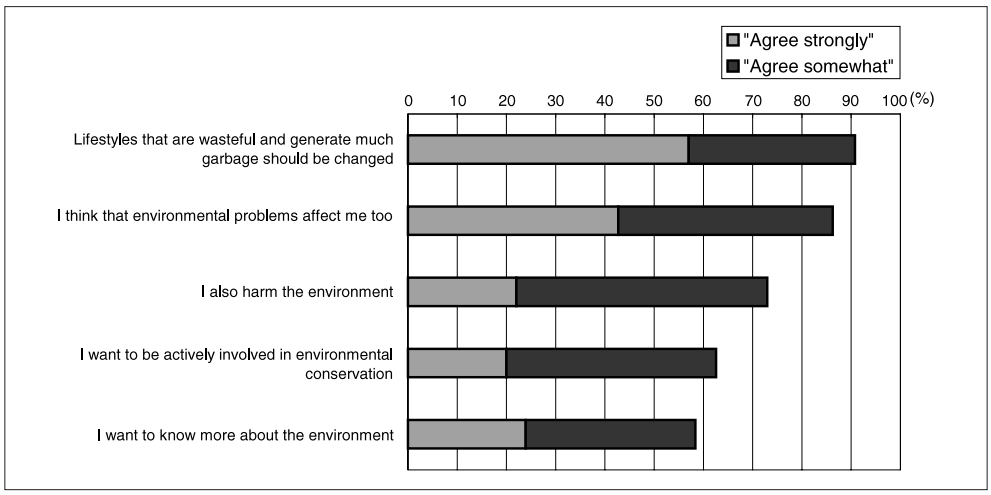
Figures 8 and 9 show the results of the National Institute for Environmental Studies'

Table 2 : Main content of environmental education in national curriculum guidelines (1998 revised guidelines)

	Elementary schools	Jr. high schools	High schools
Social studies, civics	(3rd and 4th grades) • The relationships between obtaining drinking water, electricity and gas, waste disposal, their own lives and industries (5th grade) • The importance of protecting the public's health and living environment from pollution • How forest resources work to preserve the nation's land and recharge watersheds	(Geography field) • **Issues related to the environment and energy** (Civics field) • Pollution prevention and other environmental conservation • **Learning about global environmental, energy, and resource issues**	(Modern society) • Pollution prevention and environmental conservation • **Learning about global environmental issues, etc.** (Politics/economics) • Pollution prevention and environmental conservation
Science	(6th grade) • **A mindset that appreciates natural environments and an attitude of trying to build a better environment**	(Physics / Chemistry) • **The necessity of developing science and technology that works in harmony with the environment** • The various energy sources that human beings use, including hydro, thermal, and nuclear power; the importance of efficient energy use (Biology / Geoscience) • **Study natural environments;** understand that natural environments exist in balance with the natural world. Awareness of the importance of conserving natural environments	(General science A) • **The characteristics, limits, and use of fossil fuels and nuclear, hydro, and solar power, etc.** (General science B) • **Take up water and air pollution, global warming, biodiversity, etc.; deal with the relationships between organisms and the environment and the importance of global environmental conservation**
Life studies	(1st and 2nd grades) • To develop an interest in relationships with local plants, animals, and nature, and to appreciate nature		
Home economics, vocational-technical and home economics	(5th and 6th grades) • Devising a personal home lifestyle that takes the environment into consideration	(Home economics field) • Think about the impact of one's own life on the environment and devise a consumption lifestyle that takes the environment into consideration	(Basic home economics, general home economics, life technology) • **Re-examination of everyday awareness and lifestyles, aiming for a lifestyle with low environmental impact**
Physical education, health and physical education	(3rd and 4th grades) • **The necessity of preparing the living environment in order to be healthy**	(Health field) • The necessity of waste disposal that fully considers environmental conservation • Take up the relationship between pollution and health in accordance with local conditions	(Health) • Human lifestyles and industrial activities can pollute natural environments and impact on health; various countermeasures • Standards are set to make school and community environments healthy, and environmental health activities are carried out
Morals	(5th and 6th grades) • Appreciating natural environments	• Love of nature	
Period for integrated study	• **Experiential, problem solving-based learning**	• **Experiential, problem solving-based learning**	• **Experiential, problem solving-based learning**

