

Social impacts induced by radiation risk in Fukushima

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ABSTRACT

On 11th March 2011 an earthquake of Magnitude 9.0 and subsequent tsunami triggered a serious nuclear accident at the Fukushima Daiichi nuclear power plant in Japan. Significant amounts of radiation were released to the surrounding environment. This paper reviews how radiation risk was communicated to the public by local government, how views on an appropriate emergency response differed between local and national government and how these different views led to increased public anxiety and a breakdown in trust. It also considers one particular consequence of this increased anxiety – adverse effects on the price of agricultural products. The paper concludes by considering the lessons to be learnt from this situation, which relate to understanding how the public perceive radiation risk, how expert opinions can influence perceptions and how risk should be communicated.

Key Words: nuclear accident, radiation risk, social impacts, risk communication

BACKGROUND AND PURPOSE

After an accident at a nuclear power plant, disseminating and communicating information on radiation risks is important at a local and national level. While more than 10 years have passed since Japanese experts began to discuss risk communication, the different views on radiation risk expressed following the Fukushima accident and the subsequent confusion shows there are still many subjects to be practically resolved. While some papers including Suzuki (2011) and Akamatsu (2011) consider risk communication issues following the accident, these are mainly focused on the attitudes of national government. Through literature survey as well as on-site interviews, this paper discusses information dissemination and risk communication at a local level in Fukushima Prefecture, where the most severe impacts have occurred.

LOCAL GOVERNMENT VIEWS ON RADIATION RISK

On March 30th 2011 the Prefectural government of Fukushima published Q & A covering the main issues raised at lecture meetings with medical experts on radiation risk (Fukushima Prefectural Government, 2011a). The Fukushima Prefecture concluded that “Current situation would not bring about the condition that cumulative dose of radiation excess 100 mSv, which is a criteria of health risk.” In another set of Q & A published on June 30th, they argued that increased cancer risk from a dose less than 100 mSv is not scientifically proven, while long-term cancer risk would increase with a dose of more than 100 mSv (Fukushima Prefectural Government, 2011b).

Although there are few cases in which municipal governments have expressed their views on radiation risk, Fukushima municipal government, whose administrative area is the capital city of

Fukushima Prefecture, published an article titled “Radiation Q & A” (Fukushima Municipal Government, 2011). That article includes a view on radiological health effects relating to pregnancy and childbirth, suggesting that people do not need to be anxious about health effect on unborn children, because it is very unlikely that radiation doses for embryos would exceed 100 mGy from radionuclides scattered by the Fukushima- Daiichi nuclear accident. The article notes that mGy is equivalent to mSv for Iodine 131 or Cesium 137, and refers to International Committee on Radiation Protection (ICRP) radiation dose criteria.

PROBLEMS OF INFORMATION EXCHANGE AND COMMUNICATION AMONG VARIOUS STAKEHOLDERS

1) The different views of national and local government

This was a particularly serious issue just after the Fukushima accident. While national government gradually expanded evacuation areas from the middle of March to May of 2011, these decisions were not communicated directly to local government. Some local authorities in both evacuation and non-evacuation areas had severe trouble explaining to people how this evacuation strategy could be reconciled with their own views on radiological risk (see previous section) and it became increasingly difficult to control peoples’ behavior. This situation continued for a couple of months after the accident, with local governments complaining about the attitude of national government. Japan experienced similar problems with a criticality accident at a nuclear fuel processing plant in 1999 (Murayama, 2006) – national and local government held different views and there was a time lag in communicating key decisions and advice.

2) Several factors that make communication on radiation risk difficult

Based on my experiences of risk communication activities related to chemical pollution from factories, automobiles and houses, the

characteristics of radiation risk associated with nuclear accidents make effective communication even more difficult - for people living close to the site of the accident(e.g. Fukushima) as well as less affected areas (e.g. Tokyo).

