



FAIRDO Experts | November 2012

Current Status and Issues of Decontamination in Fukushima

1st. Discussion Paper

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※ FAIRDO= Fukushima Action Research on Effective Decontamination Operation
 This research is funded by the Ministry of the Environment, Japan

I. Current Status and Issues of Decontamination in Fukushima

1. Introduction

Fukushima Action Research on Effective Decontamination Operation (FAIRDO) project was officially launched on 1 July 2012, and the research team consisting of experts from Japan and Europe immediately conducted field surveys in Fukushima during the period from 19 to 24 July 2012 (See Table 1). At the expert workshop held on 19 July, local government officials in charge of decontamination at municipal and prefectural levels, local scientists from Fukushima University, from both social and natural sciences, as well as experts from other parts of Japan and Europe met to exchange opinions about the current situation in Fukushima Prefecture as well as Europe's experience after the Chernobyl nuclear accident in 1986. The Mayor of Namie town, a highly contaminated town in Fukushima also participated in this workshop and shared his serious concerns and challenges. On 20 July, the team conducted a field survey in the Oguni district of Ryozen town, Date city and another in Katakura of Haramachi district, Minamisoma city. In the Oguni district, the team collected information on local community-led efforts for both monitoring and protection measures against radiation. Meanwhile, in Katakura of Haramachi district, the team observed Minamisoma city's ongoing model decontamination project. On 21 July, Prof. Dr. Klaus Töpfer, former Federal Minister of the Environment, and other experts joined the team in Fukushima city in order to discuss how the European post-accident experience and knowledge which have accumulated since the Chernobyl nuclear accident could be applied to the case of the nuclear power plant accident in Fukushima. On 22 July, the team obtained an opportunity to visit Namie town and its vacant city hall to understand the reality of an entire population evacuated from the town. On the 23 and 24 July, the team members moved to Yokohama to report their initial findings at ISAP 2012 (International Forum for Sustainable Asia and the Pacific)¹ and discuss the way forward.

Through these activities, the team obtained important information on various aspects of the current status and issues in Fukushima such as the following: the severe reality of the triple disasters caused by the earthquake, tsunami and nuclear accident; the efforts made by the national, prefectural and municipal governments and local communities to deal with radioactive contamination; and the challenges of communication on not only decontamination but also other issues such as anxiety about and expectations for compensation and reconstruction among the various stakeholders. In addition, the team benefited from frank exchanges of opinions amongst Japanese experts and European experts regarding the efforts made since the Chernobyl nuclear accident and their implication to Fukushima.

¹ <http://www.iges.or.jp/en/news/event/isap2012/day1.html>

This paper discusses the current status of decontamination and related issues, as well as outlining some background information and key factors, based on the findings from our field surveys mentioned above, including interviewing of relevant stakeholders². It also discusses the priority research issues to be addressed by the FAIRDO project in due course, in line with its primary research themes, namely 'effective governance on decontamination,' 'development of decontamination plans that reflect local conditions,' and 'communication that promotes collaboration with local residents'.

² The issues mentioned in this paper have been compiled from information obtained through the activities of the FAIRDO Fukushima mission. Thus, not all issues on decontamination are covered here.

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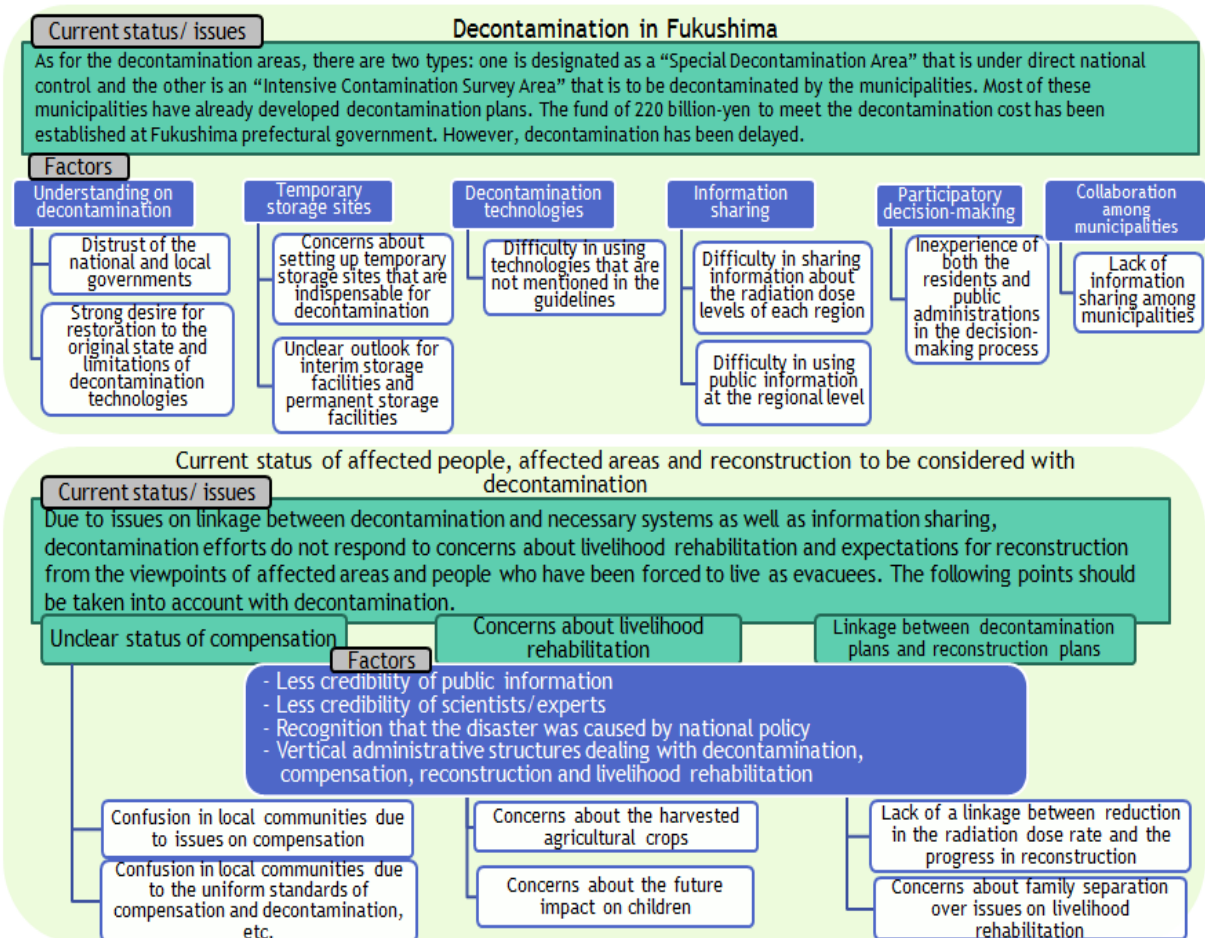


Table 1 List of FAIRDO Fukushima mission activities

Date	Event	Venue
19 July	Expert Workshop on FAIRDO	- Fukushima University
20 July	Field surveys (1st round)	- Oguni district, Ryozen town, Date city - Katakura, Haramachi district, Minamisoma city
21 July	International symposium	- Sakura no Seibo Junior College
22 July	Field surveys (2nd round)	- Namie town
23 July	Courtesy visit to Mr. Yuhei Sato, Governor of Fukushima Prefecture	- Fukushima prefectural government office
24 July	International Forum for Sustainable Asia and the Pacific (ISAP) 2012 - Plenary Session ‘Resilience: Key Element for Building Sustainable Society’ - Parallel Session ‘Effective Decontamination in Fukushima and Experiences in Europe’	- PACIFICO YOKOHAMA

2. Implementation status of decontamination

With regard to the decontamination areas in Fukushima Prefecture, the entire area of seven municipalities and some parts of four municipalities have been designated as a Special Decontamination Area³, where decontamination is under direct national control, while 41 municipalities have been designated as Intensive Contamination Survey Areas⁴, where decontamination should be carried out by the municipalities. As of 10 October 2012, 36 municipalities in the Intensive Contamination Survey Areas have developed decontamination plans⁵. Out of the 36 municipalities, 28 municipalities have shifted their plans from Basic Policy for Emergency Response on Decontamination Work to statutory plans based on the Act on Special Measures concerning handling of radioactive pollution emitted following the nuclear power station accident caused by the Great East Japan Earthquake on 11 March 2011 (hereinafter referred as The Act on Special Measures), a further eight municipalities have been discussing whether to shift their plans to statutory plans, while the remaining five municipalities have been discussing whether to develop their statutory plans. In order to implement these decontamination plans, the national government secured the necessary funds for the decontamination work in the Special Decontamination Area and granted a special fund⁶ to Fukushima Prefecture for the decontamination work in the Intensive Contamination Survey Areas, and has been working for the promotion of efficient decontamination.

While these decontamination plans and their supporting efforts are developed, some municipal governments, such as Date city, have started decontamination at public facilities. However, decontamination of residential areas has not been well carried out, while decontamination for public facilities, rice paddies and orchards has made some progress. Out of 81,092 households to be decontaminated in Fukushima Prefecture, only 34,828 households have placed orders for

³ A Special Decontamination Area is a 20 km radius from Nuclear Power Plant (NPP) and an area with over 20 mSv of the annual integral rate.

⁴ An Intensive Contamination Survey Area is an area with 1-20 mSv of the annual integral rate.

⁵ Source: Presentation material at the Dai 3 kai josen no suishin ni muketa chiiki taiwa forum [The 3rd Local Dialogue Forum towards Promotion of Decontamination] on 14 October 2012.

⁶ The national government granted JPY220 billion to Fukushima Prefecture to subsidise the decontamination costs in its municipalities, and the prefectural government has established a special fund for this purpose. Municipalities can use the fund upon application to the Fukushima Prefecture and approval of the prefectural assembly.

decontamination, and 5011 households have actually been decontaminated⁷. In the case of Fukushima city, 1723 households have already been decontaminated out of 23,576 households planned. In addition, local resident organisations in the Oguni district of Ryozen town, Date city, have voluntarily conducted mapping of the local radiation dose rate, measurement of the radiation dose rate for agricultural crops, and a test cultivation of paddy-field rice. As described above, while it has turned out that various decontamination efforts have been made at both the administrative and regional levels, it has become clear that issues on effective implementation of decontamination nonetheless remain. These issues are explained in the following sections.

3. Hindering Factors for promoting decontamination

Hindering factors for promoting decontamination have been pointed out during the field surveys in Fukushima, including discussions at the international symposium. Such factors include ‘distrust of public administration,’ ‘lack of understanding on decontamination,’ ‘concerns about temporary storage sites and interim storage facilities,’ ‘selection of decontamination technologies,’ ‘how to share information,’ ‘lack of experience in the participatory decision-making process,’ and ‘vertical administrative structure and the lack of horizontal collaboration.’ Each factor is summarised below.

3.1 Distrust of public administration

Residents believe that the latest nuclear accident is a disaster that happened as a consequence of national policy promoting nuclear power generation, and that the fumbled responses to the accident at its initial stage have made the situation worse. This perception resulted in lingering distrust of both national and local governments. Thus, there are many cases in which the public administration and local residents are unable to cooperate to move forward with decontamination. Furthermore, such standards as levels of permissible radiation doses and soil (or ambient) contamination levels that require decontamination were not concretely or coherently presented by official sources at the initial stage of disaster response. This led to the citizen’s distrust of official targets set on permissible radiation doses, food safety and reductions of radiation levels through decontamination. Moreover, briefing sessions held by municipalities to share information and discuss future activities for decontamination are not always constructive, since some residents take the floor and blame the national government and the Tokyo Electric Power Company (TEPCO), demanding that they take responsibility⁸.

⁷ Source: Fukushima Minyu article “Ken ga 41 Shichoson josen jokyo happyo [Fukushima Prefecture announces conditions on decontamination work in 41 municipalities] on 23 October 2012.

⁸ Source: Expert Workshop on FAIRDO, 19 July 2012

3.2. Lack of understanding on decontamination

Some residents or municipalities claim that the national government and TEPCO should take responsibilities to restore the radiation level to 1 mSv/y or the original state by any means possible. However, there is a limitation to the effects of reducing the radiation dose rate through decontamination, and it may be difficult to decrease the air dose rate to the level of 1 mSv/y, depending on the extent of contamination and/or the land features. Nevertheless, in fact, there are excessive expectations for a reduction of the air dose rate as a result of decontamination, because there has not been accurate information given on the actual effects and limitations of decontamination as well as the decontamination costs. Thus, some ongoing arguments are unrealistic in terms of the duration and cost of decontamination, and this situation tends to prevent effective decontamination from being implemented.

3.3. Concerns about temporary storage sites and interim storage facilities

In many cases, it is impossible to create a consensus on where to install temporary storage sites in each locality that are essential for the implementation of decontamination. Firstly, local residents are concerned about the safety of temporary storage itself. Secondly, the unclear outlook for determining the sites of interim storage facilities and permanent storage facilities has been preventing people from accepting temporary storage in their neighbourhoods, because temporary storage sites could be used over several years beyond their initial expectation, i.e. three years⁹. As a result, in some cases, local residents cannot agree on the installation of any temporary storage sites in their neighbourhoods. In fact, many of the relevant stakeholders have pointed out that it is difficult to obtain consent from local residents in setting up temporary storage sites. In addition, in the case of the Oguni district of Ryozen town in Date city, where one of the field surveys was conducted, decontamination has been implemented only in the area (16 households) where a temporary storage site has been established.

3.4. Selection of decontamination technologies

There is a lack of flexibility in the process to use technologies which are not stated in the current decontamination guidelines. In general, decontamination operations costs will be compensated only if used technologies are stated in the current guidelines. Depending on the location and/or environment, municipalities may want to use some effective technologies other than those

⁹ Nothing concrete has been agreed regarding the actual sites of interim storage facilities and permanent storage facilities as of November 2012, while contaminated materials gathered at temporary storages are meant to be moved to the interim storage facilities within 'approximately three years.'

described in the current guidelines. In order to use technologies not described in the current guidelines and to receive compensation, individual consultation between the relevant municipality and the central government is required, which means it takes additional time at the stage of technology selection¹⁰. The current system makes it difficult to adopt a flexible methodology desirable for each location with respect to the land features, species of vegetation and so on if appropriate technologies are not listed in the current guidelines.

3.5. How to obtain and share information

There is a lack of communication between public administration and the residents, regardless of whether it is directly or indirectly related to decontamination. In the case of the Oguni district of Ryozen town in Date city, a number of hot spots had been confirmed and several households had been designated as Specific Spots Recommended for Evacuation¹¹. However, the decontamination map that was issued by the relevant administrative body was not necessarily effective in confirming the radiation dose rate within the area because the mesh of the map was at 1 km intervals. This led local residents to initiate contamination measurements by themselves, and they prepared a 100-meter mesh radiation dose rate map. As can be seen, there are some cases in which the information provided by administrative bodies is not necessarily sufficient at the field level. The prefectural monitoring information, which is now disclosed on the websites, serves as a useful source of information to recognise the approximate level of the radiation dose rate. However, some residents have voiced that it is bothersome to check the level of the radiation dose rate around their residential areas as disclosed on the websites¹². Particularly in small municipalities, it is difficult to communicate smoothly with the local residents due to limited human resources available to explain decontamination issues. As a result, there are some cases where decontamination contractors have been delegated with the task of securing the agreement of the residents regarding the implementation of decontamination.

3.6. Lack of experience in the participatory decision-making process

Cooperation and agreement with local residents are essential to the implementation of decontamination. However, there are not many well-organised systems in place due to the fact that neither the public administration nor the citizens in Japan have sufficient experience in carrying out

¹⁰ Source: Expert Workshop on FAIRDO, 19 July 2012

¹¹ Specific Spots Recommended for Evacuation are spots at which air dose rates have been maintained at a level that is estimated to exceed an integral dose of 20mSv over a one year period after the accident.

¹² Source: Expert Workshop on FAIRDO, 19 July 2012

the processes of collaborative planning, implementing, and measuring and evaluating the results of public-citizen joint activities. It is more likely that public administration tends to persist in thinking that communication and participation means that the local residents should 'understand and accept' what the public administration has decided, as was the way in regional planning in the past. Therefore, the following pattern arises: the public administration informs local residents of the result of its consideration for decontamination and temporary storage sites, to which the residents react negatively.

3.7. Lack of collaboration among municipalities

Some municipalities have already implemented decontamination model projects and have been accumulating experience in decontamination-related administration and communication processes to some extent. However, horizontal collaboration among municipalities has not been made in an effective manner due to insufficient platforms where local governments can share the knowledge to be obtained from their respective implementation experience. Therefore, the accumulated knowledge and lessons have not been well utilised to promote and improve decontamination operations by municipalities that have lagged behind up to now.

4. Current status of affected people, affected areas, and reconstruction to be considered alongside decontamination

Decontamination should not be considered as a goal but rather as a step towards reconstruction. Therefore, it is necessary to consider future reconstruction while progressing with decontamination. In this context, 'compensation,' 'livelihood rehabilitation' and 'reconstruction plans' are noted as especially important issues in parallel with decontamination from the viewpoint of the affected people. These issues are discussed in the following sections.

4.1. Unclear policy and standards for compensation

With regard to the compensation for damage due to the accident (physical damage, psychological damage, economic damage related to lost business and working opportunities, including *fuhyo-higai*¹³, and expenses related to evacuation and returning home), TEPCO has been working on provisional payments and a formal means of compensation, based on the guidelines made by the government panel that addresses disputes over compensation for nuclear accidents (Ministry of Education, Culture, Sports, Science and Technology (MEXT)). However, residents are expressing discontent and distrust of the expected amount of compensation, the long period of time in dealing

¹³ Damage caused by harmful rumours or misinformation.

with the requests, and the complicated procedures of the compensation¹⁴. Furthermore, decontamination and compensation are considered as separate issues from a segmented institutional viewpoint of the central government; however, from the affected people's viewpoint, the two issues should be considered as inextricably linked. Therefore, unclear policy and standards for compensation lead to unclear procedures of decontamination. Taking the Specific Spots Recommended for Evacuation as an example, the particular spots have been designated per individual residence and the amount of compensation for each household differs greatly even within a district and between next-door-neighbours. Such a differentiation is causing confusion in local communities. During the field survey in the Oguni district of Ryozen town, Date city, such confusion in local communities over the designation of the Specific Spots Recommended for Evacuation was reported by local residents¹⁵.