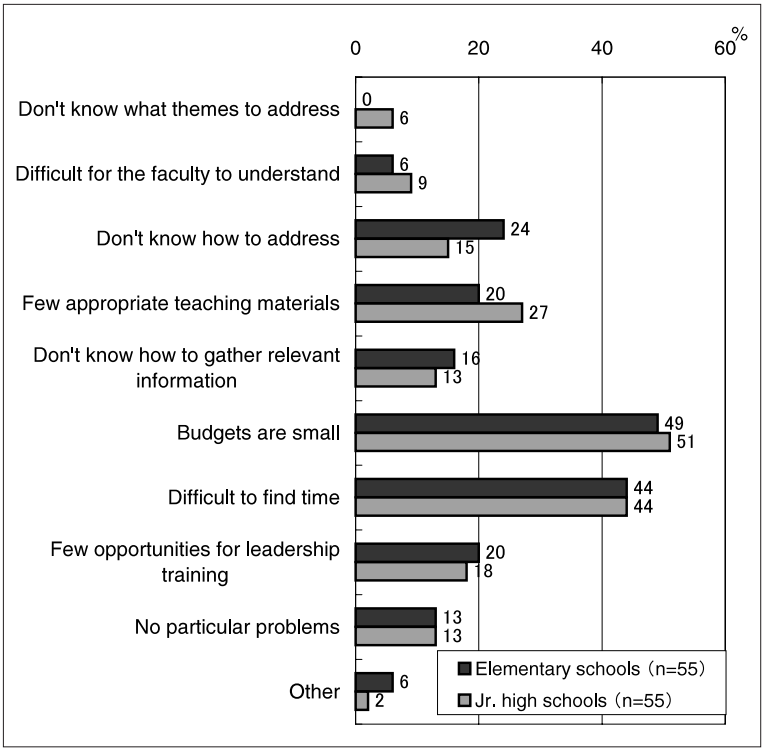
Items in bold type are newly added to the national curriculum guidelines

Extracted from Reference[11]



Prepared by the STFC based on Reference[13] (N=2,221)

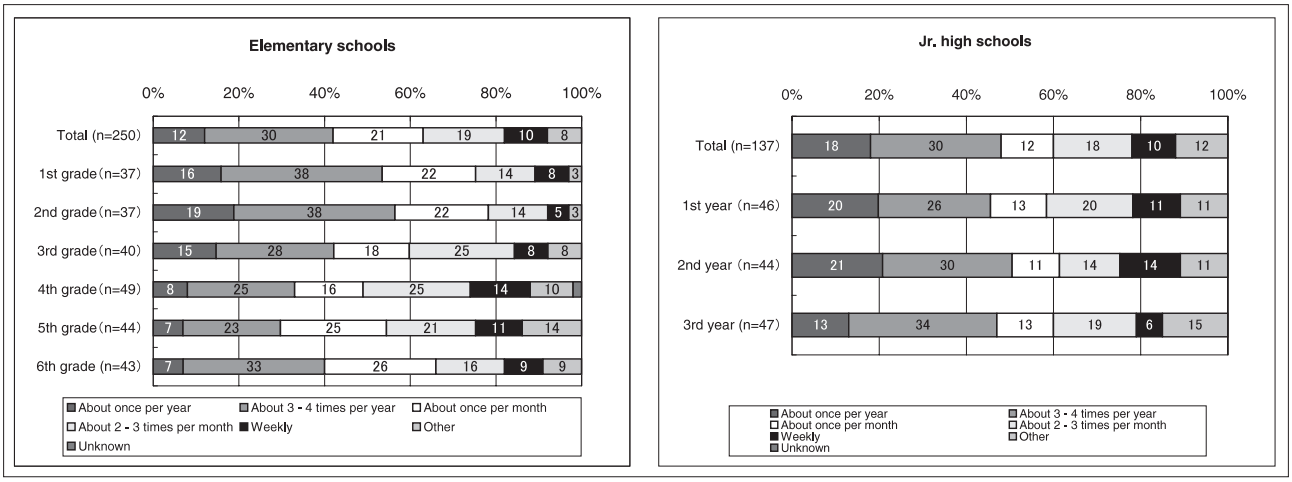
Figure 7 : Elementary and junior high school students' ideas about environmental issues



Extracted from Reference[12]

Figure 8 : Problem areas when addressing environmental education and environmental learning

survey of elementary and junior high school faculties, the Survey Regarding Environmental Education and Environmental Learning. Figure 8 depicts the main problem areas encountered when addressing environmental education and environmental learning. For both elementary and junior high schools, the most common problem mentioned was that "Budgets are small", followed by "Difficult to find time". Furthermore, "Don't know how to address" and "Few opportunities for leadership training" both scored about 20 percent, indicating a need to improve the ability of the faculty to take a lead in environmental education. This calls to mind (i) human resource development, (ii) program preparation, (iii) provision of information and so on, as described in Figure 6 above. The results shown in Figure 9 detail the frequency with which environmental education is currently addressed. At both the elementary and junior high school levels, there is a mix of schools that often take up the subject and other schools that rarely take it up. This indicates that there is yet another issue that needs to be addressed, that of (iv) expansion of



Extracted from Reference[12] (elementary schools, N = 64; junior high schools, N = 60)

Figure 9 : Frequency with which environmental education and learning are addressed

venues and opportunities. These results appear to indicate the need for enhanced support for environmental learning and further promotion of environmental learning at all levels of schooling.

