MAKING UP DECISION SUPPORT SYSTEM IN NUCLEAR EMERGENCY
———FRAMEWORK OF DECISIONS———

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ABSTRACT

In the case of nuclear emergency, decision will be made at various situations. Decisions are made to minimize detrimental effects to the population and environment of interest. Many materials and data are necessary. In the present study, the authors focus on making up the decision support system (DSS) in a nuclear emergency to help a decision-maker (a prefectural governor or a co-prefectural governor) in the headquarters of countermeasure against the emergency. As a first step to make up the system, the framework of the system is given in the following.

INTRODUCTION

There have been many natural disasters in our country and some experiences learnt from the disasters would be available to the situations in nulear emergencies. One have experienced to some extent natural disasters everywhere in our country, accompanying recommendation of relocation due to landslide by heavy rain, for example. Since the naturally occurring phenomena could be felt by one's senses, one could apply his experiences activatinig his own script in natural disasters.

The decision-maker for the case recommending intervention measures in the headquarters of countermeasure against the emergency will be a prefectural governor or a co-prefectural one. It is important to prepare for nuclear emergency paying attention to the similarities and differences between natural disasters and the situations being supposed in the emergency. The authors discuss a framework of the decision in the emergency to support the decision-maker.

DECISION S IN NUCLEAR EMERGENCY OUTSIDE FACILITY

In the case of nuclear emergency, local authority set up the heaquarters of countermeasure by the instruction of the central conference on countermeasure for disasters based on information from the nuclear facility, or by the judgement based on the indication of fixed environmental monitors above 10 μGy/h or dose predicted over 5 mSv.

A prefectural governor or a co-prefectural governor will be a head, and make decisions in various situations with assistance of the comments of senior advisers such as radiation protection and safety.

Stages of Decisions

With the declaration of nuclear emergency, environmental emergency monitoring will be made according to the procedure in advance. The decision-making in emergency have to be made based on information from the monitoring, economic and social factors. The decision-making will be done for (a)sheltering in the house, (b)sheltering in a PS concrete buillding, (c)evacuation, (d)restriction of area, food and water, (e)restriction of shipment for agricultural products, (f)cleanup of the environment ((d)-(f) are in the case of environmental contamination) and so on according to the situations. Based on justification and optimization procedure, decisions will be made after discussion on the alternatives and their feasibility. It is necessary to evaluate the cost of unit collective dose in the case of the emergency. As tentative value, the authors adopt the cost of ten times of α_0-value for workers in normal practices[4].

Factors Specific to Local Site to Support Decisions

In the case of nuclear emergency,the local factors specific to the site have to be taken into account. The main factors include the followings; (a)populations (according to kinds of occupations and earnings), (b)distribution of populations, (c)agricultural products in each season, shipment and consumption of the products, (d)the data on the fishery products, shipment and consumption of the products, (e)network of roads, land and maritime transportation, (f)types of houses and building (including the characteristics of surfaces), (g)geological and geographical data (types of soil, agricultural field, plants, forest, and so on), (h)data on water resources, (i)equipments applicable to environmental cleanup, (j)data on societies, local culture and custom, and so on. On the introduction of intervention, economic and social data are important specially in comparison of predicted detriments. It is preferable for these basic factors to be incorporated into database. Some data in the database will be also applicable to decision-making in natural disasters. One could feel risk from natural disaster with his senses. Since the detriment could not clearly be felt in nuclear emergencies, it is important to make decisions referring the objective data.

CONSTITUTION OF DSS

In the case of the emergency, strategic and tactical decisions will be important. The former ones would be made to minimize (or to optimize) detriment from the view point

of the whole emergency,and the latter ones would be made to reduce hazard in the scene (to select routes of minimum exposure for refuge in the case of relocation or sheltering in a PS concrete building, for example).

DSS includes database management software, model-base management software and dialogue generation software[2]. Major parts of DSS are classified into kowledge information system and modeling support system. These give information on the model necessary to the decisions after systematic referring knowledge on disasters in the database. The authors intend to introduce Fuzzy theory for judgement in the scene accompanying uncertain factors. Figure 1 give a conceptual framwork of the present DSS.

