[Summary of the interim report]

Project title: Interactions between the environmental quality of a watershed and the environmental consciousness: with reference to environmental changes caused by the human use of land and water resources

Aim of the 5-2 IDEA project is the development of a method to estimate environmental qualities affecting people's environmental consciousness. In this method, responses of a watershed environment to virtual impacts are predicted using simulation models, and the changes in people's value judgments due to environmental changes are analyzed. During the first 2 years in the research term, simulation models of ecosystems and their material cycling in a forest-agricultural-aquatic system have been developed, and an interest survey on watershed environments has been conducted.

Sub-models in the response-prediction model have been selected, as follows.

[Forest] PnET-CN model.

[River] A distributed model on rainfall-runoff phenomena from sub-basins and a nutrient-loading model from agricultural fields.

[Lake] Flow model of lake water and lacustrine biogeochemical model

Existing and newly obtained data have been introduced in these sub-models to compare the simulation results to the observations. Although the PnET-CN model needs more careful customization by hydrological processes, the model performance for simulating environmental changes was acceptably well. It was suggested that the PnET-CN model was able to predict environmental changes not only due to direct human impacts to forest (e.g., logging), but also due to acid rain and global warming. We propose versatile simulation models for a forest-river-lake ecosystem. The development of our response-prediction model is progressing as planned in the project schedule. Moreover, our effort is expected to become a large contribution to the research field on ecosystem material cyclings.

People's interests in a forest-agricultural-aquatic system were surveyed using a questionnaire. The questionnaire was developed in such a way that the preparation procedure was traceable, in order to keep the questionnaire versatility and applicability to environments other than the forest-agricultural-aquatic ecosystem. It was suggested that people seemed to evaluate environments similarly with respect to the categories such as direct/indirect use values and environmental functions. It supported the conceptual framework of the 5-2 IDEA project; people's environmental consciousness is expressed as their value judgments on the environment. For setting virtual impacts used in scenario questionnaires in the latter term of this research project, detailed analyses on the interest questionnaire will be continued.

Project title: Interactions between the environmental quality of a watershed and the environmental consciousness: With reference to environmental changes caused by the human use of land and water resources

Short name: 5-2 IDEA project
Project leader: Takahito Yoshioka
Website http://www.chikyu.ac.jp/idea/
Key words: environmental consciousness, watershed, response-prediction model, environmental quality, environmental value
Research term: Incubation study (IS) in 2001.
Feasibility study (FS) during 2002 and 2003.
Full-scale Research (FR) during 2004 and 2008.

[1] Research objectives

It is essential for constructing the human society, which has sustainability and assures the possibility for future generations, to preserve and utilize the global environment, as a whole. Assuming that the global environmental issues are based on the interaction between humans and the nature, understanding the essence of sense of value for environments is important for solving the environmental issues. It is important to understand how the environmental consciousness is established under the watershed environments and how it correlates with the economic value. These understandings contribute to the environmental evaluation for better use and for preservation of environments. Although relationships between environmental quality and people's perception have been widely studied in environmental sociology and environmental economics, the information and knowledge in natural sciences has not been fully utilized in those study fields. In this context, a multi-disciplinary study over the various fields of nature and humanities must be highly promoted.

In the 5-2 IDEA project, the relationship between the environmental consciousness and the environmental qualities will be elucidated. A material-cycling model of watershed environments is developed for estimating and predicting the response of the environments to the artificial impacts on the land and water-resource uses. A tool for analyzing relationships between the environmental quality and the environmental consciousness, "Interactive Device between Environments and Artifacts (IDEA)" will be developed. The IDEA would be an essential tool for the quantitative and statistical analyses of the information from the interviews, questionnaires and focus group session.

Tools and procedures developed in this project will be proposed as a methodology, in which people can take a responsible approach to the solution of environmental issues.

[2] Background and philosophy of the project

When people are placed in an environment, one may use it to get some benefits, another may conserve it because of existence of endangered organisms, and another may ignore it. Why do these differences in attitudes among people occur toward the same environment? Understanding this question is one of the objectives for elucidating relationships between humans and the nature.

People's perception of the environment affects their value judgments on the environment as a basis to determine their attitudes toward it. We define this value judgment system as the "environmental consciousness" (Fig. 1).