(2) Environmental education in higher education

Educational research related to the environment takes place in many university faculties and departments. Universities also independently and voluntarily undertake measures for human resource training related to the environment. Currently, 52 national universities and 133 other public and private universities have faculties or departments with "kankyou" ("environment" or "environmental") in their names. All told, universities of all types offer 576 classes related to the environment[10]. In addition, universities certified under the ISO 14001 environmental management system standard have begun developing hands-on environmental education initiatives through student participation in the construction of environmental management systems (EMS). As a result, environment-related education has been established at many universities and is steadily improving. It is to be hoped that, in the future, even more students, including those currently with a low awareness of environmental issues, will take environment-related classes and acquire the ability to undertake environmental conservation activities.

In order for environmental education in primary and secondary schools, as described above, to be more effective, more teachers must learn the basics of environmental education. However, as can be seen in the results illustrated in Figure 8, about 20 percent of teachers "Don't know how to address" the subject. Comprehensive environmental education for teachers is thus an urgent issue. Environmental education is not a required course in current university teacher training curricula. Therefore, in order to move towards in-depth environmental education in primary and secondary schools and in order to develop adequate human resources, it is highly desirable that this subject be made a requirement in teacher training courses.

(3) Environmental education as part of social education

Environmental education for a broad range of age groups from children through to adults, should be actively promoted in a variety of social venues, not just in schools.

Environmental education in social education facilities takes place mainly in community centers, libraries, museums, and so on. Model projects are underway that comprehensively address various kinds of local issues, including environmental problems, and integrate project planning, implementation, and evaluation. Environmental education is promoted as part of social education through the spreading of project results nationwide. Particular emphasis is being placed on the promotion of experiential environmental learning systems that have children plan and continuously carry out

hands-on environment-related activities based on local environmental issues[10].

Currently, many government agencies are implementing initiatives on the "expansion of venues and opportunities" for environmental education in the field of social education, as shown in Table 3. Figure 10 gives the example of "Junior Eco-Club" in which any elementary and junior high school student may participate. According to a Ministry of the Environment survey, awareness of the clubs' environmental activities is still only 23.9 percent. It is therefore necessary to be more proactive in providing information about these activities.

3-2 Examples of environmental education in advanced environmental countries

(1) Rankings on a world environmental index

The Environmental Performance Index (EPI) sets goals for environmental performance and evaluates each country's achievements in terms of environmental sustainability[14, 15]. The EPI was developed by environmental specialists at the environment school at Yale University and the Earth Institute at Columbia University. Its results are released annually and, by quantitatively evaluating the results of pollution prevention and the management of natural resources, the EPI serves as a useful reference tool for environmental policymaking. In the 2006 EPI environmental performance rankings by country (Pilot 2006 EPI), New Zealand was first, followed by Sweden, Finland, the Czech Republic, and the UK, while Japan was 14th. The USA was 28th. Although the USA scored highly in the environmental health category, it had only a low score in other important areas such as reusable energy, greenhouse gas emissions, and water resources.

(2) Environmental education in Sweden

Here we will discuss environmental education in Sweden, an advanced, environmentally aware country that was ranked second on the EPI. Distinctive characteristics in Sweden include preschool education and extensive social

