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Information consolidation of pollution problems

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INTRODUCTION

1. The problems and phenomena occurring in the environment, such as air and water pollution, are composed of and related to various factors and aspects; for example technology development, public education, regulations, economics and finances. And relationships among factors and aspects of the problems can not be understood, in general, by the 1:1 relationship which is the most important and basic concept of natural sciences and engineering. However, it is necessary, for under standing problems well, to unveil the unseen relationship among the various factors and aspects relevent to the subjects and to simulate a clear and actual image.

THE K-J METHOD

2. The K-J method seems to be suitable for performing the above mentioned difficulties successfully. This method is for information synthesis and decision-making through several steps of grouping and relation-making of many individual data and/or observations. The method was invented by Dr.Jiro Kawakita, a renowned Japanese anthropologist, and conveniently named after his initials. The method was developed about 30 years ago in the process of attempting to synthesize data and informations gathered through anthropological field studies in Nepal. It has later received wide acceptance among planners, engineers and adimistrators in Japan

Basics steps of the K-J Method

3. The K-J method consists of four basic steps, which were card makings, grouping of cards, preparation of display digaram and explanation of display diagram (story making). The following outlines of these steps are summarized through the book entitle "Hassoho (in Japanese)" or a method for creative thinking written by Dr.Jiro Kawakita.

4. Card making is to gather all facts, ideas and useful pieces of information which are relevant to the problem statement or theme through brain-storming. A label maker will be selected and will construct keywords or very short sentences by extracting from the facts, opinions and ideas which reflects the intention of the contributing members through free discussion. In this step, any opinions and ideas should be accepted.

5. Grouping of cards will be performed as the second step. Cards will be then primarily grouped according to theirs concept. New descriptors will be written to represent each groups of cards. The secondary and tertiary grouping will be then performed and new higher level descriptor cards will also be obtained. Sometimes there will be cards which do not seem to belong to any other cards. Such cards are called "lone wolves". However, it may later play an important role in producing new ideas and then will be grouped at higher steps of grouping.

6. Preparation of display diagram will be later performed to draw diagram and display the relational structure of groups of cards. The first step was to place the descriptor cards of the highest order grouping on a paper according to theirs configuration. The next step should be proceeded by first identifying the relationships among descriptions of the highest order grouping and then consequently with lower order. The process repeats itself until the relationships among the individual cards are identified within the primary grouping of cards. The recommended symbols for use in drawing diagram is shown in Figure 1.

7. Explanation of display diagram will be the last step. The story will be then created to explain about the problems. Figure 2. shows the flow chart of grouping process and identifying process of relational structure.

APPLICATION FOR WATER POLLUTION PROBLEMS IN CHIANGMAI

8. Chiangmai have many problems on surface and groundwaters quality. The main cause can be recognised as the lack of proper system, in both technology and sociology, for wastewater treatment and disposal. However, if the cause-effect relationships in these problems are verified and explained, step by step, by applying the 1:1 relationships already known by experiments, the appropriate counter measures to the water pollution problems are still difficult to

———	Related with
⟶	Derived from, causal relation, and the details from the whole
⟷	Mutually caused
≻≺	Mutually opposed or contradictory
═══	Same
≠	Not same
∴	Therefore
∵	Because
e.g.	For example

Fig. 1 Recommended Symbols for Use in Drawing a Diagram

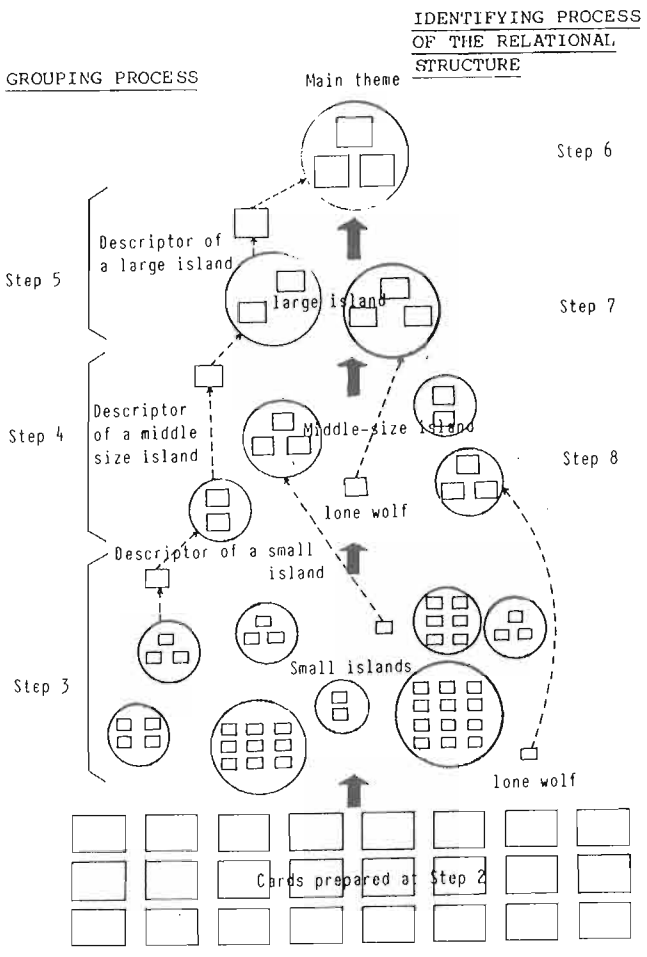

Fig. 2 Flow Chart of Grouping Process and Identifying Process of the Relational Structure