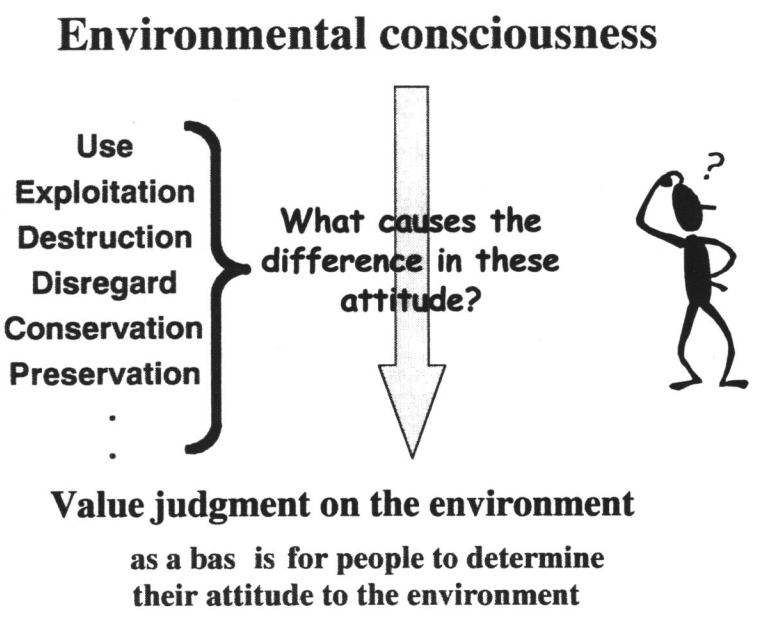


Fig. 1. Environmental consciousness and value judgment on environment

Considering the relationship between people's environmental consciousness and qualities of the environments, following assumptions (working hypotheses) will be deduced.

1) People's environmental consciousness is expressed as their value judgments on the environment.

2) Attitudes and minds of people to the environment are affected by their value judgments.

3) Some environmental changes affect people's environmental consciousness, or their value judgment on the environment.

4) Information on the changes of environmental qualities causes the changes in people's environmental consciousness and then in their attitudes and minds to the environment changes.

Therefore,

5) Understanding the relationship between environmental consciousness and environmental

quality is a key to the fundamental solution of environmental issues.

Recently, "public involvements" and "collaborative learning" are said to be important in the decision-making processes of the environmental policies from the viewpoint of ecosystem management (Ohno 2000, Kakizawa 2000). The Applegate partnership is one of the examples in USA (http://www.arwc.org/index.html). Since the relationship between the environmental consciousness and the environmental quality is an important factor for the decision-making of the environmental policies and for establishment of the mutual agreement among the stakeholders, the development of a methodology to elucidate the relationship is useful for the ecosystem management.

The environmental assessment prior to a public enterprise activities relating to rivers has become the legal obligation, after an amendment of the River Law in Japan, in 1997. However, the public involvement and the treatment of the natural environmental information during the assessment have been conducted by a one-way procedure from governmental sector to the public and from a mere sense of duty of governmental sectors. Since the environmental consciousness is formed as a result of long-term interactions between people or society and the natural environment, it is difficult to compare the result of the environmental assessment with the economic value and the public interest of the corresponding enterprise activity. Know-how and conceptual framework for intermediating natural scientific and individual or social environmental valuation are desired. Relationship between natural sciences and environmental valuation was conceptually considered and published as one of the results of the incubation study in FY 2001 (Yoshioka 2002).

[References]

Ohno, E. 2000. Practice of the environmental economic evaluation. Keiso-shobo, pp.182 (in Japanese).

Kakizawa, H. 2000. Ecosystem Management. Tsukiji-shokan, pp. 206 (in Japanese).

Yoshioka, T. 2002. Contribution of natural science to the valuation of the environment: consideration for uniting natural science, humanities and sociology on the environmental studies. Kagaku (Science), 72(9):940-948 (in Japanese).

[3] Contents and Methodology

(1) Methods

The methodology to be developed in this project must include several functions, as follows:

1) Quantitative prediction of changes in environmental elements caused by virtual environmental modifications, such as logging and dairy farming,

2) Informing people of the environmental changes in an appropriate manner,

and

3) Analysis of relationships between changes in the people's value judgment and in the environmental elements.

There are large differences between information of natural sciences and that of humanities. Because of such differences, no devise, which can flexibly compensate them, has been developed. We will develop a method, the IDEA (Interactive Device between Environments and Artifacts), as a main tool that provides these three functions including the response-prediction model for the environment and the tools for preparing and analyzing social surveys (Fig. 2).