Table 3 : Policies related to environmental education

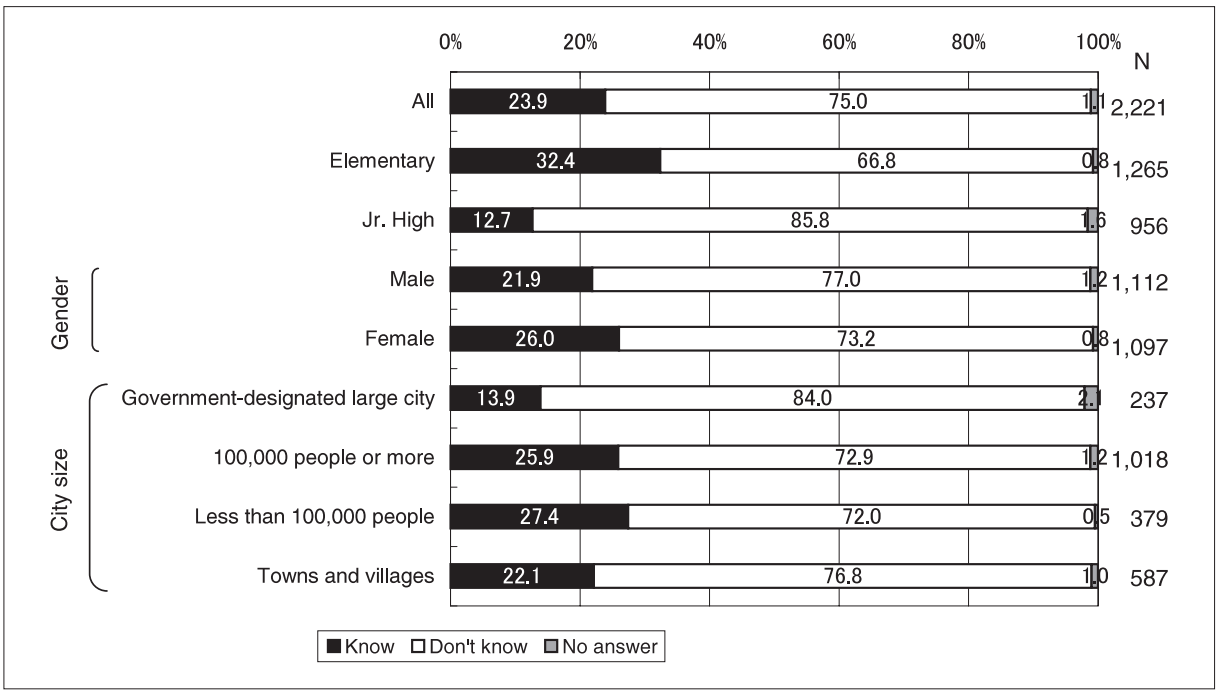
	Policy	Agency	Summary	
Human resource development	Basic training seminars for environmental education leaders	MEXT MOE	Ongoing	Training that emphasizes hands-on learning and acquiring basic knowledge of environmental education for educators and local activity leaders; promotion of environmental education and learning by children in schools and adults in the community
	Promotion of forest environmental education	MAFF MEXT (partial)	Ongoing	Training of leaders and planners/managers in hands-on learning about forests; preparation for children's forest clubs; setting conditions in preparation for school forest establishment and activities, and establishment of model school forests
	Environmental learning fairs	MEXT	Ongoing	Holding environmental learning fairs in order to improve the quality of environmental educators
	Seashore expert training seminars	MLIT	Ongoing	Development of leaders with sufficient knowledge and skills to safely carry out activities at the seashore; targets males and females at least 18 years of age
	Human resource development related to conservation activities of the natural environment	MOE	Ongoing	Training for leaders at natural parks; development of park volunteers; development of interpretive guides to nature, and so on
Program preparation	Environmental education practice and dissemination project	MEXT	Ongoing	Promotes outstanding environmental education efforts through designation of Global Learning and Observations to Benefit the Environment (GLOBE) model schools and model communities; disseminates the results nationwide
	Expo 2005 Aichi environmental education and learning dissemination project	MOE	Ongoing	Studies dissemination projects on environmental education and learning at Expo 2005 Aichi
	Project on effective environmental education for children and students regarding global warming	MOE	New	So that children and students correctly recognize and understand the importance of global warming and "habitually" take action to prevent it; creates teaching materials for schools and performs model lessons for their effective use
Provision of information	Comprehensive provision of information on environmental education and learning	MEXT MOE	Ongoing	Opens and operates a comprehensive database that collects diverse information on environmental education and learning and disseminates it widely over the internet
	Promotion of voluntary consumer activity	METI	Ongoing	Promotes voluntary activities by consumers
	Project on education and dissemination related to conservation of the atmospheric environment	MOE	Ongoing	Campaigns for Air Pollution Prevention Month, which disseminates simple measurement of acid rain involving public participation; continuous nationwide observance of stars; acoustical environment model city project; other educational activities related to protection for the atmospheric environment
	Project on education and dissemination related to the conservation of the aquatic environment	MOE	Ongoing	Water quality surveys involving aquatic organisms living in rivers; educational activities regarding the improvement of nearby watersides and other means of protection for the aquatic environment

Table 3 : Policies related to environmental education (continued)