be found and shown in visual fashion. It is therefore necessary to apply the K-J method to consolidate the informations in Chiangmai area.

9. The K-J method was applied by initiating a brain storming discussion among the selected participants from different organizations involved in water pollution problems in Chiangmai area. Thirteen participants from municipality office, provincial public health office, Northern Industrial Promotion Centre, Social Research Insititute, Governor's office and department of environmental engineering Chiangmai university were involved in the discussion. After two and a half hours of discussion, 107 keywords and sentences were obtained.

10. The keywords and sentences were then grouped according to the procedures stated above. The result obtained from first step grouping was that 97 cards were classified by 23 new descriptors with 10 lone wolves. New descriptors were written on blue cards. Second grouping were then performed. Seven newly produced descriptors were prepared from eighteen descriptors and seven original cards and were written in pink cards. Five descriptors produced in the first grouping and three original cards were left as lone wolves.

11. Fifteen cards with seven descriptors produced during the second grouping and eight descriptors and original keywords left at the last step to grouping were then arranged on the table to display a rational and proper relational structure. The diagram was then produced from large group to smaller group.

RESULTS AND DISCUSSION

12. The main result was obtained as shown in figure 3 which shows the relational structure among descriptors after the final step of cards grouping. Five main categories were grouped and displayed in the diagram. The first and very important one was "Water quality and pollution problems" and it is believed to be a main theme in this connection. Other four categories are as follows : plan, policy, problems in hardware and problems in software. Three categories of planning, problems in hardware and problems in software are acting as causes of water quality and pollution problems while governmental policy in encouraging an increase in number of industries is also able to act as a cause without careful considerations of waste management. Plan concerned to water quality control should be produced under full