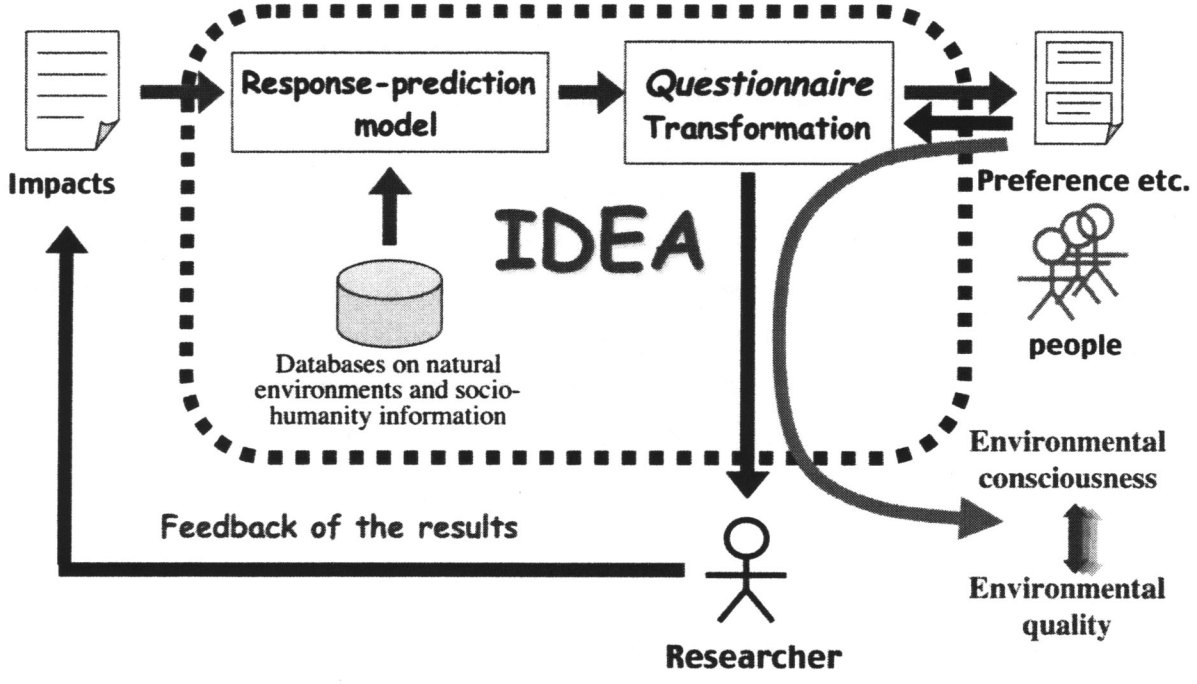


Fig. 2 Framework of the method to be developed in the project.

(2) Subject areas

The Lake Shumarinai watershed is selected as a main study area, which is located in the northern Hokkaido, Japan. Since the university forest (Hokkaido University) is located in the watershed, we can use abundant data for simulation models and facilities for field surveys. We will also study in a university forest (Kyoto University) and a private forest in Wakayama and Nara Prefectures. In the private forest, the 90-yr cycle of clear cutting and plantation has been repeated at a small watershed level. Therefore, long-term changes in forest environments after forest cutting can be traced. The surveys in this forest are applicable to validate the simulation models.

Social surveys will be conducted not only for the residents in these watersheds, but also

nationwide in Japan, in order to elucidate relationships between people's environmental consciousness and their physical and mental distances to subject environments.

(3) Organization of the project

The 5-2 IDEA project is conducted under two major themes as follows.

1) Development of a response-prediction model of a watershed environment to the changes in land and water resource uses (Response-prediction model working group: RPM WG)

2) Elucidation of the relationship between the environmental quality and the view of environmental value in the formation process of environmental consciousness (IDEA working group: IDEA WG)

Under the theme 1), we will construct a response-prediction model for the forested-catchment environment. Natural scientists (forest ecologists, forest hydrologists, limnologists, biogeochemists) and environmental engineers participate in the RPM WG. The IDEA WG, which is composed of both social and natural scientists, discusses the structure of the IDEA as the main framework of the project and implements social surveys on the environmental consciousness. Although sociology, statistics and social psychology are main field for this theme, several natural scientists have taken part in the discussion. In addition to the project leader, a liaison is established to facilitate collaboration between these two working groups, because the information exchange between them will be required for the scenario questionnaire.

・Core member (2005)

Name	Affiliation/Position	Role	Working group
Kazutoshi Fujihira	Institute of Environmentology	Mutual agreement	IDEA
Shuji Hino	Yamagata University, Assoc. Professor	Lacustrine material cyclings	RPM
Eiichi Konohira	Nagoya University, Assoc. Professor	Stream hydrochemistry	RPM
Keisuke Koba	Tokyo Institute of Technology, Assoc. Professor	Environmental valuation	RPM & IDEA
Motohiko Nagata	Mie University, Assoc. Professor	Environmental sociology	IDEA
Kisaburo Nakata	Tokai University, Professor	Water flow and ecosystem models	RPM
Nobuhito Ohte	Kyoto University, Assoc. Professor	Hydrological processes	RPM
Tatsuki Sekino	RIHN, Associate Professor	Development of IDEA	IDEA & RPM
Hideaki Shibata	Hokkaido University, Assoc. Professor	PnET model	RPM
Toshio Sugiman	Kyoto University, Professor	Social psychology	IDEA
Hikaru Takahara	Kyoto Prefecture University, Professor	Pollen analysis	RPM
Naoko Tokuchi	Kyoto University, Assoc. Professor	PnET model	RPM
Koh Yasue	Shinshu University, Assoc. Professor	Annual tree-ring analysis	RPM
Yuejun Zheng	RIHN, Associate Professor	Environmental consciousness survey	IDEA

(4) Contents

1) Development of a response-prediction model of a watershed environment to the changes in land and water resource uses

The response-prediction model simulates the environmental changes caused by the virtual impacts to the environment. Specifically, physical, chemical and biological characteristics are predicted quantitatively. In this project, the impacts on changes in land and water resource uses will be applied to the watershed environment. The response-prediction model is composed of following sub-models (Fig. 3).