4.2. Concerns for livelihood rehabilitation

Even if there is some success in reducing the air dose rate, this does not necessarily eliminate the concerns of residents and evacuees. For example, rice farmers in the Oguni district of Ryozen town, Date city, have been voluntarily working on experimental rice cultivation to study the radiation dose rate contained in the rice crop. Farmers expressed their anxiety and concerns for possible high rate of radiation dose in the future harvest.¹⁶ In addition, some kindergartens and nursery schools have not reached their quotas for newly-enrolled children for fiscal year 2012. Concerns of local residents have not been eliminated even after a year since the accident. As for the evacuees, decontamination efforts in evacuated areas have not achieved the level to assure them that they can come back and live in peace, and thus their concerns remain. Furthermore, both external and internal exposure should be comprehensively reduced in order to prevent health damage caused by the radioactive materials.¹⁷ Comprehensive measures should be taken, such as controlling the internal exposure from food consumption in addition to the decontamination efforts focusing on the reduction of external exposure in order to remove peoples' concerns for their livelihood rehabilitation.

¹⁴ Issues have been addressed to some extent through revision of the relevant guidelines and TEPCO's compensation policy.

¹⁵ Source: Field survey in the Oguni district of Ryozen town, Date city, 20 July 2012

¹⁶ Source: *Ibid.*

¹⁷ This is the basic concept of a measure called "radiation protection" that has been taken up in Europe. This approach aims to minimise radiation exposure in a comprehensive manner.

4.3. Weak linkage between decontamination and reconstruction planning

Decontamination planning should take into account how the local society should be after the completion of decontamination. Thus, decontamination planning should be linked with issues towards reconstruction of the local society. Each municipality has developed a reconstruction plan, but only a limited number of local governments have positioned their decontamination plans as part of their reconstruction plans. For example, the local authority of Namie town is willing to improve the current situation where the local community has been split up because residents have evacuated in a piecemeal fashion. Namie town intends to enable community reunion through building reconstruction housing and reconstruction public housing in the years to come. In addition, Namie town has the intention to work on reconstruction of the town, starting with the low radiation-dose neighbourhoods within the town. This requires comprehensive consideration on how the reconstruction will be linked to the ongoing and near-future decontamination activities.

With regard to the evacuated families, there are some cases where elderly residents and the men wish to return home while women and families with children do not¹⁸. Such cases could lead to the break-up of families. It is therefore necessary to consider how to precede with decontamination and reconstruction without causing such families and communities to break up.

5. Factors causing the current status of affected people, affected areas, and reconstruction

Various factors—including the series of events immediately after the Great East Japan Earthquake and the Fukushima Daiichi nuclear power plant accident, administrative systems, and the behaviour of experts in the society—were pointed out as having caused a troubling situation where concerns and issues other than decontamination cannot be resolved.

5.1. Credibility of public information

The credibility of information is essential and is considered to have a significant impact not only on decontamination, but also on various reconstruction-related activities in the future. However, the citizens have a deep distrust and strong discontent with information provided by the national government, its decision processes and the contents of its decisions. Take Namie town as an example: the local residents have a deep distrust and strong discontent with information provided by the central government and its decision-making processes due to the delay in providing the information on critical radiological contamination levels that were observed in the town immediately after the accident. In particular, the delayed action of the central government in providing official evacuation instructions right after the accident forced the town and its residents

¹⁸ Source: Field survey in the Oguni district of Ryozen town, Date city, 20 July 2012

to rely on information obtained through the mass media, such as TV broadcasting. Furthermore, due to the lack of information, they happened to evacuate to an area with high radiation dose rates. The municipality experienced great difficulty in handling the situation and guiding its residents, therefore peoples' trust in the central government has declined substantially¹⁹.

This could develop into a fundamental issue since fostering the credibility of local and central governments is considered essential for both decontamination and future reconstruction activities.

5.2. Credibility of experts

Experts used to repeatedly say that 'Nuclear power plants are safe' and 'no accidents can happen.' Nevertheless, since the Fukushima nuclear accident occurred, people have become suspicious about the information provided by experts. Besides that, in some cases, experts have greatly differing views on permissible levels of air dose rate and food safety. Several factors lie behind this situation: experts make comments about any given subject that is beyond their expertise, where all of them are put in the same category as 'experts'; some experts have incorrect knowledge or make erroneous judgments; the mass media partially quote the remarks of experts, and then these quotations tend to lead to misunderstanding. In summary, the reality is that communication between the general public and the experts is often insufficient and inappropriate. But amid this reality, some issues might be resolved as long as both experts and the general public enhance their knowledge, not only expertise but also relevant background knowledge, thereby gaining capacity in rational reasoning.

5.3. Recognition that the disaster was caused by national policy and taking responsibility for the outcome

The local residents and municipalities claim that 'the national government and TEPCO should take responsibility to restore the damage to the original state,' because they believe nuclear power plants were introduced to Fukushima through the national policy and TEPCO. Thus, there is a dominant feeling among the people in Fukushima that inhibits people from making the following realistic argument: 'Complete restoration to the original state may be difficult. So how should we take concrete measures?'

In the Act on Special Measures, the national government, which has been promoting nuclear power plants, has stipulated that it should 'take responsibility' while prefectural and municipal governments shall 'collaborate' with the central government in its activities, and thus they are

¹⁹ Source: Expert Workshop on FAIRDO, 19 July 2012

positioned as being given a more passive role. If the dominant interpretation is 'the assailant shall take responsibility = restoration to the original state should be realised', then constructive proposals, discussion and collaboration might be discouraged, even though the current situation requires collaboration among many actors as the contamination spreads over a wide area.

5.4. Vertical administrative structures dealing with decontamination, compensation, reconstruction and livelihood rehabilitation

Decontamination, compensation, reconstruction and livelihood rehabilitation cannot be separated from the viewpoints of the affected people and affected local communities. Nevertheless, different government offices are in charge of their respective aspects. Accordingly, food safety standards, the restricted area, decontamination targets, and the criteria for the valuation of compensation have been set up separately without sufficient coordination. A decontamination target of restoration to the original state and another target to limit the exposure level to 1 mSv/y have been established, although both of these may be difficult to achieve in the short run depending on the situation. Yet none of the arguments have been integrated into relevant long-term issues, such as: at what stage will the evacuated residents be allowed to return home; how can economic reconstruction be promoted; and how is it possible to establish livelihood of people who are not allowed to return home? In addition, different views between national government and municipalities on reconstruction could be observed. For instance, zoning and valuation of compensation are closely linked, so the amount of compensation might change along with the revision of evacuation zoning. There is a dilemma between municipalities and national government. The former demand uniform compensation and the latter would like to precede with reconstruction while revising evacuation.

6. Issues to be considered in the future

Sections 1 to 4 above, describes the current status of decontamination, as well as the current status of the affected people, affected areas and reconstruction to be considered in parallel with decontamination associated with the triple disasters of the earthquake, the tsunami and the nuclear accident that occurred on 11 March 2011. The factors behind the current status have been assessed based on exchange of opinions at an international symposium held in Fukushima. Based on these initial findings and analysis on the current status and background, the primary issues to be examined in FAIRDO project have been identified and illustrated in accordance with its research themes, namely: 'Research on effective governance on decontamination,' 'Research on developing decontamination plans that reflect local conditions,' and 'Research on communication that promotes collaboration with the local residents.'

6.1. Research on effective governance on decontamination

[Introduction of participatory policymaking]

It is necessary to find a way in which residents, experts and public administrative bodies can work together and debate on developing effective policies, instead of ‘having residents accept’ plans determined by the public administration. These actions will increase the effectiveness of decontamination, reconstruction and livelihood rehabilitation as well as to ensure radiation protection and safety of local residents in a sustainable manner. However, Japanese public administration is said to have little experience in developing and implementing policies based on discussions with local residents. The following points relevant to the experience and capacity of public administration for ‘decision-making through discussion’ with the residents should be examined.

Firstly, it is necessary to examine how to ensure that public administrations with little experience in ‘participatory decision-making’ are provided with effective capacity building measures and other supporting measures in a timely manner. Participatory decision-making involving local residents will take more time, money and labour costs compared to the conventional in-house decision-making within administrative bodies.²⁰

Secondly, it is desirable to examine essential requisites for enabling local residents to proactively ‘participate in collaborative thinking and decision-making’ among themselves, as well as with the public administration and experts, rather than ‘following the decisions made by others.’ This point is especially important for promoting livelihood rehabilitation and for developing and implementing medium- and long-term community rehabilitation strategies. Among others, the following points should be examined with priority: whether the residents can afford the time and money for regular participation in risk assessment and planning meetings; how to ensure the ‘equity’ for participation under the circumstances where the local community has been split and residents have become

²⁰26 municipalities in Fukushima Prefecture have requested local governments across the country via the Ministry of Internal Affairs and Communications to dispatch some of their personnel. Yet the number of dispatched personnel remains at a level of somewhere around 40% of the desired number. For the purpose of supporting the municipal labour force, the Ministry of the Environment has also set up a Fukushima Environmental Reconstruction Office with five branch offices in Kenhoku, Kennaka and Kennan, Hama-dori Kita, Hama-dori Minami and Aizu, all within Fukushima Prefecture. It is necessary to confirm the detailed contents and effects of the physical and technical support from other local governments as well as from the Ministry of the Environment.

dispersed across the country as evacuees; and how to structure effective frameworks for dealing with both short-term issues and medium- and long-term issues.

['Horizontal' collaboration and information sharing among municipalities]

Information-sharing, collaboration and cooperation among local governments have the potential to contribute to smoothly promoting responses to issues in ever-changing situations, including decontamination, waste disposal, lives as evacuees, and radiation protection. In Fukushima Prefecture, several schemes, such as the Council for Promotion of Decontamination and Waste Management (tentative translation), have been set up so as to share information between the prefectural government and the municipal governments – in a vertical manner. It is necessary to collect further information to identify existing and missing schemes for the purpose of promoting horizontal collaboration among municipalities.

[Networks of national and local governments, and research institutes]

Information exchange must be promoted not only at the level of local governments, but also at the levels of central government ministries and agencies, research institutes and other relevant organisations. In Europe, multiple national and local authorities as well as research institutes are participating in the NERIS Platform and thereby promoting information-sharing. There is much to learn from the NERIS scheme and accumulated experience in Europe in order to facilitate information-sharing and collaboration among relevant organisations in Japan, that are engaged in issues such as decontamination, compensation, reconstruction and livelihood rehabilitation.

6.2. Research on developing decontamination plans that reflect local conditions

It is important to visualise expected decontamination effects by means of a computer modelling exercise in order to enable effective decontamination operations within time and budget limitations, as well as reflecting the minds of local residents. Europe has developed a Real-time Online Decision support System (RODOS) ²¹ as a regional common asset to deal with potential radiological emergency based on their experience from the Chernobyl nuclear accident. It is considered useful to apply this kind of decision-making support system to Japan's case as a means of addressing the

²¹ The RODOS system is a model system that provides consistent and comprehensive information on the current and future radiological situation. For example, the European Model for Inhabited Areas (ERMIN) within the RODOS system enables its users to predict changes in the radiation dose rate before and after decontamination in their residential area.

For details of the RODOS system, refer to the following website: <http://www.rodos.fzk.de/rodos.html>

current situation mentioned in the earlier sections.

[Promotion of understanding on decontamination]

Amid the enhanced expectations and demands on decontamination, it is extremely important to predict and visualise the effects beforehand in order to promote public understanding on decontamination. For example, the Japan Atomic Energy Agency (JAEA) and Fukushima prefectural government have been conducting demonstration experiments on decontamination technologies. The outcomes have revealed that it would involve enormous cost, time and manpower to reduce the radiation dose of the entire region to the level of less than 1 mSv/y. Thus, it is necessary to identify responses, within a limited time and at a more realistic cost, to deal with the demands that decontamination should be continued until the radiation dose rate declines to the level of 1 mSv/y.

[Selection of decontamination technologies]

Predicting the decontamination effects by means of a RODOS system makes it possible to select more cost-effective decontamination technologies. Through the RODOS system, its users are able to calculate the decontamination effects, costs, manpower required, and waste production²², according to each type of decontamination technology. It will therefore assist in selecting more cost-effective decontamination technologies with the predicted decontamination effects in mind.

[Future issues]

On the other hand, some issues still need to be resolved before any RODOS system is applied in Japan. For example, the following differences must be taken into account: the difference in cesium behaviour due to different environmental media, such as building materials and soil components; and the difference in the outflow quantity of radiation materials due to rainfall and wind. As for architectural structures, stone has been used as the main material in Europe, while not only stone but also timber has been frequently used in Japan. Japanese tiled roofs can be cited as another major difference from the European roofing style.

Since the RODOS system was developed in Europe, the default value has been set up to match the environment in Europe. Therefore, some adjustments will be required so that the system can match the Japanese environment.

²² As for the calculation of waste production, the disposal methods also need to be taken into account.

6.3. Research on communication that promotes collaboration with local residents

[Understanding the details of current communication]

Various factors derived from insufficient communication between the public administration and local residents were pointed out during the Fukushima mission conducted in July, 2012. These factors include: distrust of the public administration; lack of understanding on decontamination; unresolved concerns about temporary storage sites and interim storage facilities; information-sharing that is not beneficial to the local residents; and issues in consensus-building among local residents. It is vital for the FAIRDO project to examine important points in communication for consensus-building toward the implementation of decontamination operations, for which the details of the current communication in the relevant municipalities will be studied and analyzed. Surveys may include such questions as how the local residents were provided with relevant information. FAIRDO also intends to contribute to the improvement of residents' trust in information provided through official channels and also their trust in experts through improving the current communication level; thereby the issues on decontamination and reconstruction can be improved to a certain extent.

[Communication for consensus-building]

Decontamination consists not only of a decontamination plan, but also various matters, including storage facilities for waste generated by decontamination, the agreement process to conduct decontamination, the mode and routes for the transportation of contaminated waste, and waste recycling. These processes will be examined with reference to the communication process in terms of risk communication on chemical substances management, environmental assessment, and regional plans. The ideal form of communication for consensus-building on decontamination will then be discussed. In particular, the aim will be to build consensus by means of collaboration and debate among the related stakeholders, rather than having the residents accept matters decided by the public administration. It is hoped that this way will enhance the effects of decontamination, reconstruction and livelihood rehabilitation. There is also insufficient communication among different administrative bodies, disrupting collaboration among the municipalities in some cases. It is also important for FAIRDO to discuss desirable forms of communication for promoting collaboration among municipalities.

[Implications from European experience and knowledge]

Japan has much to learn from the experience and knowledge accumulated in Europe for improving communication for decontamination and reconstruction operations, such as the basic approach to the radiation protection issues, as well as emphasis on interactivity and diversity in information

gathering and sharing.

In the European approach to the radiation protection issues, there is emphasis on establishing a comprehensive radiation protection system that combines effective ways, not limited to the decontamination aiming at air dose rate reduction, but also introducing effective measures to ensure the safety of food production and distribution, codes of conduct and so on. Such a comprehensive approach combining countermeasures to address both internal and external exposure would increase outcomes while costs for decontamination could be suppressed. Saved costs can be utilised for other important purposes, including reconstruction of the affected areas and rehabilitation of residents' livelihood.

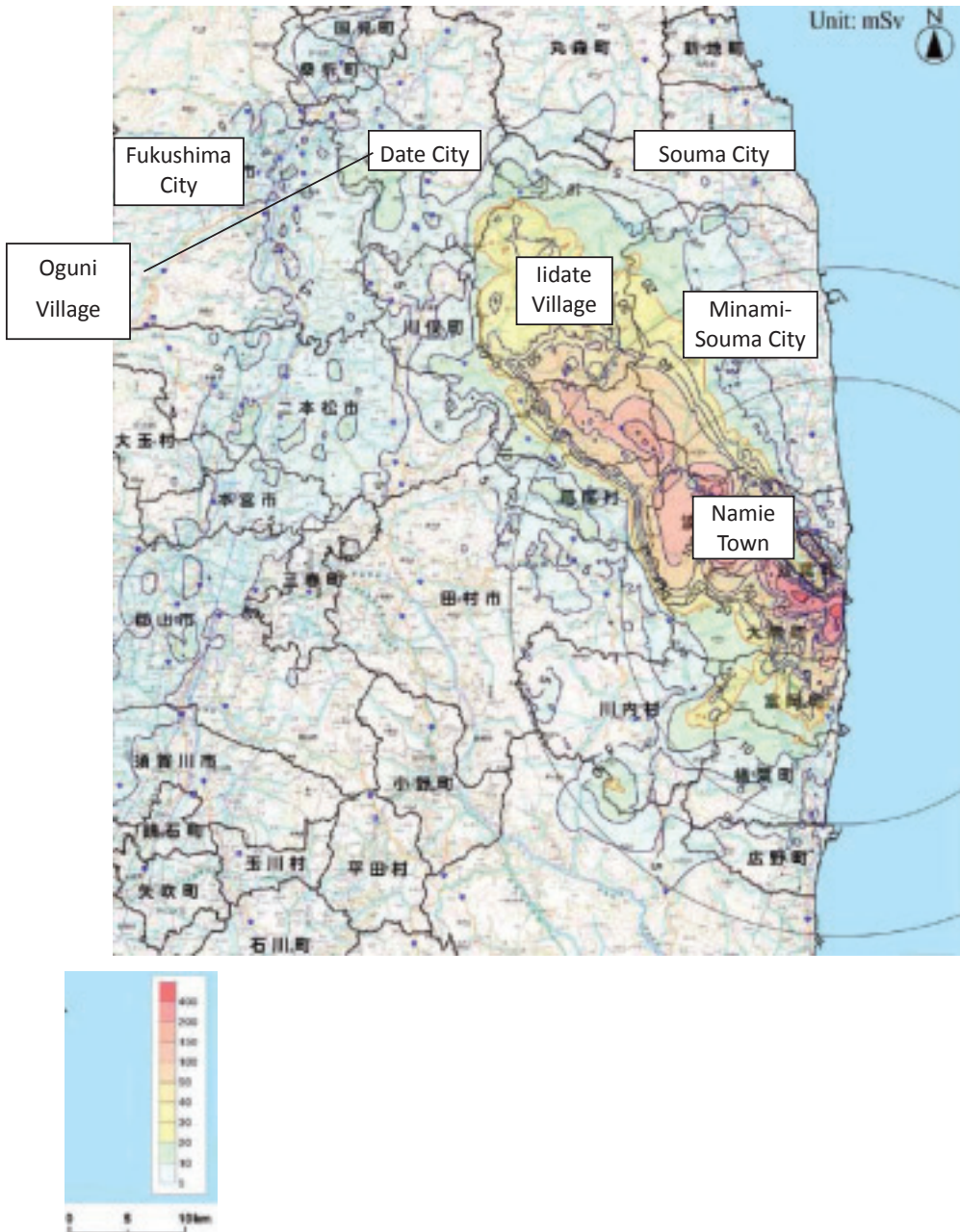
With regard to information gathering and sharing that interactivity and diversity, Germany can be taken as an example. In some cases, when local residents did not have a high degree of trust in the information conveyed by the federal government, some provincial governments provided information more effectively in collaboration with their local residents. Put simply, not only the federal government, but also provincial governments played an important role. As another example, in Belarus, residents and local experts have been cooperating in risk-assessment, developing food safety indicators, and understanding the radiation exposure levels under the ETHOS Project, which has served to promote interactive communication and to instill the concept of a radiation protection culture.