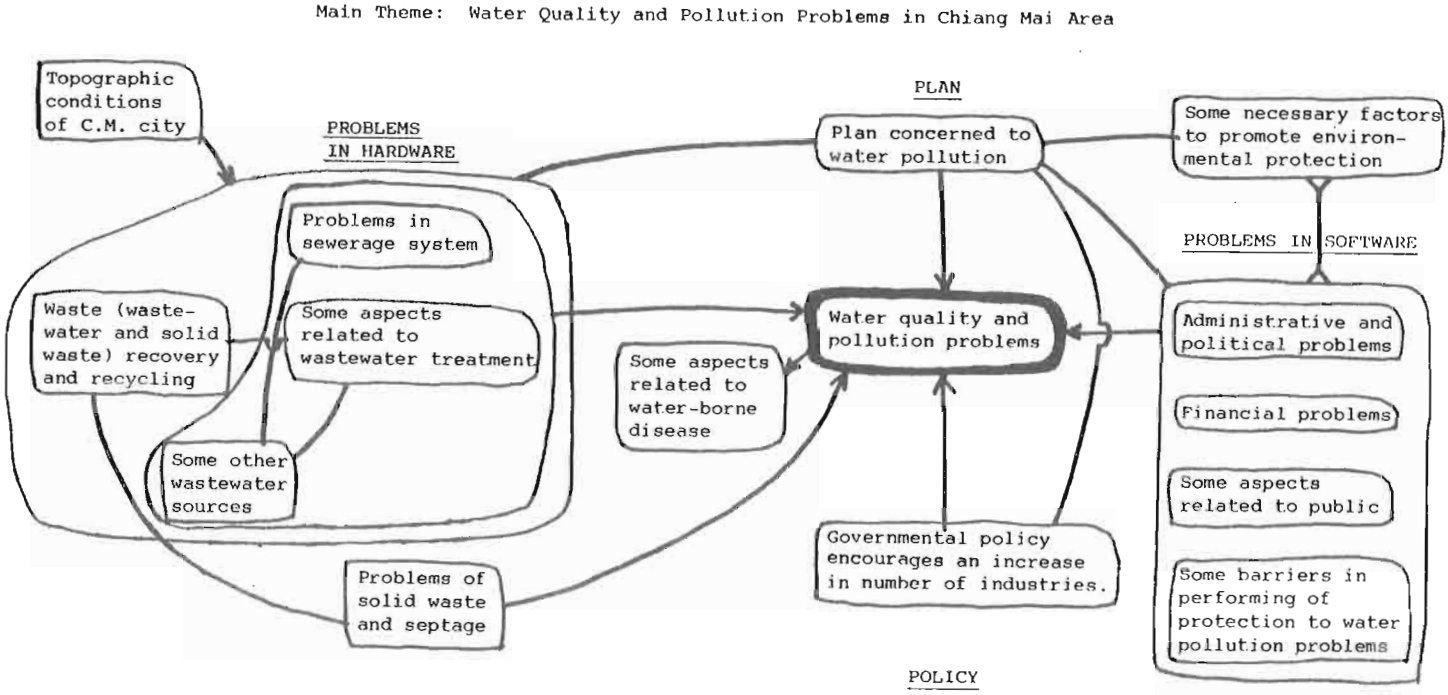

Fig. 3 Relational Structure of Categorized Information

Note: ——— : Related with, ——→: Derived from, causal relation, and the details from the whole, >——< : Mutually opposed or contradictory

consideration of other three categories. However, at present, the city have no proper plan and unfortunately very few discussion was done on planning and policy. Most of discussion time was used in the problems of software and hardware. As for problems in software, it can be clearly seen that administration, financials and public concerns are most important keywords. Problems in hardware were stressed in sewerage system, appropriate wastewater treatment, wastewater sources and reuse of wastes. Some useful informations can be extracted from discussions.

Current situation of water pollution

13. Water pollution were concentrated on both surface and groundwater. Mae Kha river, running through a high density area has the most serious problems in water quality. The second serious surface water is city canal, a famous historical monument and important stream from the view point of amenity. Ping river, a main stream in Chiangmai area, is also polluted. As for well water, the problem is serious. Bacterial density in the water is high through out the area. Taste and odour in well water, sometimes, was reported. Drinking water can not be declared hundred percent safe for human consumption. Water pollution problems, in the future, from chemicals such as fertilizer, pesticide and agricultural waste may be occurred. As for water-borne diseases, two kind of diseases were pointed. One is caused by pathogenic bacteria and acute in nature and the other may be caused by heavy metals and chronic. Denque fever was also mentioned as water related disease which are, at present, very wide spread in the area.

Problems in Hardware

14. Problem in sewerage system can be categorized into three items, namely no treatment facility, unsuitable sewer system and lack of maintenance. Collected sewage in many area were discharged directly to city canal and Mae Kha river without treatment. Many factories and newly built housing estate in the area were not equipped with treatment facilities. It was suggested that treatment system is necessary and preferably appropriate one should be considered. This is because of the high cost of conventional treatment process. Low cost technology such as oxidation pond, resource recovery type pond such as hyacinth pond were recommended. Separate collection system is also preferable. Other wastewater sources such as from gas station, laundries, hotels and night soil disposal were also created big problems. It should be urgently controlled.

15. Waste recovery and recycle was proposed as an aspect of wastewater treatment but careful evaluation should be considered.

16. Solid waste and septage are sometimes disposed to rivers directly or indirectly through sewer system. Suitable collection and disposal system of these wastes should be considered for environmental protection.

Problems in soft-ware

17. Administrative and political problems were grouped into four categorics related to organization, political aspect, administrator and politician. Lack of co-operation among organization involved in pollution problems were clearly pointed. Overlapse of duty among different agencies create this problems. There are also conflict between local and central governments. A new and powerful organization should be established for whole responsibilities of water problem. Administrators and politicians, usually, do not pay much attention to water pollution due to inadequate informations and lack of awareness of pollution problems. Public participation may be useful for improvement of these situations

18. Financial problems seem to be one of a major factors. However, concrete ideas and opinions were not proposed.

19. Public concerns play an important role in creating problems. The public has a habit to adapt the western style of living without modification such as water flush type toilet. The people who live in the community are selfish and intend to avoid rules and laws. This may be the case of lacking of environmental knowledges. There fore, social education should be emphasized. Education in environmental problems to pupils and students in school is also thought to be effective and significant.

20. Barriers in performing protection to water pollution problems were also pointed. Out-of-date law is one of the clearest example such as punishment fine has been established about 30 years ago and still using at present. Other barriers such as inadequate man power, loose action of government ant low priority of implementation for waste treatment must be also solved.

21. Some necessary factors to promote environmental protection were offered. It is first important to convince the attitudes of administrators and public that primary health care is important and then environmentist group should be organized. The implementation of water pollution control program should be then recommended and should be done gradually and increasingly.

CONCLUSIONS

22. The K-J method was applied to collect information, to consolidify facts, ideas and opinions related to water pollution problems in Chiangmai area. Current problems of water pollution were made clear to a certain degree. Hardware and software problems were fully discussed. Appropriate technolgoy seems to be a keywords of further research. Administration, organization public education must be emphasized and improved. Planning and policy should be made clear in the high level. From now, many discussions should be performed to make clear some special topics to realize countermeasures.