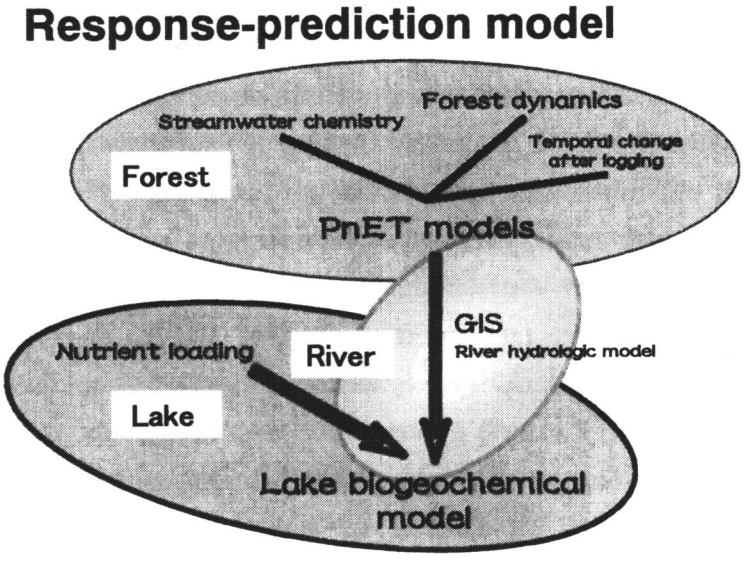


Fig. 3 Response-prediction model.

1. Carbon and nitrogen cyclings in forest environments

PnET model is applied for simulating material cycles in a forest environment. The model can evaluate effects of logging, acid deposition and so on. Since the model has been developed for North American forests, some modification will be needed for its application to Japanese forests.

2. Rainfall-runoff model

For simulating quality and quantity of stream and river waters supplied from forests, runoffs from small catchment areas should be integrated. For this purpose, a rainfall-runoff model based on a distributed model will be developed.

3. Nutrient loading from agricultural fields

Supplies of nutrients from agricultural fields in the watershed are estimated using a generator method. Data from the field survey are used for calculation of the nutrient loads.

4. Flow model of lake water

To develop a lacustrine model on biogeochemical material cycle, flow of lake water should be simulated first. Applying three-dimensional hydrodynamic model, the flow model of lake

water is constructed. Since the model includes thermal balance, water temperature is also formulated in the model.

5. Biogeochemical material cycling in lake environments

Biogeochemical model is needed to analyze the material cycles in an ecosystem. Materials and water inputs from a watershed to a lake generated by the forest and river models are the input to the flow model and the lacustrine biogeochemical model.

The performance of the response-prediction model will be validated with observational datasets including the nationwide survey on the stream chemistry and paleoenvironmental analyses using proxies of tree-rings and sedimentary records.

2) Elucidation of the relationship between the environmental quality and the sense of value for environments in the formation process of environmental consciousness

The IDEA WG examines the framework of the IDEA (Fig. 2), except for the response-prediction model, and implements attitude surveys.

1. Transformation module

The transformation module, an important part of IDEA, is used for preparing the questionnaire. It transforms descriptive expressions based on people's consciousness about the environment (e.g. "a clear water") into technical expressions about an environment based on environmental quality (e.g. "water transparency"). The core function of the module is performed by a database, which consists of tables with rules for transformation and synonyms (Fig. 4). When scenario questionnaires are designed, the transformation module functions to translate the result of the response-prediction model into narrative words and phrases, in order for people to understand environmental changes caused by the virtual impact to the environment being considered.

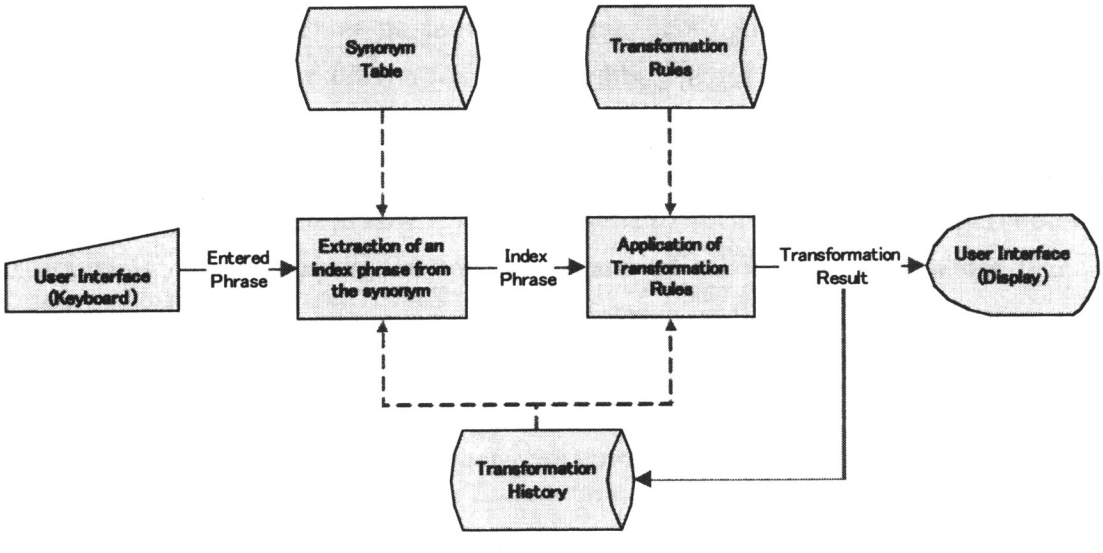


Fig. 4 Structure of the Transformation module.