II. Overview of Fukushima Mission

1. Mission Schedule

Date	Events	Venue
Thursday, 19 July	FAIRDO Experts Meeting	- Fukushima University
Friday, 20 July	Field Visit (1)	- Oguni Village, Date City - Katakura, Haramachi Area, Minami Souma City
Saturday, 21 July	International Symposium	- Sakura no Seibo Junior College
Sunday, 22 July	Field Visit (2)	- Namie Town
Monday, 23 July	Courtesy Visit to Governor Sato of Fukushima Prefecture (Transit to Yokohama)	- Fukushima Prefecture
Tuesday/ Wednesday 24-25 July	International Forum for Sustainable Asia and Pacific (ISAP) 2012 - Plenary Session “Resilience: Key Element for Building Sustainable Society” - Parallel Session “Effective Decontamination in Fukushima and Experiences in Europe”	- Pacific Yokohama

2. Map of Field Visit Sites



Integrated Dose Estimation Map (Integrated Dose up to March 11, 2012)

Source: http://radioactivity.mext.go.jp/old/en/1750/2011/10/1750_1108_set.pdf

3. FAIRDO Workshop Programme

Expert Workshop on Fukushima Action Research on Effective Decontamination Operation (FAIRDO)

Date : 9:30-17:40, 19 July, 2012

Venue : Kihu Kinen Toh, Fukushima University

Programme (draft)

<p>Plenary Session (9:00-12:30)</p> <p>9:00-10:40 Session 1: Radioactive contamination in Fukushima and Belarus [Moderator: Prof. Hiroyasu Shioya, Fukushima University]</p> <ul style="list-style-type: none"> • Prof. Kenji Nanba, Fukushima University “Current Radioactive Contamination in Fukushima” • Prof. Kyoko Hamajima, Fukushima University Kindergarten, “Situations and Countermeasures in Kindergarten after Nuclear Accident –A case of Fukushima University Kindergarten-” • Prof. Ryota Oyama, Fukushima University “Current Situations in Rural Areas -Actions and Awareness of Farmers Make Governments Move-” • Mr. Tamotsu Baba, Town Mayor, Namie town & Mr. Akira Tamagawa, Namie Town “Current Situations and Issues in Namie Town” • Dr. Victor Averin, Director, Research Institute of Radiology “Radioactive Contamination in Belarus and Countermeasures” <p><i>* 10 min presentation and 5 min Q&A for each presenter</i></p> <p>➤ Discussions (25 min)</p>
<p>10:40-10:50 Break</p>
<p>10:50-12:30 Session 2: Countermeasures in Fukushima and experience from Europe [Moderator: Prof. Kenji Nanba, Fukushima University]</p> <ul style="list-style-type: none"> • Prof. Kencho Kawatsu, Fukushima University “Environmental Monitoring in Fukushima” • Mr. Kozo Endo, Fukushima Prefecture “Decontamination Operation in Fukushima” • Mr. Takahiro Hanzawa, Date City “Decontamination Operation in Date City” • Prof. Michio Sato, Fukushima University “Decontamination Technologies” • Mr. Gilles Heriard-Dubreuil, President, MUTADIS “Lessons from Chernobyl Post-accident Management” <p><i>* 10 min presentation and 5 min Q&A for each presenter</i></p> <p>➤ Discussions (25 min)</p>
<p>12:30-13:30 Lunch Break</p>

<p>Thematic Session (13:30-16:40)</p> <p>13:30-14:30 Session 1: Governance on Decontamination (13:30-14:30) [Moderator: Prof. Yayoi Isono, Tokyo Keizai University]</p> <ul style="list-style-type: none"> • Mr. Atsushi Watabe, Associate Researcher, IGES & Prof. Sachihiko Harashina, Chiba University of Commerce “Preliminary Findings on FAIRDO (subtheme 1: Governance) • Prof. Eduardo Diaz , Director, Nuclear Engineering Department, Technical University of Madrid “The European Platform on Preparedness for Nuclear and Radiological Emergency Response and Recovery: The NERIS Platform” <p><i>* 15 min presentation for each presenter</i></p> <p>➤ Discussions (30 min)</p>
<p>14:30-15:30 Session 2: Model on Decontamination (14:30-15:30) [Moderator: Prof. Kenji Nanba, Fukushima University]</p> <ul style="list-style-type: none"> • Mr. Kazuyuki Sakuma, Tokyo University of Agriculture and Technology & Mr. Muneyuki Nakata, Associate Researcher, IGES “Preliminary findings on FAIRDO (subtheme 2: Model)” • Prof. Wolfgang Raskob, Karlsruhe, Institute of Technology (KIT) “Introduction into Achievements from the European Projects EURANOS and RODOS and Their Applicability to Fukushima” <p><i>* 15 min presentation for each presenter</i></p> <ul style="list-style-type: none"> • Discussions (30 min)
<p>15:30-15:40 Break</p>
<p>15:30-16:40 Session 3: Risk Communication (15:40-16:40) [Moderator: Prof. Takehiko Murayama, Tokyo Institute of Technology]</p> <ul style="list-style-type: none"> • Mr. Yoshiaki Totoki, Researcher, IGES & Prof. Hiroyasu Shioya, Fukushima University & “Preliminary findings of FAIRDO (subtheme 3: Risk communication)” • Prof. Miranda Schreurs, Director of the Environmental Policy Research Institute, The Freie Universitat Berlin “ Environmental Crisis and Response and Risk Communication” <p><i>* 15 min presentation for each presenter</i></p> <p>➤ Discussions (30 min)</p>
<p>Closing</p>

4. International Symposium Programme

International Symposium

Effective Decontamination –Learning European Experience and Knowledge

The decontamination of radioactive material that was released after the accident at the Fukushima Daiichi Power Plant in March 2011, calls for effective action that reflects the current local situations. After the Chernobyl nuclear accident in 1986, actions were taken by various countries in Europe, and following this, a total of 50 research and disaster-related organisations from 23 countries under the European Commission took part in the development of an on-line system and set of guidelines for emergency decision support.

This symposium invites experts featuring Dr. Klaus Töpfer, first German Environment Minister, to draw on the broad range of experience and knowledge held by Europe, and conduct public discussions on how to best proceed effectively with full-scale decontamination on a national and local level from this fiscal year.

Outline of the event

- 1) Date : 21 July 2012 (Saturday)
- 2) Venue : Marianne Hall, Sakura no Seibo Junior College
(7-7 Hanazonocho, Fukushima)
- 3) Organisers : Fukushima University
Institute for Global Environmental Strategies (IGES)
- 4) Co-organiser : Fukushima Prefecture, Sakura no Seibo Junior College
- 5) Collaborators : News Media (Fukushima Minyu newspaper, Fukushima Minpo newspaper, Fukushima TV, etc.)
- 6) Participants : 300
- 7) Fee : Free of charge

<Programme >

- 16 : 00 Opening Remarks Mr. Osamu Nittono, President, Fukushima University
- 16 : 05 Greetings to visitors Mr. Masao Uchibori, Vice Governor, Fukushima Prefecture
- 16 : 10 Introduction Prof. Hiroshi Suzuki, Professor Emeritus, Fukushima University
“Introduction of Fukushima Action Research on Effective Decontamination (FAIRDO)”
- 16 : 15 Keynote Speech Prof. Dr. Klaus Töpfer, Director, Institute for Advanced Sustainability Studies
“Countermeasures against the Chernobyl Accident in Germany - 25 years of Lessons Learned”
- 16 : 45 Panel Discussion [Panelists]
- Prof. Dr. Miranda Schreurs, Free University of Berlin
- Dr. Viktor Averin, Director, Research Institute of Radiology
- Prof. Kenji Nanba, Fukushima University
- Prof. Takehiko Murayama, Tokyo Institute of Technology
- Mr. Tamotsu Baba, Town Mayor, Namie Town, Futaba District, Fukushima Prefecture
[Moderator]
Prof. Yayoi Isono, Tokyo Keizai University
- 17 : 40 Q&A session with Audience
- 17 : 55 Closing Remarks Prof. Hironori Hamanaka , Chair of the Board of Directors, IGES

5. ISAP Parallel Session Programme

Effective Decontamination in Fukushima and Experiences in Europe

After the Chernobyl nuclear accident in 1986, actions were taken by various countries in Europe to implement decontamination, and following this, a total of 50 research and disaster-related organisations from 23 countries under the European Commission took part in the development of an on-line system and set of guidelines for emergency decision support. Inviting experts from Europe based on their experience and knowledge developed in Europe as well as a field survey in Fukushima, this session promotes public discussion on how to best proceed effectively with full-scale decontamination on a national and local level from this fiscal year.

16:00-16:20 Keynote Speeches

- Dr. Hiroshi Suzuki, Emeritus Professor, Fukushima University / Chair, Fukushima Prefecture Reconstruction Committee “Fukushima Action Research on Effective Decontamination Operation (FAIRDO)”
- Mr. Kuniaki Makiya, Ministry of the Environment, Japan “Overview of Japan’s Offsite Cleanup Efforts”
- Mr. Masamitsu Kogota, Senior Policy Administrator of Environmental Recovery Sector, Social Affairs & Environment Department, Fukushima Prefectural Government “Decontamination Operation in Fukushima”

16:20-17:10 Panel Discussion

Moderator

- Mr. Hideyuki Mori, President, IGES

Panellists

- Dr. Viktor Averin, Director, Research Institute of Radiology, Belarus
- Mr. Gilles Heriard-Dubreuil, President, MUTADIS, France
- Prof. Wolfgang Raskob, Professor, Karlsruhe, Institute of Technology (KIT), Germany
- Prof. Eduardo Gallego, Director, Nuclear Engineering Department, Technical University of Madrid, Spain
- Prof. Dr. Miranda A. Schreurs, Director of the Environmental Policy Research Institute, The Freie Universitat Berlin
- Prof. Sachihiko Harashina, Professor, Faculty of Policy Informatics, Chiba University of Commerce / Professor Emeritus, Tokyo Institute of Technology

17:10-17:25 Q&A session with Audience

17:25-17:30 Closing

III. Findings from FAIRDO Experts

Findings from FAIRDO Experts

Prof. Dr. Miranda A. Schreurs, Director of the Environmental Policy Research Institute,
The Freie Universitat Berlin, Germany

The symposium in Fukushima and the field trips to Ôguni, Date City, Minami Soma, and Namie Machi were very educational as well as emotional.

It is clear that the public in Fukushima and the displaced persons from the evacuation zone are angered and frustrated by their situation. It is easy to understand their demands for compensation and decontamination. The visits where we watched decontamination work in action suggested that the government is trying to respond to these concerns.

Yet, I could not help but wonder about the eventual effectiveness of the decontamination efforts and what could be done to improve the chances that individuals will move back to the effected regions once decontamination has progressed.

One important question is how decisions are being reached about compensation to affected areas. The visit to Ôguni made it clear that the somewhat arbitrary cut off point of a measurement of 3.2micro serviets/hr one meter before the entrance to a home for compensation was causing rifts in the community between recipients and non-recipients of compensation. Perhaps discussions with community leaders and representatives could lead to a more socially acceptable and medically advisable strategy to decontamination.

The visit to Minami Soma and the decontamination efforts there suggest a city that is eager to bring normalcy back to the lives of its badly hit community. At the same time, the visit to the city government office's decontamination department makes it clear that decontamination is occurring in a largely tateware gyôsei (fragmented administration) fashion. First, the city is becoming dependent on the central government that is paying for the decontamination efforts. Decontamination appears to be taking place based on owner willingness to have their home decontaminated and not necessarily as part of a large strategy for decontamination within the region. This could result in a very expensive approach to decontamination. The two houses we visited that were undergoing decontamination sat in the middle of fields and it was unclear

whether the efforts to rake leaves, cut bushes, and wash the buildings by large teams of 15-20 men (yes, they were all men) would be effective or whether rain and dust could return radiation to the houses.

It will be important that decontamination efforts are regularly monitored (by independent monitors) who can report back on their effectiveness and the costs involved. It will also be important to collect data on what kind of decontamination methods work best under which conditions.

Relatedly, more needs to be done to determine what to do with the waste removed during the decontamination process. Creating thousands of little radioactive mounds of contaminated dirt and dotting the surrounding hills with these mounds is probably not a very good strategy.

Another area that we got the impression where more could be done is in opening venues for public debate about how to link decontamination strategies with plans for rehabilitation of the region. Decontamination on its own is unlikely to return the region to normal. Investments will have to be made to attract people back to the region. These will include investments in infrastructure (schools, community centers, hospitals, etc.) and jobs (e.g. developing a new university/college for renewable energy and organic farming).

The visit to Namie Machi and the ruins of the rice paddies hit by the tsunami were really heart breaking. One has to respect the efforts of the city officials who are working out of temporary offices but regularly return to the city to check on its condition. Clearly, the city was badly hit by the triple disaster. For Namie, the future of the city will be clearly tied to the stability of the Fukushima Daiichi nuclear power plant's damaged reactors as they are decommissioned and decisions about how long to keep the area off limits.

The fact that part of the city has relatively low levels of contamination give hope. At the same time, the proximity to the damaged reactors and the higher levels of radiation to the West, suggest the importance of continued caution. The redevelopment of the city will need sufficient financial support to make it viable for citizens to live and work there. The damaged nuclear facility, which will need to be worked on for several decades to come, could provide the city with a future (ironic though that may be) if the city can be sufficiently decontaminated to a level where workers could commute to the power plant from there. Longer term plans will also be needed.

This brings up the question of how decontamination is being prioritized. It is not clear if there is a

plan as to where to decontaminate first and whether entire regional blocks can/should first be decontaminated within more urban areas.

Participatory governance will be critical to a successful response to the nuclear disaster in the region. Here the negative lessons of Minamata, Itai-itai, and Yokkaichi are important. Had participatory governance been initiated earlier, much human pain and suffering, as well as government expenses could have been reduced. That Minamata has recovered and is now considered one of the leading environmental communities in Japan is also a sign of hope. Fukushima can build a new image as a region that has learned painful lessons as a result of the nuclear crisis, but also one that has continued to move forward and create a new vision for the future. This vision could be one of a renewable energy pioneer that leads the way in Japan to successfully combining different forms of renewable energy to support the region with electricity and jobs.

Findings from FAIRDO Experts



Dr. Viktor AVERIN Research Institute of Radiology (RIR), Belarus

Following the radioactive fallout in the result of the Chernobyl accident, Belarus, the country where agriculture has always been one of the dominant economic sectors, had to deal with massive contamination of agricultural lands, undertaking efforts to continue their use for crop production. With combined efforts of science, government and local people we managed to succeed.

After decay of short-lived radionuclides the main radioactive contaminants are still cesium isotopes and in some areas strontium-90. Total area of Belarusian farmlands contaminated by ^{137}Cs and ^{90}Sr made up, respectively, 1055.8 and 375.0 thousand hectares. The most affected region of Belarus out of its six administrative units is Gomel region, closest to the Chernobyl NPP, with about six hundred thousand hectares of contaminated area in the range of 1 - 40 Ci.

Large-scale decontamination of settlements contaminated by the Chernobyl fallout was carried out in 1986-1989. Outside the 30-km zone about 500 settlements were decontaminated, 60% of them in 2-3 stages. These activities included removal of contaminated soil and "clean" refilling; dismantling of objects not subjected to decontamination; asphaltting of streets, roads and pavements; replacement of roofs; radioactive waste disposal. Seven million three thousand m^3 of soil was cut off, buried and replaced with 1.57 million m^3 of clean soil.

As a result, there was some mitigation of the local radiation situation. However, it proved unreal to fully decontaminate villages, agricultural and industrial facilities since the amount of work significantly overtopped available resources. From 1989 onwards decontamination activities were narrowed down and resettlement became a major protective measure.

From then on, decontamination activities have been applied only to socially important objects, like kindergarten and school premises, stores and medical institutions, as well as any local spot with abnormally high contamination.

Actions on decontamination, such as removal of 25-cm soil layer or cleaning up with detergents and water, were performed based on the specified intervention levels, i.e. "Temporary reference levels of radioactive contamination for decision-making on decontamination activities" recommended by the National Commission on Radiation Protection and approved by the Chief Sanitary Doctor of the Republic of Belarus. Decontamination activities were accomplished by republican specialized enterprises "Polessie" and "Radon" established in Gomel and Mogilyov

regions and subordinate to the Ministry for Emergency Situations.

Post-accident decontamination activities in Belarus resulted in thousands of tons of radioactive decontamination waste managed in accordance with the "Sanitary regulation on Chernobyl-origin decontamination waste management" developed based on national and international experience, the Radiation Safety Standards and a number of other related regulations.