	Policy	Agency	Summary	
Expansion of venues and opportunities	Project to promote interagency hands-on environmental learning for children	MEXT MAFF MLIT MiOE	Ongoing	Hands-on learning projects planned and sustained by children, based on the theme of nearby local environments
	Eco school pilot model project	MEXT METI MAFF MOE	Ongoing	Promotion of environmentally friendly model school facilities (eco schools) that utilize solar power generation, wood materials, rainwater, insulation, etc. (FY 2004: 98 schools designated)
	“Children’s Waterside Activities” rediscovery project	MEXT MLIT MOE	Ongoing	Promotion of rivers as sites for children's hands-on activities
	Activities for environmental learning in target areas for nature restoration	MAFF MLIT MOE	Ongoing	In nature restoration projects in various areas, works for cooperation needed so that the target area can be a site for learning about the natural environment
	Child park ranger project	MEXT MOE	Ongoing	So that children can learn the importance of protecting nature and conserving the environment, implements projects to participate in environmental conservation activities at national parks in association with park rangers
	Project to promote valuable hands-on activities	MEXT	Expanding	Along with designating “communities and schools that promote hands-on activities”, “schools that promote inter-regional exchanges”, and “schools that promote long-term overnight experiences”, carries out research on effective hands-on activities to reinforce appreciation for the value of life
	Environmental learning projects in national youth education facilities	MEXT	Ongoing	Implements projects that contribute to environmental learning by youth through national educational facilities such as Youth Outdoor Learning Centers
	Development and dissemination of safety management methods for hands-on learning about forests, etc.	MAFF	Ongoing	Develops and disseminates safety management methods through analysis, classification and implementation at the national level and research regarding safety management involving hands-on learning about forests, etc.
	“Yuyu no mori” (Fun forests)	MAFF	Ongoing	Designates national forests as “Yuyu no mori” (fun forests) for hands-on learning for schools, etc.
Expansion of venues and opportunities	Establishment of contacts for forest environmental education	MAFF	Ongoing	In order to provide a general consultancy service on nature, sets up contact windows on forest environmental education activities in forest-related agencies around the country
	Promotion of “Manabi no mori” (Learning forests)	MAFF	New	Implements forest and facility improvements at sites used for forest environmental education involving ongoing children’s hands-on forest activities, and hands-on forest learning that contributes to public participation and helps in fostering future foresters
	Promotion of forest-building activities with public participation	MAFF	Ongoing	Supports forest conservation activities such as forest improvement involving educational activities such as tree festivals and other “greening events” and corporate social contribution activities, forest volunteer activities, and temporary home stays for high school students in mountain villages
	Seaside nature schools	MLIT	Ongoing	Provides sites and opportunities for the public to experience the natural richness of tidelands, marine forests and sandy beaches in bays, improving public understanding of seaside environments and promoting environmental conservation and the formation of safe and abundant seaside environments
	“Mizube no gakkou” (Waterside fun schools) project	MLIT	Ongoing	Creates safe watersides with rich natural environments in order to promote environmental education involving rivers
	Center for Supporting Children's Waterside Activities	MLIT	Ongoing	Operates the Center for Supporting Children’s Waterside Activities to promote the use of watersides by lending lifejackets and so on and carries out education on water-related issues (http://www.mizube-support-center.org/)
	Project to improve urban parks as centers of environmental learning	MLIT	Ongoing	Prepares fields to contribute to environmental learning in government-managed parks, provides environmental conservation and environmental learning programs, and prepares environmental contacts in nearby natural areas through links with local governments
	Children’s World Water Forum follow-up	MLIT	New	Provides venues for children to think about water-related problems in an ongoing way
	My Family’s Minister of the Environment project	MOE	New	In order to promote environmental conservation activities in homes, the center of life, this initiative implements “eco-family” projects using the internet and “family eco club” projects joining together multiple families for community activities
	Junior Eco-Club project	MOE	Ongoing	In order to support elementary and junior high school students’ voluntary environmental activities in their communities, this project forms, registers, and recruits “Junior Eco-Club”
	School eco improvement and environmental education model project	MOE	New	Implements model projects that promote remodeling of facilities to reduce the environmental impacts of school buildings, and integration of environmental education and other projects in the schools and communities that use them
	Improvement of national park facilities, etc.	MOE	Ongoing	Promotes improvement of footpaths, basic facilities such as campgrounds, fields for advanced nature learning and sightseeing, and ecology museums in national and quasi-national parks

MEXT : Ministry of Education, Culture, Sports, Science and Technology.
MOE : Ministry of the Environment
MAFF : Ministry of Agriculture, Forestry and Fisheries.
MLIT : Ministry of Land, Infrastructure and Transport

Extracted from Reference[16]



Extracted from Reference[13]

Figure 10 : Awareness of "Junior Eco-Club"

education[17, 18], as described below.

- Children who have not yet begun school are at an important stage in laying the foundation for all kinds of learning. Such children in daycare centers are taken to visit local nature spots such as watersides, mountains, forests and so on. Through play and fun activities (experiencing nature), they develop an interest in the environment and activities involving learning about natural cycles (Mulle activities*1) are common.
- A diverse range of primary actors are involved in environmental education, ranging from local governments through to educational institutions such as public and private daycare centers and kindergartens, elementary schools, junior high schools, high schools and universities, corporations, foundations and other nonprofit organizations. Because the different facilities and institutions share common policies and goals, they act cooperatively with one another rather than separately.
- Local government legislatures and government policies are closely connected with actual education in the schools, so local governments are actively involved with Local Agenda 21*2 activities. These activities are widespread and widely recognized by the public.
- Social education facilities (museums, etc.) are used effectively for environmental education.