One difficulty relates to different views on radiological health risks – particularly the risks associated with low dose rates. It is a common hypothetical view that cancer risks associated with chemical pollutants increase proportionally with dose, although we often do not have sufficient data to evaluate the effects of low dose rates. In contrast, views on the health risks associated with low radiation doses differ considerably, although again we do not have enough data to properly evaluate such risks. ICRP suggests a linear relationship between external radiation dose and consequent health effects (like chemical pollutants), although the European Committee on Radiation Risk (ECRR) emphasizes internal exposure to low dose radiation poses a more severe risk. Other groups suggest the existence of a threshold below which there is no measurable risk. Some experts believe that low dose radiation may actually have positive health effects. Effective communication about the health risks associated with chemical pollutants is difficult enough, but with such a wide range of different views on the health effects of low radiation doses effective communication about radiological health risks is particularly difficult.

Another difficulty relates to the interaction between risk and crisis management following the nuclear accident. Just after the accident, several standards for radioactive substances in foods and drinking water and for radiation levels in school facilities were relaxed. It is not easy for the general public to understand such relaxations, even in a crisis situation. In my experience, environmental standards are quite effective tools for consensus making. However, relaxing standards as a response to an accident can lead to distrust in the judgment of national government. This situation emphasises that we should consider the relationship between risk

management and crisis management, rather than deal with them independently.

LOSS OF MUTUAL TRUST IN LOCAL AREAS

The difficulties of communicating radiation risk have definitely resulted in a loss of mutual trust among local people in Fukushima Prefecture. Even when dealing with chemical pollutants, where risks are relatively well understood by experts, people living around chemical factories have different views to factory workers, due to some uncertainties associated with monitoring and experimental data. The above-mentioned range of expert views on the risks associated with low doses of radiation can lead to a much greater range of views and differences of opinion among stakeholders.

Municipal and prefectural governments tend to suppress anxiety among local people about radiation risk and the need for evacuation. On the other hand, some people living in non-designated areas for evacuation move to other regions voluntarily. According to official figures from Fukushima Prefecture, 27 thousand people moved out of the prefecture during March and August of 2011, and the population fell below 2 million for the first time in 33 years. A September newspaper article (Asahi Newspaper, September 1st, 2011) supported the prefectural

government's figures and suggested that there continued to be an on-going decrease in population due to the nuclear accident.

A citizen's group: Fukushima Network for Saving Children from Radiation, was founded in May of 2011. The group conducts several activities including radiation monitoring, decontamination, knowledge dissemination, protection, evacuation and recreation. In addition, they claim the right of evacuation from areas where are not officially designated for evacuation, and have established an independent facility for measuring the level of radioactive substances in foods.

The wide range of views on radiation risk generates different attitudes and opinions among local governments and citizens in various layers of society - such as families, communities, companies and schools. While there appear to be no direct public health effects resulting from radiation, at least in the short term, it is clear that anxiety about radiation risks is having a significant social effect and is leading to the collapse of local communities in Fukushima Prefecture.

CHANGES IN THE PRICE OF AGRICULTURAL PRODUCTS

Anxiety about radiation risks appears to be having an adverse effect on the price of