Depending on specific activities, surface contamination and history of formation decontamination waste is disposed in Disposal Facilities for Decontamination Waste (DFDW) of three types. DFDW-I is a special engineering construction for disposal of decontamination waste with activity higher than 100 kBq/kg, ensuring its secure isolation by means of special safety barriers. There is only one facility of that type in Belarus – DFDW-I "Khatki". DFDW-II are near-surface clay and concrete-protected facilities for 1-100 kBq/kg decontamination waste (9 sites). Eighty two disposal facilities of DFDW-III type were constructed in the initial post-accident period, 1986-1989, during mass decontamination in Gomel region. Apart from three types of DFDW there is a separate category of disposal sites designated for demolition waste. During 1991–2011 709 thousand tons of decontamination waste was disposed with total activity of 361×10^{10} Bq.

The same as during the first post-accident period, the main course in the frames of the State Program for Mitigating the Chernobyl NPP Accident Consequences was taken towards protection of human health. This meant implementation of entire range of measures, such as evacuation of residents, resettlement, health-care support, development of methods and techniques for producing farm products within the specified permissible levels. Today Belarus is implementing the Fifth state Program which comprises four major directions: social protection, medical support, radiation control and radiation protection, and information support and public communication policy.

Since the disaster the main target of countermeasures has always been reduction of internal doses of population. To control and secure most effective internal dose reduction it is important to establish and maintain a sound radiation control system. The radiation control system in Belarus is multi-level and includes the state control and supervision, on-site radiation control and public control. Radiation control is implemented on the whole territory of the country. As far as the food products represent the basic impact to internal radiation doses, radiation control covers all forest, fishery and farm products produced both on state farm enterprises and personal farmsteads.

Post-accident agricultural practice has been focused on countermeasures aimed at reducing radionuclide transfer into plant produce on arable farmlands, therefore reducing internal radiation doses. Reduction of radionuclide concentrations in farm products was caused both by highly intensive application of countermeasures and due to natural biochemical processes. Application of countermeasures in agricultural sector during the first years after the Chernobyl disaster (1986–

1992) provided 3-8 times reduction of ^{137}Cs transfer to agricultural crops: soil treatment by real tillage –5 times; lime treatment – 4 times; basic soil improvement of hayfields and pastures – up to 6 times reduction, whereas rational selection of crop types and species being the most “available means” of lowering ^{137}Cs contents in crop yields may result in 30-times reduction of ^{137}Cs concentrations. In 1992–2010 contribution of natural processes (cesium fixation by clay minerals plus radioactive decay) prevailed over that, achieved due to countermeasures. Effectiveness of protective measures during these years declined on average to 50–80%. Nowadays, the major contribution to reduction of ^{137}Cs concentrations in agricultural produce belongs to radioactive decay.

Due to implementation of countermeasures in agriculture it became possible to reduce collective and individual doses associated with contaminated food consumption by 4-5 times. The most efficient dose reduction was reached via countermeasures aimed at lowering ^{137}Cs concentrations in milk – the most critical food type whose contribution to total dose of internal exposure was 40-80% (contribution of countermeasures to averted dose made up 60-70%). Highly-contaminated milk should be replaced by the products derived from this milk after processing, which lowers radionuclide intake by human body by more than 10 times.

Technological processing of crop production also reduces ^{137}Cs transfer into human body. For example, rape and sunflower seed processing leads to 250-times reduction of cesium content in the oil end product, potato and grain processing for alcohol almost excludes any radionuclide concentration in the end product.

Countermeasures in animal husbandry in contaminated areas are focused on reduction of the intake rates with the farm animal products. During the first 3-4 years, the main countermeasure was to feed animals 20-30 days before slaughtering the low-contaminated feed (metabolism of cesium in muscular tissues of animals is characterized by relatively high intensity with radionuclide half-clearance period of 30 days). Afterwards, another countermeasure was introduced – application of cesium binders. The reduction factor depending on the type of produce (e.g. milk, meat, or eggs) was from 2 to 11.

Another important countermeasure in animal and crop sectors is alteration of farm production line. It is applied in case the affected farm area doesn't allow crop production within permissible levels, or in case consumption of such products contributes to high internal doses. For example, the collective dose (induced by strontium and cesium) can be reduced 28 times, if contaminated forage is used for feeding the farm animals intended not for milk but meat production. Grain crops differ from other crops by their relatively low coefficients of radionuclide accumulation. However, on highly-contaminated plough lands the levels of radionuclide concentrations in grains may significantly exceed the permissible levels. Therefore, in case we have contaminated grain yield, the

most effective countermeasure preventing from high collective doses will be alteration of its use, meaning feeding it to farm animals as forage and then produce end animal products for consumption instead of producing bread and cereals from this contaminated grain yield.

Public communication and awareness-raising work among the residents of the affected areas is one more important countermeasure to be mentioned. In previous years, the Information Concept was developed and adopted in the Republic of Belarus for more effective regulation and interrelation between national authorities, mass media, educational and medical institutions in the sphere of Chernobyl-related information activities. At the present time, Belarus maintains the Integrated System of Information Support which provides national and local authorities with information on implementation of the state policy in the field of overcoming the consequences of the Chernobyl NPP disaster and fosters active concerns and attitudes of population towards revival and development of the affected areas while increasing people's radiological skills. What is more important, it promotes positive and adequate attitude to the affected areas on the part of population of non-affected areas and international community. This work includes dissemination of free informational materials on safe residence in the affected areas, free public lectures given by experts, thematic exhibitions, film demonstrations, whole-body measurements etc.

Education and training of medical professionals and teachers is performed via special seminars and workshops, "Peer Education" classes, mandatory training courses for professionals at higher educational establishments. A very important target group is schoolchildren. Supported by the French colleagues CEPN the RIR specialists have successfully implemented the new approach to public outreach by creating a number of Centers for Practical Radiological Culture on the local school premises in the affected areas. The centers are founded on the local school premises and are equipped with the modern radiometry and dosimetry instruments. Their objective is to promote practical radiological skills of schoolchildren and other groups of population, teaching them how to do measurements of radionuclide concentrations in food and feedstuffs, wild berries and mushrooms, wild game, soil, and of ambient gamma background.

For 26 years of its operation, the Research Institute of Radiology developed numerous recommendations and guidelines for safe residence on the affected territories, regulatory documents, Chernobyl-related concepts and strategies, calculation and forecast models for optimization of agricultural production. RAINBOW AgroOptimization is a tool designed to help to increase production outputs and improve the operating efficiency of a farm enterprise (farmstead/household). It is based on the available farm resource potential and helps to determine the most efficient lines of farm specialization, as well as to optimize crop cultivation. RISKAgro Model is a tool for risk assessment associated with agricultural production with radionuclide concentrations and chemical contaminants above permissible levels. Agro TF is a model for long-term forecast of

radionuclide transfer to agricultural produce.

Apart from that, there is a large number of radiation-related informational materials, handbooks and brochures, video materials, practical guidelines, memos and painting books for children, and even computer games, all of which, although based on the latest scientific developments, are user-friendly and adapted for better comprehension by general public.

Findings from FAIRDO Experts

Prof. Wolfgang Raskob, Professor, Karlsruhe, Institute of Technology (KIT), Germany

Introduction

KIT is an associated member of the FAIRDO project providing simulation models for developing strategies for urban decontamination (ERMIN) and food countermeasures (AgriCP) as part of the RODOS (Real-time Online Decision Support) system. KIT on the other hand is coordinating European research projects in the area of emergency management and rehabilitation preparedness (completed project EURANOS and running project NERIS-TP) and provides links to scientist working in that area.

Objective of the mission

The objectives – from the point of view of KIT – can be summarized in the following points

- Provide information to Japanese scientists and members of the public on research activities performed in Europe in the last 10 years
- Get information on the work performed in Japan related to decontamination of urban areas and understand the current constraints and needs of the Japanese counterparts
- Discuss the socio-economic aspects of decontamination
- Discuss with the FAIRDO staff potential future directions of the work

Major observations/findings

In one expert meeting on July 19, in one symposium on Saturday 21 and during the ISAP 2012 conference information on research performed in Europe has been provided. Even if the time was limited some of the key messages could be communicated. These messages were that modeling and monitoring are important back bones of any decontamination strategy and that simulation models exist allowing to develop decontamination strategies. It was also acknowledged that these simulation models require adaptation to Japanese conditions, in particular information about decontamination experiments have to be incorporated. Members of FAIRDO agreed that information will be made public to KIT allowing to adjust the models. KIT also emphasized that the simulation models will not be able to predict the dose to a person very precisely, as the living habits are only models as an average clearly differing for a real person. Nevertheless these models

are able to help in developing decontamination strategies by identifying those surfaces that require cleaning after more than one year after the accident. In this respect it was agreed to continue the collaboration and KIT will provide support to FAIRDO members in applying the RODOS models.

Information about the work performed in Japan was provided within the above mentioned seminars and within two field visits to Oguni Village, Iidate Village, Minami Souma and Namie Town.

One of the main impressions from the seminars and workshops was that there is much work going on, however, it does not seem to be coordinated horizontally. There is a clear hierarchical structure with the decontamination plans to be prepared by each city/village and which as to be approved by the Fukushima Prefecture. However, there seems to be little exchange between the villages. Furthermore, the decontamination activities seem to be linked only to the property of one household but do not take into account the nearby areas. Radiation however has a reach out of more than 100 m and therefore areal decontamination might be important to reduce the dose rate a certain plot. It was also communicated that decontamination is strictly linked to a certain dose limit. However, it might be more appropriate to decontaminate the whole village in a simple and basic way – less costly than the decontamination of one house – and this basic decontamination is followed by decontamination of locations that are still above a given value – which might be defined by all residents for that situation. Such a basic decontamination would improve the acceptance of the action as everybody has an added value of that action and not only those being above the threshold.

A further observation is related to the decontamination objective. During the seminar on Saturday, the statements of the residents indicated the wish to have a decontamination to zero levels – which is however technically not possible. The Mayor of Namie town clearly stated that the decontamination should reach at least the 1 mSv/yr level recommended by ICRP. As this is the ultimate goal in terms of radiation protection, there was no discussion about ALARA (as low as reasonably achievable) which may result in a decontamination level above or below that limit. Further to this, the cost of decontamination seem to be no point for discussion and thus not part of the decision making process. However, including the costs might also favor other more innovative ideas about the decontamination process.

As rehabilitation is not a technical term limited to decontamination the societal aspects of the project have been discussed in detail. Here risk communication and governance were the key words. Risk communication and governance aspects of the FAIRDO project have been discussed in

many smaller meetings. European participants focused on the need to include all stakeholders in the decision making process which include also the set-up of local initiatives. So far this seems to be realized only for Oguni Village. To which extend the European approach can be realized in Japan and is helpful was discussed but there was no clear picture – at least from my point of view. However it must be clearly stated that decontamination to zero and the continuation of the life as before the nuclear accident seem to be not possible. Therefore, there is a clear need to develop strategies for a sustainable future which include an economic perspective and a life with the contamination. To which extend a research project is able to develop this and communicate this with the political leadership in Tokyo was not discussed in detail. However, these aspects might be discussed in more detail by the other members of the delegation.

To support modeling activities of the FAIRDO team, KIT requires information about the decontamination experiments carried out so far in Japan. In this context it might be very helpful to establish an open data base with information about these experiments and their main findings including decontamination factors, work performed and general description of the environment. It is also important to know the contamination level and not only gamma dose rates as any monitoring information depends strongly on the environment (e.g. trees, walls), models however often start from an idealized environment of grass without obstacles.

Recommendations

It is difficult to provide recommendations following such a short visit and having for sure not all the insights necessary. However, some technical aspects might need further consideration. Recommendations are limited here related to decontamination. Other experts may discuss the rehabilitation aspect in more detail:

- The criteria for decontamination seem to differ from city to city. A harmonization might be more appropriate
- Communication between the cities in preparing the decontamination plan should be strengthened
- The decontamination guidelines might need some evaluation, in particular if measures that have been successful in the first year are still necessary in the following years (clearing of grass, leaves)
- Areal decontamination against decontamination of single plots should be compared and discussed. In general, there seems to be little planning towards an “optimal” decontamination strategy for a whole city

- It must be clearly communicated that decontamination is limited and zero values not achievable
- It might be worth discussion to which extend simulation models may help citizens or small communities in preparing a decontamination plan
- Information about decontamination experiments and work on agricultural problems should be collected at one place and made open to the scientific community and the public
- There is a clear need to link decontamination strategies with a future sustainable development of the province. The challenges following Chernobyl might be the same, however, Japan might need to find its own processes and procedures to deal with this due to cultural differences
- Waste is an important issue and a central deposit recommended, however it is more a communication issue than a decontamination one

Findings from FAIRDO Experts

Mr. Gilles Hériard-Dubreuil, President, MUTADIS

Introduction

I participated in the FAIRDO mission in Japan from 18 to 26 July 2012. This mission took place first in the Fukushima prefecture and then in Yokohama in the framework of the ISAP international Forum for Sustainable Asia and the Pacific.

My background is in the field of governance of hazardous activities and more specifically in the area of nuclear post-accident management, notably in the Chernobyl context (Ukraine and Belarus) since 1991, studying the living conditions of the population (1991-1995) and then ensuring the scientific coordination of the ETHOS project from 1996 to 2001 in Belarus. I also participated to the CORE program (aiming at the rehabilitation of living conditions in the contaminated territories of Belarus) from 2003 to 2008, as representative of the (western) European partnership committee of the CORE program and as a methodological expert on post-accident governance in the management instances of the program. My background also involves participation to several European research projects regarding post-accident management such RODOS, EURANOS (where I coordinated activities regarding the development of a framework for accident preparedness) and the actual NERIS research project. I also coordinated the TRUSTNET European research on the governance of hazardous activities from 1996 to 2006 and the COWAM European research on the governance of nuclear waste management activities. In addition to this, I am also member of the advisory board of the French association of local commission of information attached to nuclear power plants (ANCCLI) in France and in this perspective contributed to the development of a 5 years participatory evaluation of the practical implementation of the Aarhus Convention in the nuclear sector in Europe in the framework of the European Nuclear Energy Forum (ENEF) created by the European Council.

During the FAIRDO mission, I participated to field visits in areas affected by the Fukushima accident (and concomitant natural disasters) in the Fukushima prefecture (notably Minamisoma, Oguny village, Date city, Namie city, Ukedo settlement on the seashore in the vicinity of the Fukushima NPP. I participated to several meetings with representatives of public authorities (at national, prefectural, city and village levels), technical staff involved in the post-accident management and decontamination activities, professionals (farmers) as well as civil initiatives (Oguny Village), together with meetings with various experts and academics notably the research team of the

FAIRDO project that organised this mission under the coordination of Pr Suzuki (University of Fukushima) and Mr. Mori (president of IGES). I also participated in three events (research seminar and international symposiums in Fukushima and Yokohama) and made two presentations (on the feedback of European Experience on post-accident management, on my first impression after field visiting in Fukushima).

I found good background information in the National Diet of Japan official report (July 2012) on the “the Fukushima nuclear accident independent investigation commission” as well as in the Greenpeace report on Fukushima (March 2012). This mission did not entail any visit or information regarding the on-site situation and safety management.

The costs of my mission in Japan were supported by the NERIS European research project. I specially express my thanks to IGES and to the FAIRDO team for the excellent and very efficient organisation of this mission as well as for the very positive and friendly climate of cooperation with the FAIRDO research team that I experienced during this mission together with my European colleagues. As agreed with our Japanese colleagues, I am glad to bring here a short written contribution synthesizing my feedback from this mission. It is presented here as some observations gathered during my mission in Japan and some background information on the European experience of post-accident management governance that I feel relevant on the one hand. It will then include on the other hand some recommendation regarding the ethical positioning and governance of the FAIRDO project.

Governance of post-accident management

My understanding of the situation in Japan, some 16 months after the Fukushima accident, is linked with my personal experience and engagement in the Chernobyl post-accident situation and its major steps in the rehabilitation policies during some 25 years after the occurrence of this major accident in Eastern Europe.

Although the Japanese situation is presenting obvious dissimilarities with the technical, social, economical, political and legal background of the Chernobyl context, one can observe some similar patterns and processes regarding the evolution of the accident and post-accident situation and its move towards a long term perspective of restructuring lifestyle and activities in the contaminated areas. This includes crucial decision at collective and individual levels regarding the future of human presence and activities in the considered areas. In this perspective, one should underline the relevance of the main characteristics of post-accident rehabilitation governance according to European experience as developed for instance in the ETHOS and CORE programmes in Belarus:

- Creating an **enabling environment for local communities and people** (legal devolution to local communities, support and resources)
- Facilitating **interactions of people with knowledgeable persons** and experts
- Providing local people with environmental and health **monitoring and predictive tools** in order to facilitate local information, dialogue and deliberation
- Bringing **third parties to facilitate interactions** of communities **with upper levels of decisions**
- Supporting and **connecting local initiatives and experiences, sharing evaluation** of actions

Regarding the situation in Japan, rapid steps have been taken by the Japanese Authorities regarding post-accident management policies (remit to MOE, global framework for decontamination activities and its financing, compensation policies, distribution of decontamination tasks among the several levels of governmental, prefectural, city and village levels). While differences in timing and rhythm can be noted vis-à-vis the Chernobyl situation, it is now clear that the Japanese population after being confronted with the emergency phase is now facing the perspective of the durable presence of radioactive material in the environment. A focus is presently given by public policies on decontamination activities. While many people are eager to bring back the situation anterior to the accident, the focus on decontamination is at the origin of great expectations. It is unclear however that decontamination countermeasures will fulfil such expectations.

A major challenge appears to be the adaptation of risk management policies in order to bring appropriate governance patterns making it possible to cope with the observed complexity of the post-accident situation. An important factor of complexity is the necessity to address the multiple (health and environmental but also social, economical, legal, ethical, political and cultural dimensions) of the post-accident situation.

The European nuclear post-accident experience clearly demonstrates that the restoration of living conditions in contaminated areas is involving a large multidimensional perspective that goes far beyond the objective of radiation protection while traditional risk-management policies tend to rule post-accident situations with single standards and criteria elaborated by radiation protection experts as a result of top-down decision-making. The European experience also indicates that sustainable progress in the radiation protection of the population can only be achieved as a part of a global restoration of the life quality affected by the accident consequences. In this perspective, rehabilitation of the living conditions is involving the creation of new lifestyles and activities rather than restoring normality on the basis of former lifestyles. In addition to this, several information gathered during this mission in Japan tend to demonstrate the existence of a territorial economic,

social and cultural depletion in the Fukushima area that was pre-existing to the considered disaster (although it is worth to mention that this area has a strong historical and cultural tradition of self-government and is for instance at the origin of the creation of one of the strongest cooperative institution in Japan).