In Sweden, the emphasis placed on environmental education through experiencing nature using the five senses from early childhood onwards is based on the idea that the younger children are when they encounter nature, the greater their future interest in it is likely to be. By teaching them about natural cycles such as the water and air cycle and cycles of living things (e.g. the food cycle), they learn that human beings are part of all nature's great cycles, a basic concept in helping prevent future environmental problems. Moreover, it is expected that as children talk at home about what they have learned, entire families will start to think about the environment, thereby educating parents as well.

Ichijimacho, in Hyogo Prefecture, has adopted the outdoor activities, "Forest Fairy Mulle", a part of Swedish environmental education, since 1990. Figure 11 shows some of the findings of a

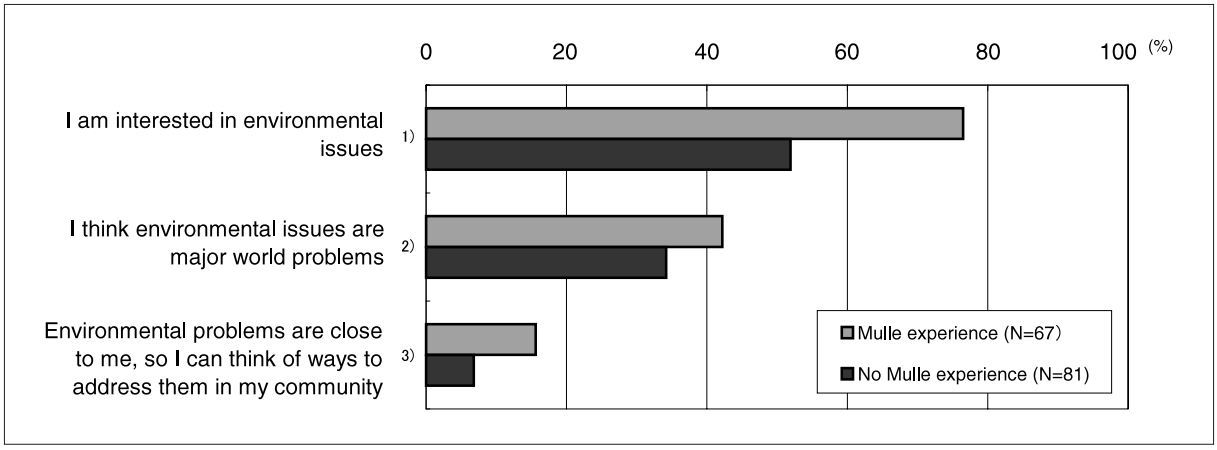
questionnaire survey (2000) on the educational effects of these activities (in this case, the awareness of environmental problems among second-year junior high school students)[18]. There was a significant difference between the responses of students who had participated in Mulle activities and those who had not, when referring to the statements "I am interested in environmental issues" and "I think environmental issues are major world problems". This demonstrates the effectiveness of Mulle activities in Japan as well as Sweden.

The nature-experience learning that occurs in Swedish daycare centers from early childhood onwards provides a good example for the enhancement of Japanese environmental education. In addition, Japan has much to learn from the strong cooperation among actors in environmental education in Sweden, public involvement in Local Agenda 21 activities, and so on.

4 Measures to promote environmental conservation activities

4-1 *The process to environmental conservation activities*

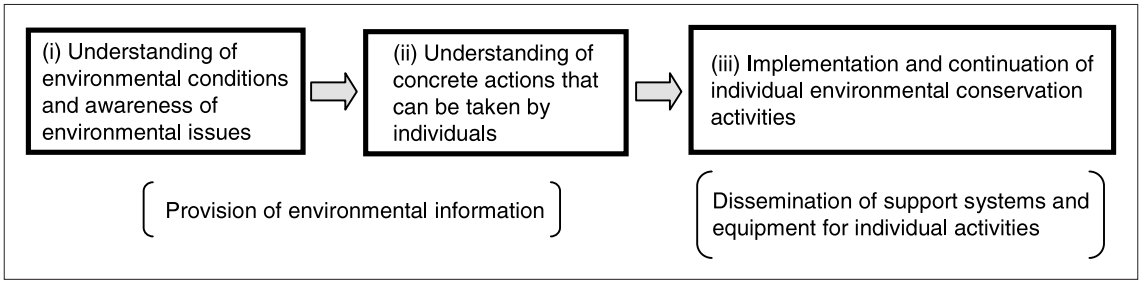
As described above, policies are needed that further advance environmental education in Japan and link it with individual environmental conservation activities. The aim of environmental education, namely the "process to environmental conservation activities", can be roughly divided into the following three stages: (i) understanding of environmental conditions and awareness of environmental issues, (ii) understanding of concrete actions that can be taken by individuals, and (iii) implementation and continuation of individual environmental conservation activities (see Figure 12). In stages (i) and (ii), it is necessary to provide easily understandable information about the environment, while stage (iii) requires the effective dissemination of



2nd-year junior high school students, N = 148

Prepared by the STFC based on Reference[18]

Figure 11 : The effect of Mulle activities on raising awareness of environmental issues



Prepared by the STFC

Figure 12 : The process to environmental conservation activities

support systems and equipment.