2. Attitude survey

Attitude surveys will be conducted by way of questionnaires and interviews.

2-1. Interviews to residents in the Lake Shumarinai watershed and nearby city and town

In order to elucidate the social and environmental situations from the viewpoints of the ordinary sense of residents, interview surveys are conducted in and around the Lake Shumarinai watershed. Collected scripts from residents are analyzed with the evaluation grid method. Results may be useful for verifying the conceptual framework of the IDEA as well as for preparing scenario questionnaires.

2-2. Survey on people's interests in a forest-agricultural-aquatic system

Interests in the watershed environment are studied based on the interviews and questionnaires. Questionnaire should be carefully developed in such a way that the preparation procedure is traceable, in order to assure the universal applicability of this method to other environments and stakeholders. Results of the analyses are used for selecting and scoping virtual impacts applied for the scenario questionnaire. The questionnaire is also analyzed using factor analyses to verify a model that assumes the relationships between people's interests in the environment and their environmental valuation.

2-3. Scenario questionnaire

Relationships between people's environmental consciousness and environmental change are analyzed using the responses to the questionnaires regarding the environmental change scenarios generated by the response-prediction model.

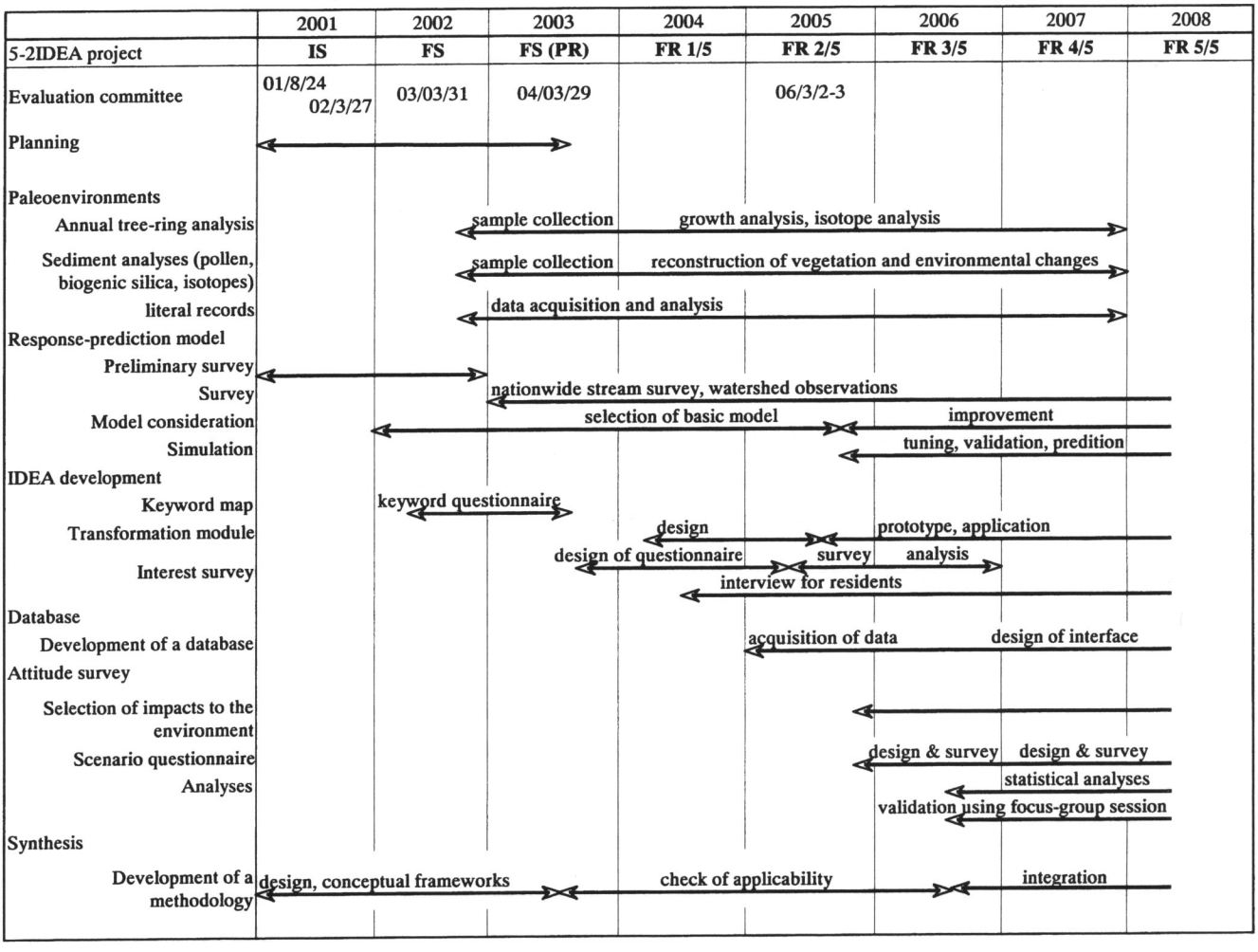
When the project was planned, we intended to conduct questionnaires with methods used in environmental economics, such as a contingent valuation method (CVM) or a conjoint method. In the feasibility study of the project, it was suggested that the economic valuation would not be always needed for our purpose. Therefore, we will consider a wider range of the methods including economic valuation for scenario questionnaires.