One can already observe in the Fukushima prefecture (according for instance to the declarations of inhabitants of the contaminated areas in the Oguny village) the difficulties encountered by present public policies regarding for instance relocation, compensation and decontamination. Narrow reference criteria for relocation and compensation operate significant discrimination among inhabitants of affected localities. Minor differences in exposure levels in the vicinity of neighbour housing can lead for instance to strong differences among people regarding access to relocation, compensation and decontamination of their housing. This situation at the origin of paradoxical effects at community and individual levels, creating for instance inequitable situations among inhabitants of the contaminated areas. It also unclear that this policy will bring a sound basis for people to restore confidence regarding the way the radiological situation is managed. Another observed difficulty is linked with the inherent fragmentation of administrative policies of post-accident management and the resulting lack of consistency at local community level (for instance between decontamination and reconstruction strategies that are dealt with by separate bodies of administration).

A parallel can be drawn here with the difficulties encountered by traditional risk management policies in the post-accident context of Belarus that have open the way to the search for alternative policies more open to devolution of rehabilitation activities to local actors and local communities (see the CORE program for instance).

Traditional approaches of risk management are usually managed by public authorities in order to maintain public exposure within the regulatory standards of protection, while the public is not usually expected to contribute to the management of risk (out of specific emergency recommendations issued by the authorities). Norms and standards of radiation protection are established by risk-assessment experts. They take into account available knowledge, according to current values and ethical guidelines, but also the economic, social, political practicability of the considered standards. This approach applies efficiently to short-term management of nuclear accidents where public authorities are expected to take action in order to protect the population while making sure that appropriate actions are taken by the operators in order to manage the nuclear accident. But it can hardly address the complexity of post-accident situation. Existing experience in Europe demonstrates the need to create the conditions for people to manage the

post-accident situation or at least to bring a significant contribution to it.

Regarding post-accident management in Japan, it can be foreseen that a major step in the near future will be attached to the definition of an appropriate governance framework of the post-accident situation in order to provide local actors with capacities and power to assess by their own the situation in the contaminated areas, to develop their own evaluation of the potential impact of the contamination as well as of the potential means and strategies to reduce their level of exposure beyond the reduction that can reasonably be expected as a result of decontamination strategies. The last decades experience of sustainable development at local level demonstrate in the same way the limits of developing projects “for” people and the need for supporting people’s initiative at community level. Again here, the European experience shows that devolution of rehabilitation strategy to local communities and inhabitants can improve drastically the efficiency of the resources dedicated and the sustainability of the progress achieved. It is worthwhile to mention the existence of several civil initiatives developing in the contaminated areas in Japan regarding the monitoring of the radiological situation. A visit was organised in the Oguny Village where citizens have formed a civil initiative and organised themselves for developing their own capacities to assess their radiological environment in order to regain control on their exposure and also in order to check the consistency of the public policies on decontamination and compensation. A quick review of the social media reveals the existence of a wealth of initiatives of this kind at territorial level, indicating therefore an actual potential of self-organisation in the affected Japanese population. From the perspective of the European experience, this emerging societal potential in Japan is representing an important asset for the future steps of the post-accident governance. It should be supported and provided with appropriate means in order to favour the development of a radiation protection culture in the population of the contaminated areas. The initiative of the Oguny village has benefited from in kind support from local authorities (free access to radiological monitoring devices, free premises for the local independent laboratory of radiological control). It is not clear however that upper levels of administration are regarding this kind of initiative as an asset in the post-accident management, whereas European experience is providing evidence that public policies should support them.

The FAIRDO project

This mission in Japan was organised by the FAIRDO research project (project coordinated by IGES under the aegis of the Fukushima university) that is entrusted with the task of supporting regional authorities in Fukushima involved in the decontamination activities. The FAIRDO project is developing on three directions: governance, risk communication and models. During the mission, several dedicated “informal” meetings were organised in Fukushima and in Yokohama in order to foster the exchanges between the European team and the FAIRDO research team. My contribution

to those exchanges developed mainly on providing some feedback on the European experience of post-accident management governance as reported above. A second aspect of my contribution was regarding the questioning of the very goals of the FAIRDO project and its ethical position regarding the different stakeholders involved and notably the population of the contaminated areas. In this perspective, on the basis of my former experience of the ETHOS research action and subsequent CORE program in Belarus, I did strongly recommend a more explicit positioning of the FAIRDO project regarding the main stakes of the post-accident situation. Some very sensitive questions such as the contribution of the FAIRDO project to the return of the population in the (de)contaminated areas should in particular be addressed (here the goals of the “risk communication” activities should be clarified, avoiding the paternalistic and simplistic idea of “providing information for the population to better understand and accept the decisions of public authorities” – see here the result of the TRUSTNET research on the governance of hazardous activities). A clear ethical framework of the FAIRDO activities should be prepared that could for instance follow the line of the principle of the Aarhus Convention (1998) on public information and participation rights (in the context of public decisions impacting environment) and access to justice that was prepared and undersigned by most European countries in the aftermath of the first RIO conference. Such framework should for instance make explicit principles such as the respect of the prerogative of the local communities and local populations regarding direct access to information and independent expertise on the radiological situation of their territory (and their level of exposure), regarding their right to make an informed and democratic decision (at individual and community levels) on living (or returning) or avoiding living in the contaminated areas. On the basis of the ETHOS and CORE projects, one should recommend the preparation of a cooperation framework to be undersigned by representatives of the concerned parties of the FAIRDO activities and more specifically, the research team, the local communities and local governments (where research activities and actions take place), the concerned civil initiatives and NGOs and the regional and national concerned authorities. This framework should establish the common goals of the action research as well as a governance framework of the research involving the concerned parties (an possibly national or international third parties) in the follow up and evaluation of the project activities. The framework should explicit the contribution of the FAIRDO research to the achievement of the identified goals. In this perspective, a process of dialogue between the concerned parties should be established among concerned parties and maintained during the course of the project.

Findings from FAIRDO Experts

Prof. Eduardo Gallego, ODirector, Nuclear Engineering Department, Technical University of Madrid, Spain

Introduction

With regard to the FAIRDO mission, I have a background in the field of assessment of radiological and economic consequences of nuclear accidents, emergency planning and related problems. I am member of the NERIS Platform and partner of the NERIS-TP project representing UPM, with participation in the Working Group on Preparedness at national and local level. I am also member of the Executive Council of the International Radiation Protection Association (IRPA), and actively participated in the elaboration of the *“IRPA Guiding Principles for Stakeholder Engagement in Decision-Making in Radiation Protection”*. Also, with direct relevance to the mission, I was member of the Task Group of the International Commission on Radiological Protection (ICRP) producing ICRP Publication 111, *“Application of the Commission’s Recommendations to the Protection of People Living in Long-term Contaminated Areas after a Nuclear Accident or a Radiation Emergency”* (2010), which recently was translated into Japanese and is being taken as reference by many Japanese groups and organizations²³, including the Japanese authorities²⁴.

During the FAIRDO mission I made two presentations: one was a general description of the NERIS Platform: European Platform on Preparedness for Nuclear and Radiological Emergency Response and Recovery, during the FAIRDO Workshop at Fukushima University on July 19th; and the second at the ISAP 2012 Forum on the framework for post-accident preparedness in Europe and the IRPA guiding principles for stakeholder engagement.

General observation

The organization of the mission was excellent and it allowed us to really profit the short stay in Japan to get the as much information and as many impressions as possible in very intense days. We had the opportunity to meet people of different origins, technical background, points of view,

²³ See for instance:

<http://ethos-fukushima.blogspot.jp/2012/04/blog-post.html>

<http://www.gepr.org/en/contents/20120326-02/>

<http://www.gepr.org/ja/contents/20120227-02/>

²⁴ see: http://www.nsc.go.jp/NSCenglish/geje/20110804suggest_3.pdf

sensibilities, occupations... from university professors to farmers, from high-level administrators to lay technical staff, from central government to local associations. This has offered indeed a very good panoramic view of the post-tsunami and nuclear accident issues in the impacted areas.

The impression is that a tremendous collective effort is being done but not always in the most effective way. Every administration and technical organization is putting its best knowledge and personal efforts at all levels, but perhaps there is a lack of horizontal communication and understanding, and this may cause lack of effectiveness in some directions as it is discussed below. More and more effective dialogue forums are needed to create greater consensus and to regenerate confidence in government and prefectural administrations.

Also, it seems that additional significant efforts should be put in developing a practical radiation protection culture at all levels (individuals, families, neighborhoods, schools, university, farmers associations, municipalities, and the prefecture and country level), which helps to put radiation risks in their right position and to take better informed decisions, considering not only radiation risk but all the relevant dimensions such as health, environmental, economic, social, psychological, cultural, ethical, political, etc.

Governance

Quality and effective strategies should be based on dialogue and understanding between experts, authorities and affected stakeholders. Optimal strategies can only be those accepted by all: they should be technically sound, feasible and effective, and allow improvement of the overall life conditions in the areas and their economic development. I am convinced that this is exactly the motivation behind the actions already launched at different levels.

From the limited observation during the mission, it seems that each administration is trying to put every effort to reach better living conditions for the impacted populations as soon as possible. However, the interaction with the wide spectrum of sensitivities implicated could be improved. The legal framework and the compensation schemes implemented could be not optimal. They are based on a top-down vision of the problems and on the application of strict borders between safe/unsafe conditions. These schemes may lack of important elements to address the real worries of lay people that feel their life threatened, even though the radiation levels in many locations indicate far-from-danger environmental conditions. But in order to be able to decide, people need to have a clear picture of the risk they are facing and to consider the new conditions in comparison to the pre-accident situation which will never come back... They need to develop what we called "radiation protection culture", that in essence means integrating the presence of radiation in their

lives as a common factor, as we have integrated other technological risks (for instance, traffic risks), and taking care of it to minimize their exposure. It is also very important to evaluate the potential to continue economic activities or food production, which are essential for a sustainable future. In this sense I strongly recommend to follow the proposals from Jacques Lochard presentation to the Japanese Cabinet Office²⁵.

The experience from the ETHOS and CORE projects in Belarus was assimilated in the EURANOS project through their practical implementation in some European countries, which has resulted in a proposed framework based on the creation of pluralistic platforms to analyze and diagnose the different alternatives for management during the long-term rehabilitation process. This framework is now being extended to other countries (like Spain) in the NERIS-TP project. I presented it briefly at the ISAP2012 session.

In essence, in an existing exposure situation after an accident (but also for radon in homes, for example), the individuals should have a basic right to decide on their own living and health conditions, and it is a right to accept some risk if they believe this can clearly be compensated by the possibility of keeping their homes, economic activity and usual environment. And also the opposite reasoning is correct (one can decide to live below a given level of risk, and claim for compensations or accept to spend large resources and personal effort to be reassured).

Basically, authorities and technical support organizations should provide good characterization of the presence of radioactivity at each point (i.e. home by home) that could be checked by independent organizations (for instance, university labs), good information on technical possibilities to decontaminate, and good evaluation of risks. But then, it should be the individual who has the right to decide. It could be a parallel situation to the informed consent to patients before medical procedures, which is a common practice, legally mandatory, in countries like Spain: the patient must receive good information and a risk assessment, but the decision is finally taken by the patient, not by the physician. For instance, this is the case with medical diagnosis or treatments implying large amounts of radiation (several milliSievert in diagnosis to some Sievert in radiotherapy). And the patient has the right to get a second independent opinion. Although this process would be expensive and time-consuming, certainly it will help building back confidence in the authorities and creating new and stronger networks between the local population and municipal administration with the prefecture and national administration.

²⁵ <http://www.cas.go.jp/jp/genpatsujiko/info/twg/dai5/siryoku2.pdf>

The rehabilitation phase is very different to the emergency, and the authorities must bear it in mind. As in the medical analogy, an urgency is not the same that a planned intervention: in the urgent phase, the objective is to save patient's life, and there may be no time to discuss or inform, but just to act and decide, even on behalf of the patient and his family. It would be similar to the nuclear emergency, where decisions are taken by the central administrations to protect people and on behalf of them. But then, during recovery, any procedure or surgery should be discussed with the patient to seek for his approval or rejection. I think the ethics behind could be also applicable to post-accident existing exposure situations.

To implement this new governance framework local government should be equipped with more technical means and qualified technicians to analyze. Standard measurement methods and calibration procedures must be implemented to warranty that all measured values are compatible and reliable. University labs and independent experts should be allowed (and paid) to verify measurements of radiation levels in the ambient and in food locally. The Oguni case is a very good example.

An important point for reassurance could be to give access to whole body counters (WBC) locally operated at health services (hospitals). Until now, good measurements have been performed by technical support organizations (like JAEA in Tokai), but this kind of checks would be much more useful to increase people's reassurance if they are managed by normal health services. This could also contribute to develop the "radiation protection culture".

Consensus on the temporary storage for the low-level radioactive wastes generated by decontamination activities is essential. These wastes are less dangerous than many other industrial and toxic wastes, and they only require good administrative control, some distance from inhabited areas, and providing good isolation from water ingress and dust resuspension. Municipal governments should play the most important role in identifying appropriate sites and controlling them. But to persuade municipalities and local communities to accept temporary waste storage, they should see clear plans from the Government to build interim storage and final disposal facilities. It seems some candidates to host interim storage facilities are currently studied²⁶, and plans to select disposal sites should be develop in cooperation with relevant stakeholders in the near term. Before deciding on any site or technical option for final disposal, it may be very useful to open a discussion process in which all stakeholders could participate, as it has been made for

²⁶ See: <http://www.nisa.meti.go.jp/shingikai/700/14/240723/BM-1-2.pdf>

instance in other countries. Stakeholder engagement is very important to search for widely accepted solutions, because top-down decisions in this field generally fail after long law court processes.

Risk communication

Effective risk communication requires establishing personal contact. Information is the first step, but to get effective communication interaction with people is necessary. Organization of dialogue meetings between experts and people must be promoted. The positive role of Neighborhood Associations and the Parents and Teachers Associations has been already seen from the first days after the accident. They should be engaged in organizing further activities. Also, establishing local information centers (like, for instance, in Belarus), if possible linked to non-governmental associations could be very beneficial, like we saw in the case of Oguni. The support to local associations is essential!

The availability of local technicians and measurement equipment, including capability to measure radiation levels in the ambient and in food, and WBC in health care centers may contribute to normalize the presence of radioactivity as an additional variable in daily life. Training of schools teachers, health care staff, municipality staff, but also of any citizen willing to collaborate in using radiation measuring devices, could help significantly in this sense. Then, university labs and prefecture technical services should be available to calibrate measuring equipment and solve any technical doubts about the results obtained.

Of course, continuous update of reliable information about radiation levels, progress on decontamination, etc. through bulletins distributed home by home and web pages like (<http://fukushima-radioactivity.jp>) are also good tools to increase transparency about the current radiological situation and to counteract misinformation.

Decrease in radiation levels by natural decay and by decontamination activities would have a beneficial impact on peoples's mind, as pointed out by Dr. Averin; therefore this is a factor to consider in decision making and also in risk communication.

Decision support systems

The availability and use of decision support systems (DSS) can help to take actions in the most likely effective way. DSS also help in forecasting future evolution of contamination levels and the effect of countermeasures. Its use may help not to create false expectations or to otherwise maintain very negative perspectives.

Strategies for decontamination of urban environments can be analyzed with simulation tools like ERMIN in the search for an effective use of resources. I found some information about JAEA tools that can be also made available to interested stakeholders, but I could not find the name of the tool.

As Prof. Koyama pointed during the FAIRDO Expert Workshop at Fukushima University, there is a need of tools for planning the next cultivations. Food countermeasures can be analyzed with tools like the AgriCP (part of JRODOS) or the RAINBOW (Belarus) tools. But these models should be adapted to the Japanese environmental conditions.

Finally, the contamination of freshwater bodies may affect drinking water sources, fish and other aquatic foodstuffs, irrigation supplies and people's exposure during recreational activities. Consequently, it can also create significant public concern, even though dose assessment may in many situations indicate lesser importance than for other exposure sources, as clearly experienced in the aftermath of the Chernobyl accident. DSS like MOIRA²⁷ could be of help to forecast the long-term evolution of water, sediments and fish contamination. The system is based on validated models for predicting the time behavior of contaminants in lakes, rivers and drainage areas, as well as the effect of countermeasures to reduce the contamination levels of the water bodies. However it would need some customization effort to be applied in the Fukushima region. It can be obtained cost-free from the developers' team.

²⁷ Monte L., Brittain J.E., Gallego E., Håkanson L., Hofman D. and Jiménez A. (2009), "**MOIRA-PLUS: A decision support system for the management of complex fresh water ecosystems contaminated by radionuclides and heavy metals**", *Computers & Geosciences* 35(2009) 880–896. doi:10.1016/j.cageo.2008.03.008.

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Findings from FAIRDO Experts

Dr. Hiroshi Suzuki, Emeritus Professor, Fukushima University / Chair, Fukushima Prefecture Reconstruction Committee

Upon completion of the FAIRDO first stage field survey

As part of the full-scale start of the FAIRDO (Fukushima Action Research on Effective Decontamination Operation) project, which began from FY2012, a field survey together with an international symposium participated in by all research members, including foreign research collaborators, was conducted from July 18 through July 23, 2012. This gave us an insight into (1) the serious situation after the nuclear disaster, (2) various efforts made by the national, prefectural and municipal governments and local communities to deal with the radioactive contamination, and despite these, (3) problems in communicating not only decontamination issues, but also anxiety about and expectations for restitution, compensation and reconstruction among a range of stakeholders. In addition, we were able to hear honest opinions of foreign research cooperators taking part in the event about (4) measures that have been taken since the Chernobyl accident, and about (5) approaches taken in Fukushima, etc.

Based on comments and remarks about the circumstances of Fukushima, future challenges, etc., provided by research members (chiefly foreign research collaborators) in the meetings during the survey period, this report explores our future tasks and direction.