In order for this process to be effective, we propose the following measures for each stage:

4-2 Raising awareness of environmental problems and promoting understanding of concrete actions for environmental conservation (stages (i) and (ii))

(1) Raising awareness of environmental problems (stage (i))

In general, environmental issues have aspects that can make them difficult to recognize and personally realize. A major reason for this is that it is often difficult to visually grasp the status of the environment or the changes occurring in it. For example, even if large volumes of CO_2 (the main cause of global warming) are emitted, because it is a colorless and odorless gas, any actual changes are difficult to discern. In other words, the use of familiar indexes and easily understood measurements are effective means of getting people to address environmental issues (such as the degree of air and water pollution, energy consumption, and so on) by presenting problems in terms that people can more readily identify with. For example, converting the amount of energy used to the volume of CO_2 emitted and presenting this as a concrete measurement can increase awareness of the issue.

Furthermore, instead of merely displaying measurements, comparing items of information (such as the seriousness of pollution) with environmental standards (such as goals and reference values) and warnings (such as examples of problems that may occur if the present situation continues) can also be an effective means of increasing awareness.

(2) Promoting understanding of concrete actions for environmental conservation (stage (ii))

The next stage involves getting people to understand concrete actions that individuals can take against environmental problems. One effective approach, when providing information on concrete activities, is the "presentation of the results of environmental conservation activities and the effects obtained". Showing concrete figures (such as the relationship between decreased distances driven by cars and decreased CO_2 emissions, between the volume of cooking oil washed down sinks and the volume of water needed to treat that much oil, or between the amount of electricity used by appliances on standby and CO_2 emissions) is an effective means of encouraging people to take action.

(3) Transmission of environmental information by the media (stages (i) and (ii))

Through environmental monitoring, environmental conditions and changes can be easily quantified and visualized. In order to get people to understand concrete actions that can be taken for environmental conservation, this information must then be transmitted via various media. Information transmission must particularly target people with a low awareness of environmental issues.

Provision of information over the Internet is extremely effective for people who already have a high awareness of environmental issues. For example, much information on air pollution obtained from atmospheric monitoring stations in Japan can be obtained in real time over the Internet via the Atmospheric Environmental Regional Observation System (Soramame Kun)[19]. People with a low awareness of environmental issues, however, are unlikely to access the site that transmits this information. For such people, it is more effective to add visual effects to the data obtained via environmental monitoring and to then process the data so that as many people as possible can easily understand it and be made aware of the problems in question. For example, information could be effectively transmitted via electronic billboards (liquid-crystal billboards) in locations with heavy foot traffic or by liquid-crystal displays on trains as well as via the still-popular media of television and radio. For young people with a relatively low awareness of environmental problems, youth-oriented television programs and information displays in areas where younger people congregate could also be effective.

Account categories

	Category	Unit	CO_2 emission coefficient	Amount consumed (purchase price)	CO_2 emission volume (kg)
Energy / resources	Electricity	kWh	0.12		
	Natural gas (LPG)	m^3	0.64(1.8)		
	Kerosene	l	0.69		
	Water	m^3	0.16		
	Gasoline (diesel)	l	0.64(0.72)		
	Garbage	kg	0.24		
Food/everyday necessities	Sweets	¥1,000	0.46		
	Purified water	¥1,000	0.61		
	Alcoholic beverages	¥1,000	0.40		
	Tobacco	¥1,000	0.20		
	Books/magazines	¥1,000	0.43		
	Cosmetics	¥1,000	0.40		
	Clothing	¥1,000	0.41		
	Furniture	¥1,000	0.52		
	Home electronics	¥1,000	0.49		
Total					

*Enter the amount consumed (purchase price) for each category according to the unit given.
The amount consumed (purchase price) multiplied by the CO_2 emission coefficient is the volume of CO_2 emitted.
Extracted from Reference[21]

Figure 13 : Example of a household environmental account book

4-3 Continuation of environmental conservation activities (stage (iii))

The crucial final stage is the implementation and continuation of environmental conservation activities. In order for people to continue environmental conservation activities, it is very important to establish frameworks that provide feedback on the effects that individual actions are having on environmental conservation, in terms of concrete indexes. Furthermore, in order for economic incentives to come into play, money is also an effective index for such feedback. Some examples of this activity that are already underway are shown below.