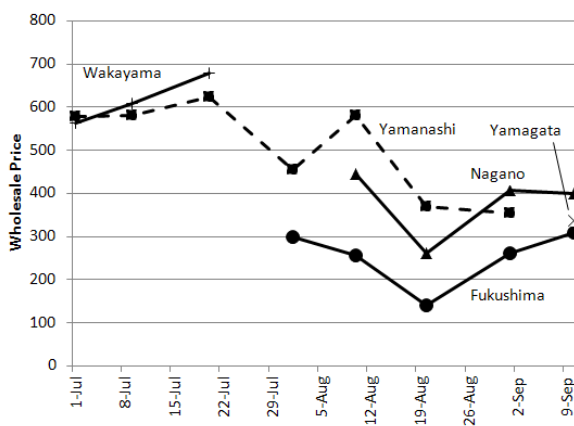


Fig.1 Change of Wholesale price of Peach

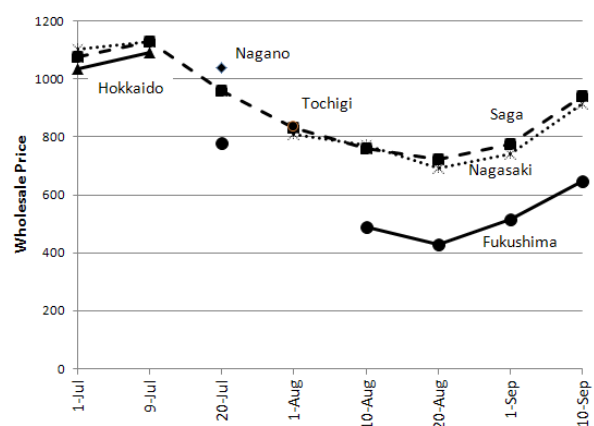


Fig.2 Change of Wholesale price of Asparagus

Source: calculated based on data from Japan Ministry of Agriculture, Forestry and Fishery

agricultural products from Fukushima prefecture. Figures 1 and 2 show the wholesale prices of Peaches and Asparagus in the main markets of Japan for the period following the nuclear accident. According to these figures, the price of peaches from Fukushima dropped 100 to 200 Yen, and that of asparagus dropped around 300 Yen compared to the same products from other regions. Prices for other agricultural products may have shown similar trends. As all products that were distributed in the marketplace met the standards on radioactive contamination for shipping at that time, this drop in prices may simply reflect people's anxiety about radiation risks.

ISSUES TO BE RESOLVED

1) Understanding how the general public perceives risk

It is important to understand how people perceive radiation risk. Psychological research shows that it is not just the risk of direct physical effects that influence people's perception. The US National Research Council (NRC) has listed several factors that affect the acceptance of various risks - see Table 1 (US NRC, 1989). Irrespective of health effects, personal controllability, reversibility, health effects on children and other factors may affect risk

perception and levels of concern or anxiety. According to this view, we should avoid comparing uncontrollable radiation risks with other, more controllable / voluntary risks associated with activities such as smoking and poor diet.

2) The reliable relationship between scientific experts and the general public

In my experience, people judge the acceptability of risks in at least three ways:

- By evaluating physical data and related information themselves
- By relying on expert opinion – particularly for complex subjects
- By relating risks to personal values and interests.

While the weight given to each of these may vary from person to person, most people rely on expert opinion to a greater or lesser extent. Therefore, it is important for effective risk communication to develop a good level of trust between scientific experts and the general public. To facilitate this, experts should recognise the difference between the risk of direct physical effects and the risk of psychological effects and increased anxiety. After the Fukushima accident, some experts on radiation risk argued that people should not feel anxious because of the relatively low doses of

Table 1 Qualitative factors affecting risk perception
Source: US NRC (1989)

Factor	Conditions Increasing Public Concern	Conditions Decreasing Public Concern
Controllability (personal)	Uncontrollable	Controllable
Voluntariness of exposure	Involuntary	Voluntary
Effects on children	Children specifically at risk	Children not specifically at risk
Effects on future generations	Risk to future generations	No risk to future generations
Reversibility	Effects irreversible	Effects reversible
Origin	Caused by human actions or failures	Caused by acts of nature or God

radiation likely to be received. However, experts should leave the issue of anxiety to the general public.

3) Finding practical ways to communicate risk

For relatively low doses of radiation, it is not helpful to talk in terms of either-or situations, e.g. safety vs danger. A more effective way to engage stakeholders is to provide objective information on the characteristics of the risks and the options available to avoid or minimise risk. A couple of years ago, I conducted stakeholder dialogues on the risks associated with chemical pollutants (Murayama et al, 2009). In that case, stakeholders were first asked what their concerns were and these were then organised and prioritised using the Jiro Kawakita - or KJ method. Related physical risks were then estimated using data from the Pollution Release and Transfer Register (PRTR) published by National government, and discussed with the stakeholders.

As mentioned above, it is more difficult to conduct effective dialogue on low dose radiation risks because of the wide range of expert views. It may, however, be an effective way to rebuild the relationship between the general public and local governments, and between other social groups, to make clear common and different viewpoints among stakeholders, and to discuss the range of options available for avoiding or minimising the risks, e.g. evacuation, decontamination and so on.

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