The FAIRDO project is being implemented according to the following three subthemes: (1) governance, (2) decontamination plans tailored to the local situation and (3) communication of risks. In the recent field survey, a variety of subjects not limited to these themes were discussed. This report reviews individual subjects discussed there that are not necessarily in line with our research themes.

(The boxes below show the comments provided in the meetings.)

1. Overview

- Mapping the current situation – What is ongoing? Where are the gaps located? What about data collection? A framework to maintain coherence is also required. It was reported that as many as 200 meetings to explain decontamination operations were held. As things are always changing, it is difficult to comprehend the overall situation.
- Although many people appear to be considering region-wide (across-the-board)

decontamination, it is not realistic.

The desire to return home is not sufficient; a vigorous economy must be recovered. Germany (after a nuclear plant was decommissioned?) prepared for the next industries by establishing solar power facilities without carrying out thorough decontamination activities that cost too much.

Can the tsunami-hit areas not take a similar approach? With FIT (feed-in tariffs) also introduced in Japan, can the introduction of such a system at the regional level contribute to the building of the relevant facilities for the local people? Another approach that can be considered is to establish facilities for research on renewable energy technologies along with those for training of the required human resources in order to attract young people, an approach that is employed by Germany when developing a future plan. This can contribute to job security as well.

- These are nice ideas. However, we should examine the issues methodically by making a distinction between radiation problems and other related problems.

We need to remember that FAIRDO was first designed to deal with radiation problems. We are now agreeing that we should treat radiation problems in a wider context. Accordingly, we are talking about creation in the affected areas of new industries such as renewable energy generation for local regeneration.

So, from which community or municipality will FAIRDO start to tackle? Will only areas with an established concept of self-governance such as Oguni be dealt with? This may not be a bad idea. (Mr. Takeuchi's report yesterday mentioned a reconstruction plan incorporating the concept of commons.) Does the concept of commons include processes such as decision-making and execution based on public discussions? If people in Oguni would start investigating current situations on their own and thinking about ways to prepare for the future and studying several options to determine their future vision, and any idea that would be in conflict with current systems is hammered out as a result of these activities, how will the public administration react to it? It may not be accepted as it is, but it will surely have some impact on the government.

It appears to be wise to concentrate more on radiation problems first, and then go to the next step and discuss the vision for local regeneration.

- Germany was also engaged in decontamination using a substantial budget before the build-up of the solar power facilities.
- I will give an additional explanation about the situation in Namie. The plan drawn up by Namie through consultations with the local residents aims to encourage the evacuees to return to their homes by decontaminating areas with low radiation levels on a priority basis. However, officials from the Ministry of the Environment concerned said that they

were at a loss as to how to cope with the problem because they were strongly requested by the vice mayor of the town that “the radiation levels in the entire town should be reduced to 1 mSv or less before getting the evacuated residents to return home”. Local residents have, on the other hand, taken the situation more calmly and realistically since the release of the “map of the accumulated radiation dose” (December, 18, 2011), while leaving a wide gap between the town executives and the local residents. How to fill this gap is another challenge to be addressed.

The concept of commons proposed by Mr. Takeuchi in his presentation is based on the traditional concept of common land, etc., which was existing for long period of time in Japan. In addition, fisherpersons in Kesenuma, for example, are practicing traditional idea of enriching the sea by taking care of the nearby mountains and forests.

- As far as possible we must present the activities of FAIRDO to areas suffering from pollution from radioactive materials and simultaneously gather related information from them. For this purpose, mapping of the approaches to dealing with radioactive materials in the contaminated areas (monitoring, division of areas such as those for evacuation and those for decontamination, decontamination plans and their implementation status, reconstruction plans for local regeneration, the current status of information sharing and opinion exchanges about the above-mentioned matters among the national, prefectural and municipal governments and local communities, etc.) in some form or other is effective for all stakeholders.

- When considering how to deal with radiation, it is vital to discuss a reconstruction plan going forward as well as the future of local communities. Accordingly, whether the stakeholders are able to reach agreement on certain common targets and the processes towards their achievement is closely related to what kind of approaches to take in dealing with radioactive materials, including the imminent decontamination work. In other words, I believe that the linkage between a decontamination plan of the local government and a future vision of local communities created through a reconstruction plan should be treated as governance issues of decision making and consensus building.

2. Communications

- To provide a participatory risk dialogue (covering a wide range of risks not limited to decontamination).
- The explanatory meetings held as many as 200 times do not appear to have been reflected in the decontamination operations. I do not intend to criticize, but you have failed to

establish a platform where everybody can express his/her views, expectations, dissatisfaction, etc. No platform has been provided in which any municipalities can get involved. Furthermore, there are a variety of forms of involvement by municipal governments, as each has a different view and capacity level.

- It was reported that 200 explanatory meetings were held. However, they were designed as one-way communication events. Nothing has changed even after the 200 meetings. They have made absolutely no effort to listen to what people are thinking.

→ What shall we do to transform a one-way communication meeting into a dialogue meeting? How do we create examples of such a meeting? Is it possible for Date city, for instance, to hold such a meeting? How about Motomiya city, Iitate village, or Namie town?

We need to make a proposal to both the local government and local residents on how to hold a dialogue meeting. In doing so, what kind of information to be commonly shared is very important. It may be necessary in some cases to break through the government's traditional information management methods. (Are there any regulations on the use by municipal governments of information managed by the national or prefectural government?)

→ It is imperative to develop a decontamination plan while linking it to the concept of the future. In order to stimulate people's passion for the regeneration of local communities, this operation is vital.

Accordingly, case examples where such efforts towards future reconstruction are being made (which, although depending on agenda of reconstruction plans, include industrial promotion, commitment to new renewable energy, etc.) will be studied from this point onward, with the examples of Minamisoma-shi, Kawauchi-mura, etc.

→ Before making a proposal as scientists, we should place the emphasis on identifying some of the bases in the life of local societies on which a new community will be formed and combining them to enable them to collaborate as the engine driving local regeneration. There are many cases in Japan where ideas related to the commons have been put into practice. Lots of energy is being funneled into efforts to combine these ideas. In Namietown, we will be as attentive to people's ideas as possible. This approach should be considered as leading to community capacity building.

3. Capacity Building

- What do you think about local community capacity building? For example, local people make an assessment using models on their own supported by experts; and prepare a plan for the future, for instance, what they are going to cultivate on which land, on their own. Is it possible (in Japan) to help people with this type of decision making?
- Capacity building on a systematic basis is not popular; key persons are required.
- Japan does not attach importance to the consensus-building process. The stance of the government is that we, the scientists, should come up with great ideas and plans and impose them on the public. I hope the recent crisis along with the development process of decontamination plans will become valuable lessons for the future.

→ The challenges for the communication of risks seen in the previous section are at the same time regarded as challenges for local community capacity building. From this perspective, they can be positioned as a governance issue. Capacity building depends on how earnestly the public administration addresses the issue. As there are a few cases in Japan where governments have been endeavoring to tackle this issue, comparison with these cases should be made (Iitate-mura, for instance, has formulated its comprehensive plan over the past 20 years setting much store on the development of plans by administrative districts). The recent action research needs to highlight such examples of good practice as these, and in some cases we could develop good practices as a part of our research activities (we are highly likely to be requested to do so by some local communities). In doing so, I think it is important to cooperate with the relevant governments.

4. Decontamination plans

- When considering these difficult operations (monitoring, decontamination, radiation protection and reconstruction), what kind of conditions should comprise a decontamination plan for the local communities and people? What does it mean that the plan has been prepared for local people? For example, if Date city's plan encourages residents to move to another place if their house is located in an area with a contamination level of 3.2 $\mu\text{Sv/h}$, local residents (who have been given notice to this effect) would have no option but to move. Therefore, it is desirable that some options including decontamination and other measures should be presented to them.

I was surprised at the fact that they were talking about the decontamination plan and the reconstruction plan as two completely different plans in Namie town, a situation derived from the government's bureaucratic compartmentalized public administration seen

everywhere as being normal. Under these complicated circumstances, they need to consider other approaches available.

* A substantial difference has arisen in the role of the local government and the attitude of local communities between regions where decontamination is being carried out under the direct control of the national government and those where decontamination is being implemented in accordance with a decontamination plan developed by the respective local governments. The government of Namie town strongly requests that the national government responsible for decontamination there should decontaminate the town to the fullest extent, while local communities, taking reconstruction into account, adopt a more realistic approach: they are striving to pave the way for reconstruction by identifying areas with low radiation levels at the moment, choosing from among these some areas as candidate reconstruction bases and implementing intensive decontamination operations for the selected areas. Community moves such as these have gradually changed the municipal government's attitude towards decontamination (The Namie town Reconstruction Plan Review Committee and the Namie Reconstruction School are simultaneously studying reconstruction; the fact that the same people participate in each of these groups as members has had a favorable impact on the municipal government's attitude).

- How to guide communities toward their decision making, how to accept their decisions and in what ways municipal governments should respect them – no consideration has thus far been given to these matters. I believe we must deal with these matters for the time being. How should we coordinate between Date city and Oguni? FAIRDO first needs to make a proposal on the ideal relationship between them.

- Is it not interesting to mediate talks between people from organizations in Oguni and those from other areas?

What are local residents thinking and planning to do on their own? – it is important for us to understand this and convey it to the Ministry of the Environment, the Ministry of Education, Culture, Sports, Science and Technology, and the prefectural and municipal governments.

- I agree with the idea that local governments require special programs.

At the same time, how about scientists (engineers) performing a simulation to check how long it will take for the radiation levels to reduce to 1 mSv/year. Response measures need to be changed depending on how many years it will take to achieve this target.

→ The Namie town Reconstruction Plan Review Committee is taking the following steps: to calmly understand the distribution of the radiation dose, while checking the map of the accumulated radiation dose as information commonly shared by the members; and to

examine methods for intensive decontamination while discussing roadmaps and visions for reconstruction that start from areas with low radiation levels. Furthermore, it has organized a resident NPO for the examination of these steps and the development of a reconstruction plan on its own to develop it into a tool for negotiations with the municipal government.

- A substantial difference has arisen in the role of the local government and the attitudes of local communities between regions where decontamination is being carried out under the direct control of the national government and those where decontamination is being implemented in accordance with a decontamination plan developed by the respective local governments.

The government of Namie town strongly requests that the national government responsible for decontamination there should decontaminate the town to the fullest extent, while local communities, taking reconstruction into account, adopt a more realistic approach: they are striving to pave the way for reconstruction by identifying areas with low radiation levels at the moment, choosing from among these some areas as candidate reconstruction bases and implementing intensive decontamination operations for the selected areas. Community moves such as these have gradually changed the municipal government's attitude toward decontamination (The Namie town Reconstruction Plan Review Committee and the Namie Reconstruction School are simultaneously studying reconstruction; the fact that the same people participate in each of these groups as members has had a favorable impact on the municipal government's attitude).

- An official of Date city in charge of the formulation of a decontamination plan has pointed out that "although decontamination will never worsen the current situation, we are unable to obtain the consent of the residents; they will not even accept a rational explanation". However, it is necessary to thoroughly investigate the causes of the adversarial relationship between the public administration and the local communities. For example, people from the Oguni district said that the application of uniform decontamination criterion (which is linked to the compensation criterion) has caused some adversary relationship among the residents of Oguni district as well. The criterion (radiation dose of 3.2 $\mu\text{Sv/h}$) is a threshold determining "whether the place should be decontaminated or not" or "whether the resident should be compensated or not". Pollution levels must be able to be treated in a continuous manner, based on which appropriate decontamination methods as well as flexible compensation programs should

be possible. In doing so, a platform that enables the public administration and local communities to discuss these issues as stakeholders is required. The establishment of an arena where an improvement in these issues is explored should realize participatory governance. What support will the national and prefectural governments be able to offer for this?

- In the Oguni district, where local communities have been carrying out monitoring and decontamination on their own, temporary storage sites for radioactive waste have been selected without any complications. Considering that other municipalities are having a hard time doing this, it is necessary for the administrative institutions of municipal government to make a relative assessment of the problem.
- Decontamination plans not related to evacuee support or future reconstruction plans appear to have become a major obstacle. One of fundamental governance-related tasks for the government is to improve the legal systems with a view to facilitating consensus building by organically combining decontamination and reconstruction plans applied to the devastated areas. For example, the “Chernobyl law” (1991; Russia) designates areas where the amount of contamination is 1 mSv/year or more as “areas concerned about the right of relocation” and stipulates that the state shall provide both evacuees and residents with medical services, food supplies, jobs, etc., including allowances in kind as compensation. This framework has enabled international standards to be developed and put into practice for the treatment of evacuated people and disaster victims as set forth in “Guiding Principles on Internal Displacement” (1998) and “IASC Operational Guidelines on the Protection of Persons in Situations of Natural Disasters” (2006). We may propose that Japan take measures that are in compliance with these international standards (Reference: Susumu Tsukui “Major Disasters and the Law”, Iwanami Shinsho (2012); “Report on the Chernobyl nuclear power plant disaster, etc., by an investigative group of members of the House of Representatives” (December 2011); etc.).

5. Networks

- I have written a report on the EURANOS framework. Which measures contained in it shall we adopt? What shall we do to enable local residents in Fukushima to implement the measures?
- I think we must create a decent website like those of NERIS and EURANOS to disseminate information worldwide.
- It is also necessary to increase connections with ETHOS-CORE. Attending this type of

seminar, visiting people, and talking more with different types of people – we would like to do these by next summer. Let us call in more people with expertise.

Japanese people said that our comments were useful. We talked about our 20 years of experience in 30 or, in some cases, three minutes. If we are able to increase opportunities (for us and Japanese people to interact) and enable what we have achieved to be understood in more detail, these activities must become far more productive.

Why do you not get more people from Belarus involved? How about inviting them to Fukushima and talking with them?

- It is effective to create a FAIRDO website. This will enable us to share information with all stakeholders in the contaminated areas with the aim of holding dialogue meetings with them and deepen our cooperation with EURANOS, NERIS, ETHOS-CORE, etc. I suggest that we position the website as one of FAIRDO's concrete outputs.

6. Relationships with the national, prefectural, municipal governments and local communities

- We should make a more aggressive effort to establish a system for consultation, especially for talks between the public administration and local communities and create opportunities for dialogue and discussions.
- How about compiling a map of the reconstruction and decontamination status showing the relationship between decontamination and reconstruction plans and researchers and experts?

- Is it possible for us to set the stage for exhaustive talks with the Fukushima Office for Environmental Reclamation and Fukushima Prefecture's Decontamination Measures Division? Although we will secure contact with all relevant municipalities, our relations with them will be handled separately depending on individual themes applied to them while endeavoring to share information, as our research centers on case studies.

7. How to summarize the recent field survey

- What have the Japanese participants gained? It can be summarized in one sheet of paper. Even if it is not for publication, it may be of use in the future.
- I took note of the discussions we have had so far. However, I would like you to submit a two to three-page summary of your impressions from the field survey and the discussions. We are planning to compile your summaries as the proceedings of the conference and report them to the relevant municipalities with an explanation by Professor Suzuki. Moreover, we

intend to publish another report covering a wider spectrum of opinions, perhaps including those of Dr. Toepfer and Professor Hamanaka.

- Significance of attendance by European members—A new concept has been conveyed to people in Fukushima. The majority of people in Fukushima have just voiced their request for immediate decontamination. However, your opinion that we need to take a long-term view, i.e. to think about our future and the decontamination work at hand at the same time (by linking them together), must have opened their eyes.

We have to apologize that we have named this research project FAIRDO because we sought effective decontamination operations when we decided on the title. We have to admit that we ourselves were preoccupied with the urgent need to tackle the decontamination work. We, the Japanese members, are now changing the way we think.

- I was surprised at the fact that, despite being Japanese, I did not know much about the current situation in Japan. I have, for example, realized how vaguely Japanese laws have been written with the intention of obscuring where the responsibility resides and how deep the divisions are between municipal governments and the local communities.
- We are considering that FAIRDO can make a contribution to the guidelines or guiding principles being developed by the Ministry of the Environment. We hope that your opinions along with the case studies we have carried out so far will be helpful in making such a contribution.

→ After some time has passed from the start of the joint project and its members have been able to share certain information on the current status of the affected areas, it is important for them to make a brief summary of their impressions as well as the matters they can propose at the moment and make it available to the public. In the first phase of such an attempt, this report provides an overview of information obtained from the field survey we conducted and the exchanges of opinion implemented there together with our views on and challenges for the execution of the action research. In the second phase we are planning to substantiate the information we recently obtained and make proposals based on the substantiated information and any other information and data that we will have independently analyzed.

→ It is also essential for us to establish in the course of these operations two-way relationships between the FAIRDO project and all the stakeholders involved in the contaminated areas.

→ Furthermore, the worldwide dissemination of information on these efforts may enable us

to exchange various information with other parts of the world. We need to create the FAIRDO website in the near future.

- It has repeatedly been pointed out that Japan is facing the daunting task of improving relationships between the public administration and local communities as well as those among the national, prefectural and municipal governments and identifying the roles to be played by researchers and experts in promoting these relationships. We do not believe Japan will be able to take a significant step towards regeneration from the recent catastrophic disaster without overcoming these problems.

- We are required to immediately examine the decontamination guidelines and make some proposals based on the results of the recent survey.

Findings from FAIRDO Experts

Prof. Yayoi Isono, Tokyo Keizai University

I was able to obtain a lot of knowledge and accumulate valuable experience and information from the two sets of symposiums and on-site inspections conducted recently in Fukushima Prefecture. They especially made me realize that, after one and a half years since the nuclear accident, steps towards reconstruction have begun to be taken one step at a time. At the same time, I have learned that the issue is becoming more complicated and serious. Focusing on governance, I will here take a brief look at the challenges for reconstruction from the following viewpoints:

1. Relationship between evacuation and reconstruction;
2. Decontamination of the land, buildings, etc., that were exposed to radiation;
3. The national, prefectural and municipal governments and experts;
4. Information-sharing; and
5. Participatory governance.