(1) Household environmental account books using CO_2 emissions as an index

Some experts recommend entering environmental conservation activities and actions taken in daily life that impact on the environment in a "household environmental account book". Using a household environmental account book, each home can readily determine the amount of CO_2 that it emits. Because this provides continuous feedback on the effects of actions taken to cut CO_2 emissions, sustaining environmental conservation activities becomes easier. Consumers can see concrete figures telling them how much of an impact their homes have had on the environment, making it easy for them to connect environmental impact with cutting back on energy use or garbage volume. At the same time that they reduce household environmental impacts, economic incentives also come into play[20]. Figure 13 shows an example of a household environmental account book[21]. If the use of the household environmental account book system can be extended to groups such as workplaces and communities, then even greater results can be expected.

(2) On-board automobile monitors showing fuel consumption

Automobile emissions account for about 30 percent of household CO_2 emissions. The dissemination of "eco driving" (a method of driving that reduces fuel consumption and contributes to a reduction in CO_2 emissions) is, therefore, one environmental conservation activity that people can undertake individually as an important countermeasure to global warming. On-board monitors that display fuel data in real time are an effective tool for sustaining eco driving. Because drivers can see, in real

time, how different driving conditions affect fuel consumption, it becomes easier for them to constantly be aware of saving energy and to sustain eco driving activities[22].

Making this kind of equipment, with its built-in feedback function, available at low cost will further accelerate the spread of eco driving.

(3) Electricity consumption monitoring that indexes CO_2 emission volume and utility fees

Real-time conversion of electricity consumption into concrete indexes of CO_2 emission volume and utility fees, displayed on a monitor, makes it easier for individuals to sustain energy-saving activities.

Distributing these monitors to schools, workplaces and homes, at low cost, or equipping various devices with such monitors could, therefore have significant effects.

5 Conclusion

Individual lifestyle changes are necessary in order to solve environmental and energy problems. The spread of environmental education connected with individual environmental conservation activities and the utilization of environmental monitoring data are effective ways of bringing this about.

Environmental education for the general public must encompass a broad range of ages in schools and various other social venues, and a number of methods can be used for disseminating this education. In schools, enhanced support for environmental education and its further promotion are especially desirable. To encourage implementation of environmental conservation activities, it is necessary to increase awareness of environmental problems and provide information on concrete actions that can be taken to conserve the environment. In order to sustain environmental conservation activities, it is important to have systems and equipment in place that provide feedback on the results of each action. The following three points are particularly noteworthy:

(i) Enhanced support for environmental education in primary and secondary schools and further promotion of environmental education in higher education

Currently, environmental education in primary and secondary schools is carried out during the "integrated study" and as part of various other subjects. However, enhanced support for environmental learning is needed because there are gaps in the frequency with which different schools address environmental topics and the leadership ability of the teaching staff can be improved.

In higher education, students with a low awareness of environmental issues should be encouraged to take classes in environmental education subjects. In addition, environmental education should be a required class for university students in teacher training courses because these students will be responsible for the environmental education of children and students in the future.

(ii) Raising awareness of environmental problems and promoting understanding of concrete actions that can be taken for environmental conservation

The first stage in moving towards environmental conservation activities is raising public awareness of environmental problems. An important part of this process is being able to monitor the environment and any changes in it and then being able to quantify and visualize the results. When doing this, displaying concrete units of data in comparison with environmental standards and warnings is particularly effective.

The second stage in moving towards environmental conservation activities is the provision of information linked to concrete actions on environmental conservation. In this case, it is preferable to display the effects of environmental conservation activities.

It is especially important to transmit such information to people who have a low awareness of environmental issues. It is therefore necessary to use visual effects and suchlike to process the information so that even people with a low awareness of the issues can easily understand the problems. Effective media for the transmission of this sort of information include electronic billboards (liquid-crystal billboards) in locations

with heavy foot traffic, and television.

(iii) Dissemination and development of support systems and equipment that provide feedback to help facilitate environmental conservation activities

It is essential that individual environmental conservation activities be carried out on an ongoing, continuous basis. The use of concrete indexes to provide feedback on the environmental conservation effects of activities is an effective means to get people to sustain their activities. For example, household environmental account books that index CO_2 emission volumes, on-board automobile monitors showing fuel consumption, and electricity consumption monitoring that displays CO_2 emission volumes and utility fees are all very effective. Further efforts are therefore needed to develop such systems and equipment, to reduce their price, and to promote their dissemination.

Acknowledgements

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Glossary

*1 Mulle activities
Based on a nature education program for five- and six-year-olds developed by Sweden's Friluftsfr_mjandet (Association for the Promotion of Outdoor Life), Mulle activities have been expanded to daycare centers. Over the past 40 years, over 2 million children have participated in these preschool environmental education activities closely linked to local communities. (Sweden's current total population is 8.8 million.)

*2 Local Agenda 21
Local Agenda 21 refers to local action plans on environmental policy intended to meet the sustainable development goals set forth in Agenda 21 at the United Nations Conference on Environment and Development (UNCED) in 1992.

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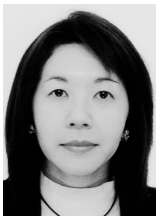

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