CONCLUDING REMARK

In the present study, a decision support system in nuclear emergency was discussed. However, the system is just begun to start. The content of database and model-base necessary in nuclear emergency will be gradually revealing. Since the α-value in the emergency is the most important factor in comparison of the detriments, further discussion on the value will be needed.

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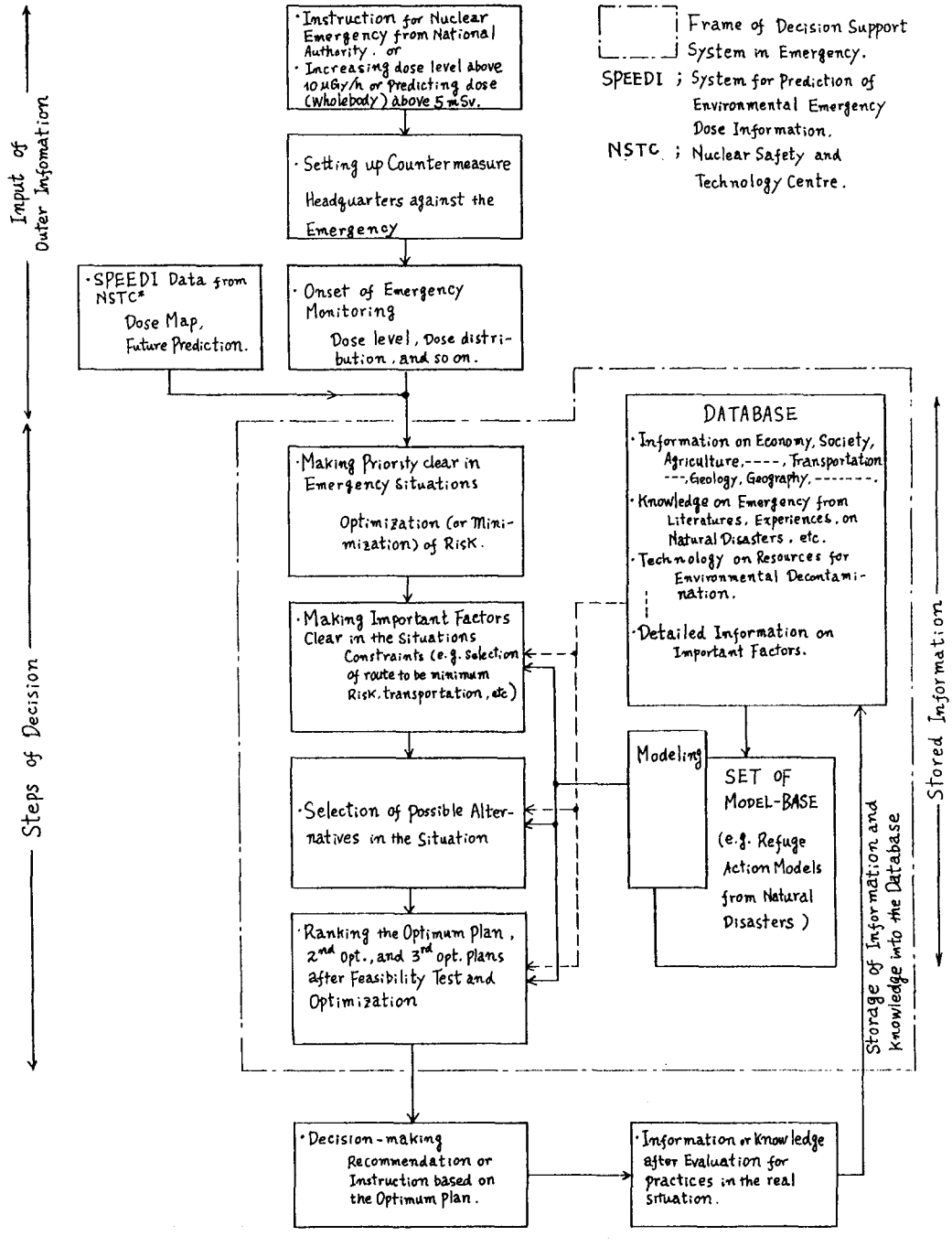

Fig.1 Conceptual Constitution of Decision-making in Nuclear Emergency