The relationship between people's environmental consciousness and environmental qualities estimated from the scenario questionnaire will be fed-back to the next questionnaire, in order to determine whether the relationship shows the direct interaction between environmental consciousness and environmental quality or not (Fig. 2).

Questionnaire will be conducted not only to the residents who have some connection to the watershed considered, but also to the residents who do not have any connection to the watershed, in order to elucidate the general features of the relationship between environmental qualities and environmental consciousness.

[4] Time schedule and budget

Time schedule and budget of the project are summarized below.



(Unit: 1,000 yen)

	Facility/ Equipment	Supplies	Domestic Travel	Travel Abroad	Personnel	Others	Total
FY2004	56,610	19,923	8,884	2,122	20,310	1,089	108,938
FY2005	4,533	32,510	8,800	1,815	22,640	37,552	107,850
FY2006	0	18,225	7,200	2,000	22,515	30,060	80,000
FY2007	0	12,225	7,200	2,000	22,515	26,060	70,000
FY2008	0	9,425	4,000	2,000	22,515	12,060	50,000
Total	61,143	92,308	36,084	9,937	110,495	106,821	416,788

Special research equipments with high price more than 1,000,000 yen are written below;

FY2004		
	Automatic water sampler	1,767,000 yen
	Centrifuge	1,606,000 yen
	Chlorophyll analyser	2,646,000 yen
	Research vehicle	10,419,000 yen
	Autoanalyzer	15,975,000 yen
	Meteorological observation system	1,003,000 yen
	Organic carbon analyzer	2,866,000 yen
	Water flow meter (2)	2,679,000 yen
FY2005		
	Water flow meter	1,377,000 yen

[5] Progress of the project

(1) Results obtained up to now

Results of the RPM and IDEA WGs are reported as followings.

◎ Development of the response-prediction model: RPM WG

- Application of process-based model of biogeochemical cycling in forest watershed in Hokkaido, northern Japan (Shibata)
- The influence of forest disturbance and examination of applying the PnET model for the long-term influences (Tokuchi, Fukushima and Tateno)
- Necessity for consideration on hydrological controls of biogeochemical cycling to develop a catchment scale ecosystem model (Ohte)
- Quantitative approach and problems of river hydrological simulation (Yamashita, Ichikawa, Sato and Shibata)
- Characters of nutrient load from influent rivers of Lake Shumarinai (Hino, Satoh, Okamura, Kikuchi, Ishikawa, Mikami, Igarashi and Takano [a])
- Development of biogeochemical model coupled with hydrodynamic model of Lake Shumarinai (Nakata, Hino and Ueda)
- Factors influencing early vegetation establishment following soil-scarification in a mixed forest of northern Japan (Yoshida, Iga, Ozawa, Noguchi and Shibata)
- Studies on the past environmental changes of the Lake Shumarinai watershed by dendrochronological analyses (Yasue and Okada)
- Vegetation history during the last 10000 years in the watershed of the Uryu Experimental Forest of Hokkaido University (Takahara, Kawano, Nomura and Sasaki)
- Japan-wide stream chemistry monitoring (JWSM) 2003 (Konohira, Itaya, Wakamatsu, Shindo and Yoshioka)
- Dynamics of planktonic communities in Lake Shumarinai Shumarinai (Hino, Satoh, Okamura, Kikuchi, Ishikawa, Mikami, Igarashi and Takano [b])

◎ Attitude survey for elucidating relationships between the environmental quality and the people's view on environmental value: IDEA WG

- Transformation module (Sekino)
- Interests of residents in the watershed environment of the Lake Shumarinai (Nagata)
- Theoretical Analysis on People's Environmental Concerns in the Watershed (Zheng)
- Sample Survey on Interests in Watershed Environment (Matsukawa)
- The 5-2 project's significance consideration from the viewpoint of the control theory's application (Fujihira)

1) Development of the response-prediction model: RPM WG

1. Carbon and nitrogen cyclings in forest environments (Shibata; Tokuchi et al.)

To estimate material cycles and vegetation dynamics, we chose and run the PnET-CN model developed by US forest scientists, using measured data as an input. We found that the PnET-CN model could be applicable to our project though there are some discrepancies between observations and simulation results. It was suggested that some modifications might be needed in hydrological processes for the application to our study sites. As preliminary predictions, effects of the intensity of logging on stream chemistry were simulated for the forest in the Lake Shumarinai watershed. Although logging affected the stream chemistry, the 25% logging was estimated to only slightly increase the stream NO_3^- (Shibata: Figure 3). The model results also suggested that the effect of the increase in atmospheric nitrogen deposition on the stream NO_3^- concentration was compensated by the increase in atmospheric CO_2 concentration (Shibata: Figure 5). In the simulation results for the forest in Wakayama and Nara prefectures, the patterns of the biomass increment reaching a plateau and the decrease of leaf nitrogen concentration with forest age seemed to be simulated well (Tokuchi et al.: Fig. 2 and 3).