1. Relationship between evacuation and reconstruction

It has been clearly pointed out that the purpose of reconstruction, including decontamination, is to secure conditions that will enable the evacuated residents to return to their communities and get their peaceful life back. Confirmed also by the recent symposiums, the importance of this cannot be stressed enough. On the other hand, even among residents of the municipalities outside the evacuation zone, not a few people still remain evacuated from their respective municipalities. It was mentioned in the recent symposiums that quite a few of these people were found to be unwilling to return home in the foreseeable (I think we can say foreseeable) future. The municipalities are also elaborating on reconstruction measures taking even these evacuees into account as their residents.

When I saw the current decontamination status during the recent on-site inspections, I felt it was easy to imagine that even if the decontamination of public land, houses and residential areas is completed in advance, this alone will not be enough to tempt all evacuated residents into returning to their homes.

Accordingly, when thinking about the relationship between reconstruction and decontamination, we should not only endeavor to increase the number of people returning to their communities, but also avoid actions that disrupt the decision of some evacuees across the nation to continue to live in other areas even after the completion of decontamination. More specifically, if the reconstruction of local communities ends up with the termination of compensation for evacuees choosing a new life in other areas, it could adversely affect the policy of municipalities to regard even evacuees who have decided to live in other areas over the long term as their “residents.” Furthermore, it may accelerate depopulation and result in the destruction of local communities. I

was afraid that decontamination aimed at reconstruction would not necessarily contribute to the genuine rehabilitation of local communities.

In addition, considering that even these people cherish their own hometown to a great extent, I believe, when developing a decontamination and reconstruction plan, it should be fully borne in mind that one of the keys to decontamination and reconstruction is to secure a heart and soul for them; in other words, it is necessary to develop a plan that reflects the opinions of evacuees who have decided to live away from their hometown.

2. Decontamination of the land, buildings, etc., that were exposed to radiation

(1) The symposiums reported a wide range of problems pertaining to the decontamination plan. We learned that in the Oguni district of Date City people were engaged in voluntary decontamination and saw a temporary storage site for waste from the decontamination. In Minamisoma, we looked around a decontamination site after receiving reports on the municipal government's decontamination plan and implementation.

Firstly, the difficulty in reaching agreement on the establishment of temporary storage sites was highlighted again. I also could not help doubting whether the target and purpose of decontamination had been agreed upon between competent authorities and local residents.

Secondly, I cannot help but think that, with only houses being the subject of decontamination, current decontamination work focusing only on residential areas and public land is leaving the job unfinished because, except for built-up areas, many areas accommodate houses surrounded by agricultural and forest land. In particular, decontamination of highly-polluted areas first means that hilly and mountainous areas are to be decontaminated on a priority basis. Taking it into consideration that residential premises are surrounded by agricultural and forest land, I believe the authorities need to discuss exhaustively what effective decontamination is and review the decontamination plans with the local residents.

Thirdly, the sharing of pollution information appeared to be entrusted to the national government's center at present. It is necessary for the national government to prepare a detailed framework for subsidies that will help local governments proactively lend radiation measuring equipment to local residents who will then gather the information on contamination by themselves. It is of paramount importance to establish a small community-based network for the sharing of the information collected and obtained by local residents and organizations, local governments and the national government. As seen in the case of the Oguni district, it is required to establish a mechanism of information sharing while being fully aware of the role of groups of residents in gathering information.

3. The national, prefectural and municipal governments and experts

Firstly, financial assistance from the national government for the development and implementation of a decontamination plan is required to be extended in accordance with the national government's

guidelines, which can be interpreted as giving technical assistance through financial measures. However, the guidelines cannot be said to be fully addressing individual needs. The hearing also revealed the need for coordination among the national, local and municipal government in handling individual cases, and it was also demonstrated that individual coordination had been actually practiced.

The issue here is whether a variety of stakeholders are involved in the process of such individual coordination. If only one stakeholder, i.e., the Ministry of the Environment, understand the process and results of the coordination, decontamination is unlikely to be implemented smoothly and effectively. With regard to this issue, we need to examine from this point onward in what way the real stakeholders, the local residents, are involved and whether the related information is shared with them.

Secondly, the national government has dispatched experts as part of its technical assistance. This is considered to be an important system. Nevertheless, if municipal governments employ or have employed experts on their own, it is imperative for the national government to find how the relationship between these experts and technical assistance is working.

Thirdly, the national government has its own problems. Despite the Reconstruction Agency having been created in the form of a centralized headquarters, decontamination, for instance, is still taken care of by both the Ministry of Agriculture, Forestry and Fisheries in charge of woodland and farmland and the Ministry of the Environment covering residential areas. This inefficient structure has caused the problem mentioned in section 2 above. Meanwhile, municipal governments are by nature comprehensive administrative bodies centering on a mayor. It is considered that a future task will be to discuss whether, making use of this nature, municipal governments are able to collaborate with each other and develop into a comprehensive administrative force that can act as a counterbalance to the national government's compartmentalized public administration.

4. Information-sharing

As mentioned in sections 1 and 2, the establishment of a regional-level system that will enable local stakeholders to share and use information that each of them has obtained in their communities needs to be studied. As illustrated at workshop programs and the experience in Belarus presented at the symposium, it is critically important to create an environment that helps individual residents gather pollution information and understand it without effort.

In addition, although it was not referred to in the recent mission, a wide array of organizations and researchers have conducted a range of investigations including ones on decontamination. The cultivation tests carried out in the Oguni district are among these. Based on the results of these investigations, they made proposals in their respective areas and these areas have in turn been putting the proposals into action on a trial basis. For the purpose of information-sharing for governance, it is necessary for each area to consolidate the information on these investigations, proposals, actions, etc., into a single database.

5. Participatory governance engaging residents

The recent workshop stressed the necessity of participatory governance engaging residents. We have experienced few situations that required individual residents to make their own decisions to a greater extent than in the current situation. It is true that residents are now required to decide on what kind of communities they want to reconstruct. If reconstruction fails to reflect the needs of the residents, not a few of them are expected to leave their communities at some time in the future to live somewhere else, thus pushing the municipalities to the brink of collapse. Accordingly, the most important key to the solution of this issue is active resident and stakeholder participation in governance.

Involvement of the residents entails some challenges. One is to consider how to reflect the needs of the residents who are living away from their hometown and determined not to return soon. Another challenge is to assign a proper role to resident groups.

Lastly, it is not possible to discuss governance issues without taking compensation issues into account. I have previously mentioned the issue of compensation for local residents. Meanwhile, the size of compensation payouts from the Tokyo Electric Power Company to the municipalities will affect the directions that their policies will take. We need to examine from now on whether discussions on governance issues are possible without considering this point.

Findings from FAIRDO Experts

Prof. Takehiko Murayama, Professor, Tokyo

1. Governance-related issues

1) Decontamination procedures and stakeholder involvement

It is inevitable that each local government will implement its decontamination operations under the relevant legal systems centering on the Act on Special Measures. On the other hand, there is a strong tendency that these systems are not corresponding to the complex and varied conditions of individual decontamination sites. Taking their own stand, the Fukushima Office of the Ministry of the Environment, the Japan Atomic Energy Agency (JAEA), the government and the Regional Development Bureaus of Fukushima Prefecture, local governments, etc., have adopted only measures that are in compliance with the legal guidelines. Consequently, a range of stakeholders such as local government officials and decontamination operators have voiced their opinions about the current systems under which it takes a considerable amount of time to reflect the conditions of individual decontamination sites in the decontamination operations and no new decontamination measures are employed with ease. It is therefore desirable that the systems should be improved so that cutting-edge technologies can be applied depending on the circumstances of individual sites. It is suggested that we examine whether it is feasible to introduce a program to put greater emphasis on performance, like the Top Runner Program for energy efficiency (a system of benchmarking against best-in-its-class performance).

2) Provision of information on radiation levels

A wide array of data and information are being gathered and compiled. The prefectural government of Fukushima is also disseminating a variety of information. Nevertheless, it appears that there is something more that can be done to raise the level of accessibility and quality. I think that an information source that, based on the idea of plural monitoring, collectively provides information published by diverse actors in various forms would be helpful.

2. Simulation of pollution levels and support for the development of plans

It is desirable that when the applicability of the system developed in Germany is confirmed to a certain extent, we should establish such a system in a specific area and check the accuracy of the simulation taking the appropriateness of the scale of the mesh into consideration. With decontamination plans and operations having started one after another, I believe it is necessary to

reconfirm the significance of the use of such a system.

Meanwhile, as was mentioned in the workshop that a questionnaire survey of the local residents found that they regarded the treatment of mountain forests as a matter that needed to be considered, some measures should be taken to prevent radioactive materials from moving from mountain forests to farmland or urban districts.

3. Communications

1) Experience in Belarus

The report by Mr. Gilles and individual discussions gave me a better understanding of what they have done in Belarus. In particular, I suppose it is one of the achievements of the recent workshop that we were able to share information on the circumstances surrounding, the participants in, and the challenges with regard to their initial approaches to the accident. They said that the records kept in French of each meeting concerning the response measures taken in Belarus were still available. I think it worthwhile to review the contents of the records since they may help us with our study of future communications in Fukushima Prefecture.

In addition, the idea of a “Practical Rehabilitation Culture” seems to indicate that it is important for us to consider not only decontamination, but also the overall livelihood of local residents with the aim of rebuilding the entire local society. If reconstruction from a nuclear disaster needs to incorporate cultural aspects, the current reconstruction efforts could be regarded as rather biased toward the science and technology aspects. On the other hand, it is true that the formulation of region-wide reconstruction plans has been completed and they have embarked on decontamination work at their respective sites. It may be necessary to discuss if there could be any measures that can make use of the experience in Europe, while coordinating them with those that have already started.

2) Comparison with other environmental pollution cases

A comparative examination of the recent radiation contamination situation with other environmental pollution cases proposed by Prof. Miranda is useful to a certain extent for a relative understanding of the approaches currently adopted in Fukushima. While access to information on overseas cases such as the Bhopal, Love Canal and Seveso incidents is limited, comparison with domestic cases such as Minamata disease and the dioxin problem is thought to be important when considering the issue of communications. With regard to Minamata disease, it may be difficult to collect related materials because it dates back to a long time ago. However, I would like to discuss with members of the Environmental Pollution Research Committee, which has long dealt with the

problem and of which I am also a member, as to whether to examine the case.

Meanwhile, the dioxin and asbestos problems have arisen in relatively recent years. Since I have already investigated some aspects of these problems from a communication point of view, I am considering studying from this point onward how to proceed with a comparison between these problems and the issues of radiological risks and decontamination.

3) Handling of social media

It is extremely difficult to capture a full picture of the role of social media, an issue brought up in the workshop, since access to information is limited. However, it may be significant if we systematically look into the matter in one way or another based on the information currently available. It is desirable that after sorting out surveys and research that has already been conducted on community websites, we should discuss to what extent information exchanged online, among twitter users or through websites, can be organized.

4. Overview: Role played by FAIRDO

One issue raised in the workshop is the role played by the FAIRDO project in the resolution of decontamination-related problems. Each area going through decontamination seems to be having a hard time in deciding its own future due to: stakeholders such as the local government, local residents and business operators having already begun decontamination work; considerable restrictions imposed upon this by various systems, chiefly the Act on Special Measures; uncertainty about the information on contamination levels and the degree of radiological risk; possible replacement of decontamination technologies; changes in the attitude of stakeholders centering on the local residents; etc. On the other hand, some observers have pointed out that plans, approaches, application examples of various technologies, etc., in one area are not well known in other areas, and thus the experience of each of the areas has been wasted.

Under these circumstances, the FAIRDO project could play some meaningful role in linking the moves that each area is carrying out independently. More specifically, the project may be able to:

- Understand social organizations and regional movements from a monitoring perspective;
- Provide a platform that enables a diverse array of stakeholders to share information (exchange experiences); and
- Make proposals on some measures drawing on the experience in Europe on the premise that differences between approaches in Japan and those in Europe are taken into account.

In addition, although an urgent task is to discuss the procedures for the establishment of facilities to dispose of the waste generated by the decontamination work, which is another issue brought up in the symposium, it cannot be said to be headed in the desired direction at present. We may also need to examine if there is anything we can do to contribute to bringing some changes to the current situation where scientific rationality takes precedence over everything else and to introduce a democratic perspective on it.

Findings from FAIRDO Experts

Prof. Kenji Namba, Professor, Fukushima University

Concern over radiation exposure

Radiation in food is measured in becquerels (Bq). It shows the amount of radiation taken in from eating. The radiation intake has an impact on the human body through internal radiation exposure. People have substantial psychological resistance to the intake of radioactive materials due to concern that it is more harmful than external exposure. Some appear to be thinking that we should never allow radioactive materials to get inside the body, no matter how small the amount. Internal exposure is represented in terms of the amount of radiation that the human body absorbs through the entire time that the radioactive materials stay in the body until they are removed naturally by it. Becquerels can be converted into sieverts (Sv), the unit used to measure the impact of external radiation exposure, using a conversion factor.

Concern about the use of the sandbox in kindergartens is thought to be another example of the cautious stance toward internal exposure. Ms. Hamajima, the principal of the Fukushima University-affiliated kindergarten, made inquiries on the measurement of radiation dose of the sand inside the sandbox of kindergarten as well as the changing of the sand. Children playing in a sandbox are exposed to radiation in the air, which may include radiation emitted by the sand. There are additional risks of radioactive materials adhering to their fingers and their inhaling dust or accidentally swallowing the sand. Although the actual extent of harm from these risks can also be converted into the amount of external radiation exposure, they seem to be regarded in people's mind as more hazardous than contactless external exposure.

Arguments about decontamination technologies

The decontamination guidelines of the Ministry of the Environment have not been revised. This makes it difficult for us to put into use in the actual decontamination work new technologies that have been demonstrated to be effective. This is a problem that Mr. Hanzawa from Date city has also identified. The ministry is reluctant to adopt new techniques presumably because it is concerned that: while decontamination has been completed for some places, the adoption of new techniques elsewhere that were unavailable at the time these places were decontaminated might cause dissatisfaction among people whose area has completed going through decontamination. In other

words, the ministry appears to be taking care to prevent a time lag from causing inequality. However, if the same technique is used and the amount of radiation is reduced to the same extent, the exposed dose in places that were decontaminated first will become lower than that of places where the decontamination is performed later, and consequently, when comparing residents who have continued to live in their homes since before the decontamination, those whose place was decontaminated first have an advantage over those living where decontamination has been put off until later. Some may consider that in order to mitigate any inequality derived from this time lag, some benefit should be given to the latter residents.

High-pressure washing described in the guidelines is a technology that only removes radioactive contaminants adhering to the surface of the objects being cleaned. The removed radioactive contaminants remain in the used water and are dispersed to other places without any controls. Some point this out and argue that the operation is “not decontamination but trans-contamination” and is thus reduced to nonsense. A basic requirement of decontamination is that radioactive contaminants should be removed from places where they must be removed and after having been reduced in volume, they shall be isolated so that the radiation released from them will not reach humans or be taken in by humans through the food chain. Of course, the length of time required for the decontamination and protection of the cleanup workers from exposure to radiation are key factors that need to be taken into account. I think there is room for further technological development as well as compromise in each of the points of removal, collection and volume reduction, as well as the isolation of radioactive waste, the overall costs and the protection of workers from radiation exposure.

Although they cannot be referred to as new decontamination technologies, the inspection of decontamination work in Minamisoma-shi has found that local operators are adopting two unique approaches: one is to put a cover over the spray nozzle of ordinary high-pressure washing equipment to prevent the workers from inhaling airborne droplets; and the other is to collect the waste water generated from high-pressure roof cleaning through the gutters. These two approaches can be said to be superior to the conventional methods in the sense that the former reduces the radiation exposure affecting the workers and the latter collects the contaminated waste water rather than dispersing it. The guidelines do not necessarily guide the process of decontamination to these directions. It is believed that the workers engaged in the actual decontamination work have been upgrading existing technologies in response to public opinion.

In talking about his own experience, Prof. Sato of Fukushima University has provided some insight into the confusion surrounding the development of decontamination techniques. He presented

some cases where an unscientific technique was proposed based on real experience, but misinterpretation of it through a wrong causal connection or an unfeasible decontamination method based on an idea not widely applicable was proposed by a researcher from a highly professional field. While many people are assumed to be basically engaged in the development of new technologies in good faith desiring to be of service to the restoration process, some may be motivated by desire to earn money by taking advantage of contributions to reconstruction efforts. I suppose it will often be required of local and evacuated residents for whom it is a prerequisite to have their places decontaminated for the reconstruction of their livelihoods to determine whether the technologies and systems offered will be really advantageous to them.

As expected, there is no end to discussions over the decontamination of woodlands. One of the concerns about decontamination is that “after the decontamination, radioactive materials will then be dispersed from the mountains”. Some argue, out of this concern, that the “decontamination of mountain forests is essential”. I think judgment as to whether the decontamination is effective should be made based on accumulated knowledge about the amount of radioactive materials expected to move from mountain forests through processes such as erosion and transfer by water and the refloating of contaminated materials. It is also necessary to consider the matter from the viewpoint of economic costs. It is desirable that decontamination presence-absence models should be analyzed using a sufficient knowledge-based simulation approach and then judgment convincing to local residents is desired to be made.

In order to develop decontamination models required for the simulation, parameters describing the attributes of the individual decontamination techniques are required. With the Japan Atomic Energy Agency and other organizations having already been engaged in decontamination verification tests, some parameters are considered to be available. The Japan Atomic Energy Agency released a 600-page report in June. Furthermore, aerial surveys using aircraft are useful in understanding the distribution of wide-range radiation dose rates. The results of an aerial survey conducted by the Ministry of Education, Culture, Sports, Science and Technology are available only at the request of a governmental agency.

Findings from FAIRDO Experts

Mr. Atsushi Watabe, Associate Researcher, Programme Management Office, Institute for Global Environmental Strategies

I have been able to learn through the recent tour of Fukushima and discussions held at the workshop, etc., about the complicated situation surrounding evacuation and restitution issues following the accident at the nuclear power plant, the current status of the decontamination work, challenges in conducting effective decontamination, etc. Below are my comments on the mission by subject.

- Measures and scope of the decontamination

It is to be desired that decontamination technologies and the appropriate scope of decontamination be determined based not only on whether they would reduce “the level of the air dose rate to 1mSv/y” or not, but also the following medium- to long-term strategies:

- An overall plan for radiation protection and health risk management (external and internal exposure and psychological security should also be taken into account); and
- Efforts to reconstruct local communities and putting people’s lives back together (decontamination should be considered as one of the tools to realize the future vision, i.e. which region he/she will live in and what job they will do to make a living in the future 10 or 20 years from now).

Unfortunately, the current scope of decontamination has been decided based on air dose rates without envisioning how people would be able to live there after the decontamination work is completed (or if it were not implemented). It lacks the perspective of reconstruction and putting people’s lives back together.

- Insufficient stakeholder participation

Instead of the national and prefectural governments determining the decontamination work, health risk management, subsequent reconstruction projects, etc., in accordance with uniform standards that have been set down, it is to be desired that such decisions be made through discussions participated in by a wide array of stakeholders ranging from local resident groups and occupational organizations to NGOs, schools, research institutes, etc.

- Decontamination, health risk management and reconstruction plans need to be formulated not only with the aim of lowering the air dose rates through decontamination, but also by paying due consideration to “in what way health risks will be reduced and how people will live in the region.” For this purpose, it is effective to create a future vision for the local

community based on the opinions and requests of a variety of stakeholders involved in the community.

However, most municipalities have focused on “how to make the local residents understand” the plans on the scope and methods of decontamination, temporary storage sites, etc. developed by the public administration. A system that enables the local residents to participate in the development of plans that incorporate various opinions of theirs has not yet been established.

- Information sharing problems

The knowledge and information required for the discussions and decisions on (and execution and assessment of) decontamination, health risk management, reconstruction, etc., cannot be said to have been made available to the public in a way that makes it easy for a diverse array of stakeholders including local residents to access and examine them.

In addition, it is considered a problem from the viewpoint of transparency that only the “scientific knowledge” provided by the public administration and experts (and often based on data calculated by them behind the local residents’ backs) has authority as the standard for judgment. It is desirable that there exists a framework under which the knowledge gathered from not only the public administration and experts but also from a wide range of sources can be commonly shared.

- “Scientifically correct” information and technical knowledge concerning the radiation dose rate, health risks, etc., provided by scientists and the public administration are not the only information required.
- Initiatives to conduct decontamination, control food and behavior, measure the effects of radiation exposure on the human body, etc., that have been taken chiefly by local residents and groups (with the support of experts) have been bearing fruit. It is desirable that this experience be widely shared.
- Similarly, any platform where it is possible to gather information obtained from various activities in the fisheries and agriculture industries, schools, etc., and examine and review it together with experts and make it available to the public is considered to be useful not only for decontamination, but also for reconstruction.

The issues below are ones that are not directly related to decontamination but have to do with the overall situation after the accident at the nuclear power plant.

- Distrust of experts

For the following reasons, distrust has been increasing on “decisions made and advice given

based on the expertise” of scientists:

- They had repeatedly stated that nuclear power was safe and no accident could possibly occur;
- There are divergent opinions among experts concerning air dose rates and food safety (although it is fundamentally natural and sound that experts express different opinions on the knowledge); and
- Prefectural and municipal governments have employed their respective advisors, while a number of independent researchers and research institutes have conducted their own research; however, there is variability and differences among their views, research results, etc., which have, in many cases, not been made available for use by the local residents.

The underlying problem lies in the way that scientists have maintained relationships with the non-academic community since before the accident at the nuclear power plant. Originally, when scientists argue that a certain scientific analysis is correct and appropriate, they must demonstrate at least the following three points: (1) the relevance of different knowledge, (2) what raised the question and what they did before reaching the conclusion, and (3) the limitations of the analysis and examination. However, when a scientist makes a statement to people outside the academic community, he/she often presents only the conclusion and acts as if it were true. As a result, when an event that defies the predictions of experts occurs or a decision made by experts is later found to be wrong, the expert error is not regarded as “an error that science naturally entails” but may bring about suspicion that “the pundits are lying and hiding something.”

- Disaster caused by the national policy

The national government together with Tokyo Electric Power Company (TEPCO) built up the nuclear power plants in Fukushima and failed to take adequate safety measures there. Accordingly, the local residents and municipalities desire that “the national government and TEPCO return the region to its original state on their own responsibility,” while the national government and TEPCO declare that “they will return it to its original state and compensate for all of the damage.” Under these circumstances, no one can venture to propose that “we should discuss the next best policy, since it may be difficult to completely restore it to its original condition.”

- One-sided view on responsibility

If it is understood that the person who caused the damage should take responsibility means that he/she shall restore everything to its original state (and those responsible for the damage, the national government and TEPCO, accept this), constructive proposals, discussions and

cooperation are difficult when facing an irrecoverable crisis like this. Responsibility (the attempt to respond to the counterparty's wishes, anxiety, pleasure, etc.), Obligation (the constraining power of a custom or contract that compels one to follow a particular course of action or create a particular condition) and Duty (a task or action that a person or organization of a particular position is bound to perform for moral or legal reasons) differ slightly in meaning. While only Duty (as well as Liability, indemnity liability and negligence liability) has been emphasized, the Response appears to have been played down in the recent event (at least, it does not appear to have been carried out systematically; it has instead been provided as the mere emotional labor of evacuation center staffs and individuals who take care of local residents).

The above are my personal comments, not an analysis based on clear evidence. I do not know whether these views will be accepted by the stakeholders or other researchers. Even if they are right, it is above and beyond my ability, at least at present, to suggest "what we should do or what we should have done." Nevertheless, I have put them down here as issues that I intend to continue to bear in mind and dig deeper into when conducting research for decontamination, reconstruction, and putting people's lives back together in Fukushima.

Findings from FAIRDO Experts

Mr. Yoshiaki Totoki, Policy Researcher, Sustainable Consumption and Production Group, IGES

1. Challenges and Negative Aspects

The decontamination process is breaking the community bonds

The decontamination process as envisioned by the central government is now taking the course of accelerating the work by delinking decontamination and compensation. Contrary to expectations, however, such delinking has not been successful. The resultant inability to cope with the relationship between compensation and decontamination has often undermined community bonds. Fairness is called for in the decontamination process.

A sense of unfairness has emerged, for example, in the Oguni district of Date City, Fukushima Prefecture, after a project to measure radiation levels for subsequent decontamination work was conducted. (Each household was notified by mail of the project before its implementation, as well as its results afterward.) In this project, radiation levels were measured at only two points for each house: in front of the entrance and in the garden. Based on the measurement data, it was decided that buildings and gardens with a measurement of 3.2 $\mu\text{Sv/h}$ or more will be subjected to decontamination (a little stricter standard was adopted for households with one or more children and/or pregnant women). These measurements were also linked to the amount of compensation. It was decided to pay 100,000 yen per capita per month in compensation to households with a measurement of 3.2 $\mu\text{Sv/h}$ or more until the decontamination work is completed. The amount of compensation was set at 80,000 yen for those with a lower value. To make matters worse, since the measurement was taken at only two points for each house, there were cases in which a house was found disqualified for decontamination while those on both sides of the house were decontaminated. Furthermore, there was a sense of unfairness within a community since the amount of compensation for households subject to decontamination diverged widely from those not subject to decontamination.

In the minds of local residents, decontamination and compensation are clearly interlinked and it is recognized that the central government and the Tokyo Electric Power Company should be responsible for the cost. They have yet to come to the understanding that decontamination work is preceding separately the issue of compensation. These factors seem to constitute the fundamental background to their sense of unfairness. The boundary issue poses another problem. Although it allows the authorities to make the decision-making process prompt and smooth, whether it is

socially acceptable is another matter.

Distrust of the Authorities

We have observed strained relations between the central government, Fukushima Prefecture, municipalities, and administrative districts, and even within communities. The central government, as well as the prefecture and municipalities concerned, seems to be working hard, judging from what they were doing. Yet the central government is discontent with the prefecture, which in turn criticized the central government. Similar relations are seen between municipalities and the central government or the prefecture. Some municipalities are even negotiating directly with the central government, bypassing the prefecture. Fukushima Prefecture is torn between both the central government and the municipalities. The Act on Special Measures Concerning the Handling of Radioactive Pollution stipulates that the prefectures are responsible for decontamination work. A special fund for this purpose has been set up within the prefectures concerned. Yet it is the municipalities that are primarily carrying out the decontamination work. Local governments have a rather deep distrust of the decontamination guidelines. Although these guidelines must be updated to reflect the findings of model projects, the central government has yet to do so. This situation seems to be the basis of their distrust. As a result, requests from local governments that are not covered in the guidelines have to be handled through separate negotiations on a case-by-case basis, which is a time-consuming process.

It has been pointed out that there are gaps in understanding within the central government, or more precisely, the Ministry of the Environment (MOE). Such a gap exists, for example, between the MOE headquarters and its Fukushima office, which is responsible for resolving competing interests within the prefecture. For instance, officials at the Fukushima office showed their understanding regarding requests by local residents that a nearby temporary storage site for contaminated soil and debris that had been removed in the process of reconstruction and decontamination be covered with a plastic greenhouse. The locals made this request as a measure to block the sight of objects covered by black shield sheet, not as a measure against rain. In the separate negotiations that followed, officials at MOE headquarters could not understand the intention of the local people and turned down their request as an excessive measure, noting that the storage site was already protected by a shield sheet.

We have also observed distrust among citizens of their municipalities. The preceding surveys had given us the impression that Date City was one of the successful municipalities in terms of decontamination work because of their relatively prompt response. Our interview survey in the Oguni district showed, however, that citizens felt otherwise. Behind their discontent lay their view

that Date City had failed to provide enough information about the decontamination process. They told us that they had been informed of both the radiation measurement project and the measurement results by mail only. They said that city officials failed to explain the results directly to them.

Moreover, the false understanding that the area would be returned to its original condition as a result of the decontamination alone has been spreading among citizens. MOE's original plan aimed to halve the radiation levels within two years. MOE decided that the target was attainable due to two factors. One was, of course, the implementation of the decontamination work. The other was the relatively short half-life of cesium 134; it was estimated that the same amount of cesium 137 and cesium 134 had been released into the environment. However, a growing number of citizens seem to believe that the target would be completely attained with the decontamination work alone. Some people noted that the exaggerated video coverage by the media was partly to blame.

Furthermore, there was a growing divergence from MOE's original plan while the targets were changing. Under pressure from citizens, MOE changed the allowable level of additional exposure from 5 mSv a year to 1 mSv a year. This change in policy meant that more municipalities had to carry out decontamination work to meet the new standard, thus creating growing distrust of the central government who had changed its policy so easily.

Perfunctory communication and consensus building

The central government, the prefecture, and municipalities claim to have spent a lot of time on communication with the citizens by holding a number of briefing sessions to explain about decontamination. Yet the citizens seemed to be discontent with the process involving decontamination. In the wake of the nuclear accident, citizens were most likely appreciative of briefing sessions on radioactivity and radiation. These sessions may have been one-way communication, but they helped citizens to understand the scientific aspects of the accident. However, as the citizens have gained a certain level of knowledge, it is about time to conduct communication with them about the radiation risks and build a consensus on how to proceed with the decontamination. In this consensus-building process, one-way communication cannot produce conclusions that are convincing to the citizens. Forcing things through will only provoke antipathy. As the primary implementers of the decontamination work, the municipalities should seriously conduct a dialogue with the citizens. In fact, it was suggested that such a dialogue be established on how to proceed with the decontamination process in the wider context of a future vision of reconstruction.

Someone asked whether decontamination in the evacuation areas would motivate the evacuees to return home. The reactions to this question suggested that such decontamination would not provide a strong incentive for them to return, though it had positive aspects.

2. Protection from Radiation is Taking Root.

Local radiation monitoring by municipalities has failed to provide information that is sufficiently useful to local people, as it used a rather coarse grid of 1 km by 1 km. This prompted a community in the Oguni district in Date City to take their own measurements of airborne radiation levels and radioactive substances in the soil. This community launched an Association to Regain Clean Oguni, which conducted monitoring using a 100 m x 100 m grid and mapped the findings, helping the community to assess local radiation levels. In addition to airborne radiation, the association also measured radiation level of agricultural products and made the findings available to the public. The procurement of the measuring devices was financed largely by donations from the general public, rather than subsidies from the city. The concept of citizen-led protection from radiation is thus taking root. We felt that it was time to help replicate such initiatives elsewhere.

Although the heads of the prefecture and municipalities recognize the importance of monitoring radiation and measuring agricultural produce, they seem to care less about the practicability of such activities when they use such a coarse grid for monitoring or when the device for monitoring farm products is located far away from homes.

3. What European Experience Suggests and How the Cultural Background of Europe and North America Differs from Ours

It is clear that decontamination has limits when it comes to reducing radiation levels. In Belarus, which is not a rich country, decontamination work was carried out only for reasonably-selected areas and items under a limited budget. There was even a controversy as to whether roofs should be decontaminated or not. Still, decontamination work at least had a soothing effect on the public. Belarus established standards and basic rules, as Japan is doing now. What Belarus did is to shift the focus to radiation protection in order to reduce radiation exposure as a whole. In Fukushima Prefecture, progress is also being made to promote protection from radiation. There are a growing number of cases where the exposure to humans is being measured and food items are monitored. Though these activities are not considered to be part of the decontamination work, they represent quite an important development.

The role of communication is to place people within a common framework. In Japan, holding briefing sessions tends to become an end in itself. In such sessions, communication is often just a

formality, with information conveyed in one direction only. In Europe and North America, the debate approach has long been established. This is not the case in Japan, where the social background is different. The city planning process, for example, often does not fully reflect the views of the stakeholders. There is no established approach to make this possible in Japan. Decontamination cannot be delinked from reconstruction. The question is what the decontamination work should focus on to maximize its effectiveness in the wider context of the future vision of each municipality. It is important to build a consensus in ways that citizens find reasonable.

Findings from FAIRDO Experts

Mr. Muneyuki Nakata, Associate Researcher, Programme Management Office, Institute for Global Environmental Strategies

Mr. Kazuyuki Sakuma, Tokyo University of Agriculture and Technology

General Overview

Through my experience in the FAIRDO Mission in Fukushima and Yokohama, I have realized that a range of actors--the central and local governments, local communities, and experts--have been taking a variety of decontamination initiatives in Fukushima Prefecture. In particular, I have learned that many experts at Fukushima University have been working with local communities and governments and that people in the Oguni district have been engaged in voluntary activities in small community units.

Attention should be paid to how each local community should look after the decontamination work is completed. In other words, the decontamination design should take into account the desired form of the local community and economy after the evacuees return home and the land has been decontaminated. As discussed in the media and elsewhere, the young and the older generations have different ideas on a future vision of local communities after the reconstruction of disaster-stricken areas is completed. The reconstruction design should reflect the wishes of as many local residents as possible²⁸.

Although decontamination work is essential, it will be of less effective if the local community is undermined as a consequence. A wide range of stakeholders should be involved in the process of discussing future strategies for the local community while implementing decontamination work as a stepping stone to reconstruction. That is what I strongly feel about the decontamination process.

For this to happen, effective decontamination is indispensable as the first step; it is necessary to implement the decontamination by understanding the effect of decontamination and the financial and human resources, etc. required in advance.

The Role of Decision-Making Support Tools

²⁸ The Economist: <http://www.economist.com/node/21559932>

Visualizing the effects of decontamination using a model or other means can provide a useful tool for accurately assessing the financial, human and other resources required for the decontamination work as well as its effectiveness. Visualization of the decontamination effects is made possible by, for example, RODOS, a system developed in Europe. Such visualization is reported by the media to be useful²⁹; it is thus of great significance.

Meanwhile, the Japan Atomic Energy Agency (JAEA) and Fukushima Prefecture have conducted demonstration experiments of decontamination technologies. These experiments suggest that a prodigious amount of expenditures, time and human resources will be required to reduce radiation levels in all areas to one millisievert or less per year through the decontamination process.

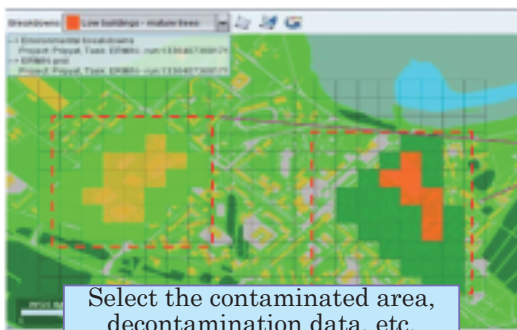
The legitimate wishes of local people that radioactive substances should all be removed by means of decontamination should be addressed to the extent possible. However, if the decontamination design is to take into account the future form of the local community, it is important beforehand to assess its effects as well as the cost, time, and manpower required and weigh them against the effects to ensure cost effectiveness.

Determination on whether this is an optimal option varies from community to community. The opinions of local residents should be given top priority after all.

Still, it is quite important to develop a system such as the European RODOS system that better reflects the realities in Japan and visualize the effect of decontamination. Such a system provides a useful tool for helping making the best of the limited budget and time available.

²⁹ The Asahi Shimbun article "Purometeusu no Wana: Josen no Nayami 10 [The Prometheus trap: problems with decontamination 10] on August 5, 2012.

[The ERMIN³⁰ model in use]



Select:

- The contaminated area
- The environment within the contaminated area
- The extent of decontamination

- Legends
- Red: without countermeasures
 - Blue: relocation for 2 years
 - Green: relocation for 1 year
 - Purple: relocation for 0.5 years



Calculation results

- * This model allows the users to estimate the radiation doses over time by selecting the contaminated area and entering the extent and means of decontamination.
- * The graph above shows experimental results for a fictitious area (not an estimate for any particular area) and the means of decontamination for demonstration purposes only.

In adapting the RODOS or other systems to the Japanese environment, differences in building materials, soil components, and other factors should be taken into account. For example, buildings are often made of stone in Europe, while they are often made of wood in Japan. Another major difference is that many Japanese houses have a tiled roof. Such modifications, built on European and Japanese expertise and experience, will contribute to smooth communications between the decontaminators and local residents.

³⁰ This model, a component of the RODOS system, is designed to visualize radiation levels in residential areas.

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Current Status and Issues of Decontamination in Fukushima (Initial Findings)

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Printed in Japan



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