2. Rainfall-runoff model (Ohte; Yamashita et al.)

Performance of the hydrological sub model in the PnET-CN model was examined using the dataset from a Japanese temperate forest (Matsu-zawa catchment) under Asian monsoon climate. Although the PnET-CN model reproduced the monthly discharge of the stream water, the model was not able to simulate sufficiently the seasonal variation in the stream NO_3^- concentration in the catchment (Ohte: Figure 3). In order to develop a robust model for ecosystem scale water and nutrient cycles, more realistic hydrologic sub model must be built in the model. The simulation using the Hydrologic Cycle (HYCY) model developed for the Japanese forested watershed was able to reproduce the seasonal pattern of the monthly NO_3^- concentration (Ohte: Figure 3c and 5b).

A method for the description of rainfall-runoff phenomena from sub-basins was considered to propose a new rainfall runoff model based on the assumption that retention capacities in the soil has a great effect on the runoff phenomena. The simulation results agreed fairly well with observed data collected at two small catchments in the Lake Shumarinai watershed (Yamashita et al.: Fig. 2).

3. Nutrient loading from agricultural fields (Hino et al.)

Nutrient loading from influent rivers to Lake Shumarinai has been investigated since the beginning of the project (Hino et al. [a]: Fig. 3). Accumulated data are introduced in the biogeochemical model.

4. Flow model of lake water and biogeochemical material cycling in lake environments (Nakata et al.)

The development of a model to simulate the flow of lake water was completed. Water temperature and flow rate in each water layer were simulated (Nakata et al.: Fig. 3 and 4). The flow model will be combined with the biogeochemical model.

5. Other results relating to the response-prediction model

•Effects of soil-scarification on early vegetation establishment (Yoshida et al.): At the scarification site, light intensity showed a negative effect on the demography of tall-tree species, such as *Betula* spp., *Abies sachalinensis, Acer mono* and *Phellodendron amurense* (Yoshida et al.: Table 1).

•Reconstruction of climatic condition by tree-ring analyzes (Yasue and Okada): From the densitometric analyses the past summer temperature and precipitation in the northern Hokkaido were reconstructed back to A.D. 1651. It was suggested that the Uryu-dam (or, Lake Shumarinai) construction did not affect the micro-meteorological condition in the watershed (Yasue and Okada: Fig. 1). However, environmental changes not due to climatic changes might be estimated in the Dorokawa swamp forest.

•Pollen and biogenic silicate analyses (Takahara et al.): The analyses have elucidated regional and local climatic and vegetation changes for more than 7000 years (Takahara et al.: Fig. 4). The long-term climate change is not only useful for validating the response-prediction model, but it is also used in the questionnaire to the examinees as environmental information.

•Japan-Wide Stream Monitoring (JWSM) 2003 (Konohira et al.): This survey is practically the first comprehensive survey on the stream chemistry in Japan. Spatial distributions of ionic composition in Japanese natural streams (1278 streams in total) were obtained (Table 1 and 2). Atmospheric nitrogen deposition, annual precipitation, annual air temperature, slope of catchment area and direction of the slope contributed to the stream NO_3^- concentration. The most effective factor was the atmospheric deposition (standardized covariance coefficient: 0.501). On the other hand, dissolved inorganic phosphorus concentration in natural streams seemed to be controlled by the geology of the catchments.

•Microbial characteristics of Lake Shumarinai (Hino et al. [b]): Bacterial biomass (6.83×10^7 cells ml^{-1}) was higher than that in eutrophic lakes, although the cell size was rather small in Lake Shumarinai. Picophytoplankton was also abundant (3.8×10^4 cells ml^{-1}) in the lake. Dataset obtained in this survey will be introduced in the biogeochemical model.

2) Attitude survey for elucidating relationships between the environmental quality and the people's view on environmental value: IDEA WG

1. Transformation module (Sekino)

During the first stage of the project, we considered to develop a tool for estimating relations between people's images on an environment and environmental qualities (Keyword-map). However, as a result of the IDEA WG, its concept has been progressively merged into the transformation module.

Transformation rules and synonym database for the performance testing were generated using the results of keyword questionnaire survey conducted in 2002. Before the implementation of the module, the details of the functions that the module needs to perform were identified. Since the module needs to be frequently reconstructed based on the results of the performance test, Microsoft Access 2003, in which changing the database structure and the user interface is relatively easy, was used as the database management software in this implementation.

2. Attitude survey

2-1. Interviews to residents in the Lake Shumarinai watershed and nearby city and town (Kimura. Her Bachelor's thesis is not included in the list of reports.)

Evaluation grid method on the transcripts from the interviews for residents, who live in and around the Lake Shumarinai watershed, suggested the following sequence in the people's environmental perception:

Causes→environmental changes→recognition of environmental changes→value judgment on environmental changes

This sequence matched the basic assumption of the project. Regarding a questionnaire to elucidate people's interest in watershed environments, a procedure has determined to prepare the questionnaire, which is applicable for a variety of regions and environments.

2-2. Survey on people's interests in a forest-agricultural-aquatic system (Zheng; Matsukawa; Nagata)

Questionnaire on people's interests in a forest-agricultural-aquatic system was conducted to determine ranges of type and scale of virtual impact to the environment. Procedure for preparing the questionnaire was considered to keep high versatility and applicability to other environments. The questionnaire was distributed to 120 sites and 1800 residents in Japan. The collection rate was 49.2%. The tabulation is presented in the attached sheets (also see http://www.chikyu.ac.jp/idea/QS/interestQS.htm (in Japanese)).

Factor analyses of the questionnaire revealed that people seemed to evaluate environments similarly, with respect to the categories such as direct use value, indirect use values and environmental functions. Assuming several parameters based on direct and indirect use values, we can analyze people's interests in the watershed environment from the viewpoints of environmental values and people's attitudes (Matsukawa: Table 1, Figure 1 and 2). The same survey has been conducted local people who live in and near the Lake Shumarinai watershed. Several differences were found in main interests between nation-wide and local

surveys. However, both surveys indicated that people were clearly divided into three clusters of 'very interested', 'somewhat interested' and 'not much interested' (Zheng: Figure 3, Nagata: Figure 2).

3. Other results relating to the IDEA

•Conceptual consideration of the project (Fujihira): The methodology to be developed in the project has been considered from the viewpoint of the system control theory.

(2) Changes in the project plan

The PnET-CN model instead of the PnET-BGC model has been applied in the project. Application of the PnET-BGC will be simultaneously considered with the PnET-CN. Since the development of PC-aided transformation module has taken longer time than originally expected, its application must be postponed. The manual-type transformation module will produce information needed for preparing and analyzing questionnaires.

(3) Publications

Saito, T., K. Koba, T. Sakai, K. Kameda and T. Yoshioka. 2002. Evaluation of model plans for a wildlife issue by conjoint analysis: the case study of wildlife issue of great cormorant in Lake Biwa. The Japanese Journal of Evaluation Studies, 2:79-90 (in Japanese).

Yoshioka, T. 2002. Contribution of natural science to the valuation of the environment: consideration for uniting natural science, humanities and sociology on the environmental studies. Kagaku (Science), 72:940-948 (in Japanese).

Guo Z., Xiao X., Gan Y., and Zheng Y. 2003. Landscape Planning for A Rural Ecosystem: Case Study of A Resettlement Area for Residents from Land Submerged by the Three Gorges Reservoir, China. Landscape Ecology, Vol.18: 503-512.

Koba, K., M. Hirobe, L. Koyama, A. Kohzu, N. Tokuchi, K. J. Nadelhoffer, E. Wada and H. Takeda. 2003. Natural abundance of 15 N in plants and soils of a temperate coniferous forest. Ecosystems 6 (5): 457-469

Kuboyama H., Y. Zheng and H. Oka. 2003. Study about Damage Probabilities on Major Forest Climatic Risks According to Age-classes. Journal of Japanese Forest Society, 85(3), 191-198 (in Japanese).

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[6] Future activities

(1) Expected outcomes

1) Proposal on simulation models for the forested watershed

The response-prediction models would be useful for assessing environmental changes in forested watersheds. We will propose a package of ecological and biogeochemical simulation models for the environmental assessment procedure, based on this R-P model.

2) Proposal on a methodology to analyze relationships between environmental quality and people's environmental consciousness

A manual for the method developed in the project will be published for researchers and individuals who are interested in environmental issues.

3) Presentation of project results to the public

The findings from the project will be presented at seminars and lectures open to the public, and published as books. These activities will be useful to promote the discussions to establish the desirable future environment.

(2) Activities in the latter period of the project

1) Activities conducted as planned

The construction of the prototype of the R-P model has been almost completed. Using the R-P model, environmental changes will be estimated base on various impact scenarios. Results of the interest questionnaire will be analyzed within this fiscal year to create the type and scale of impacts to be used as model input. In the 3rd and 4th year, main focus will be scenario questionnaires. The refinement of the R-P model and the collection and management of measured data of the environment will be continued.

2) Activities with modification

As mentioned before, the R-P model was changed from PnET-BGC to PnET-CN and the development of the transformation module was postponed. However, the overall activity of the project was not changed.

(3) Problems in implementing the project

1) Project budget

Expenditure for attitude surveys may be higher than expected. Although the reduction in the project budget in the latter period is anticipated, appropriate financial measures will be highly appreciated.

2) Attitude survey and protection of personal information

According to the recent movement on the protection of personal information in Japan (the Act on the Protection of Personal Information, enforced on April 1, 2005), the selection of residents who could answer the questionnaire using the Basic Resident Register has become difficult. Collection rate for the attitude survey, in general, has gradually decreased year by year, probably because of changes in the life style and people's sense of value. A framework of the attitude survey observing the Act on the Protection of Personal Information should be considered. A method for selecting examinees without the Basic Resident Register may need to be developed.

(4) Toward the final outcome of the project

The RPM WG and IDEA WG need to collaborate more closely for conducting scenario questionnaires. Organization of the project will be adjusted to facilitate interviews and focus-group-sessions, which are used to validate the analyses of the questionnaires. The concepts in environmental economics, environmental ethics and environmental philosophy related to the environmental value and environmental consciousness as the bases for the project will be studied to present to the public as well as the researchers in different academic disciplines.