From Abroad

Fukushima - The Response was Worse than the Event

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In physical terms Fukushima was a middle-ranking industrial accident of the kind that happens perhaps eight or ten times each year round the world. The response, and especially the irrational prevention of people from returning to their homes in areas where there was hardly any contamination, turned it into a serious human tragedy. Authorities need to recognise that there is no such thing as 'erring on the side of caution' – any counter-measure that is not justified by the best scientific understanding of real risks will create human misery and should be steadfastly resisted.

1. Introduction – A Fairy Tale

One day a Japanese family was sitting at home taking tea. In their own homes several of their neighbours were doing the same thing. Suddenly there was a power surge in the area, caused by an earthquake damaging equipment. A 50W light bulb in the room came on all by itself. The same thing was happening in their neighbours' houses.

The local authorities responded quickly. They forced the families out of their rooms and moved them many miles away to strange rooms where no tea was served. Even though the authorities quickly managed to find a way of dimming the light bulbs so much that they could hardly see them glow any more, the rooms were locked and the families were told they could not go back. This lasted for three and a half years.

This made the family very unhappy – they had lost their homes, lost their friends, lost their jobs. They found themselves smoking more, drinking more, crying more. The authorities explained that they were just being careful over the family's health – 'erring on the side of caution' as they put it – as light could be dangerous, even causing skin cancer.

The families started to worry. Obviously the light coming from their bulbs must be very dangerous indeed to cause such a reaction from the authorities. How much harm had they come to before they were forced out of the rooms? Would it ever be safe to go back?

Then a scientist from the light bulb company came round to their new temporary homes. He explained to them that their fear was irrational. The light from the light bulbs was no different to the light from the sun. So they should stop worrying and wait patiently to be allowed to go back onto their own rooms to finish their (by now rather cold) tea.

Wait a minute, thought the families. If the light from the bulb is no different to the light from the sun then why are we still allowed to go out in the sun? In fact, when we think about it, we know there are areas of Japan which are far sunnier than our home town, where people get much more light on their faces than we get even when we include the light from the 50W bulb. Why aren't those people removed to a less sunny area of the country? But by now the scientist had gone to tell another set of families that they were ignorant and irrational for being scared of a 50W light bulb.

So the families didn't know what to make of it. Perhaps the authorities were lying about the amount of light coming from the bulbs – maybe it was much much more than 50W? Or perhaps the authorities had gone mad or had an evil plan to cause the families so much misery over something that was not worth worrying about. Or, most likely, artificial light is more dangerous than natural light and the scientist was either badly informed or making it up. They couldn't think of any other explanation for the misery they had suffered over the previous three and a half years.

One thing was for sure – whatever the truth, these authorities could not be trusted. And this scared the family far more than the 50W light bulb had done.

Just a fairy tale. Yet in effect this is what has happened in Japan after Fukushima. Ionising radiation can be looked at as a rather less dangerous version of sunlight. We know that if we spend too long in sunlight without proper protection it can cause cancer – typically some 1500 people die in Japan each year from skin cancer. However, we do not presume that a walk in the park on a normal day is anything to be worried about.

2. Irrational Actions, Irrational Communications

At the JAIF Conference in April 2014 one of the speakers bemoaned the fact that people in Japan do not know that natural and man-made radiation are the same thing. (The audience laughed at such extraordinary ignorance.) Correcting this misconception would put their minds at rest over the hazards associated with the exclusion zone (and by implication smooth the way to nuclear plants reopening).

This concept – that the problem with the public is that they don't know enough nuclear physics – has a long and as far as I can tell almost completely unsuccessful history in nuclear communications. To develop the above analogy, it has been known for a very long time that considerable parts of the 20km exclusion zone had very low levels of contamination. The 2013 UNSCEAR report into the accident, *Levels and effects of radiation exposure due to the nuclear accident after the 2011 great east-Japan earthquake and tsunami*[1], shows that after just one year the 1 mSv 'contour' excluded much of the exclusion zone to the south and southwest of the plant, for example. A dose of 100 mSv per year is a known health risk.

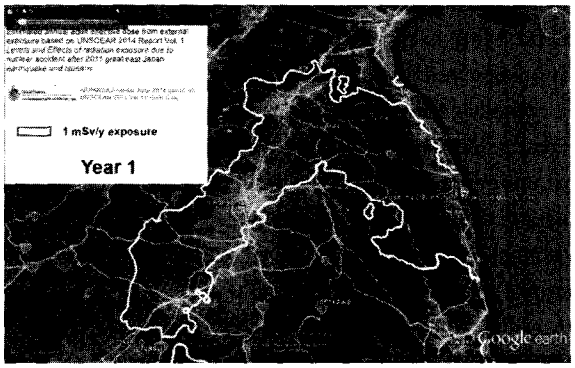

Fig. 1 The 1 mSv contamination contour 1 year after the Fukushima accident – levels of contamination outside this contour would be below 1 mSv and in some areas undetectable.[2]

While it is difficult to get precise figures, natural background in Japan varies as it does in all countries. Doses are higher in areas like Kyushu than they are in the northeast of Japan. Total dose (natural plus contamination) in parts of the exclusion zone will be less than natural dose alone in the higher background areas. Of course there are other areas of the world where background doses are dramatically higher than any found in Japan.

What do the high background areas have in common? One thing is that nobody has suggested they should be evacuated, any more than anyone suggests we should block up all our windows and never leave the house to avoid sunlight.

So the intelligent non-specialist in Japan is faced with a conundrum. They know the entire zone remains evacuated after three and a half years (with the exception of a few hundred people allowed back in recent weeks). They know the authorities say that total radiation levels in some of the zone are lower than natural levels elsewhere in Japan and the world. The most obvious conclusion is that natural and man-made radiation must be different.

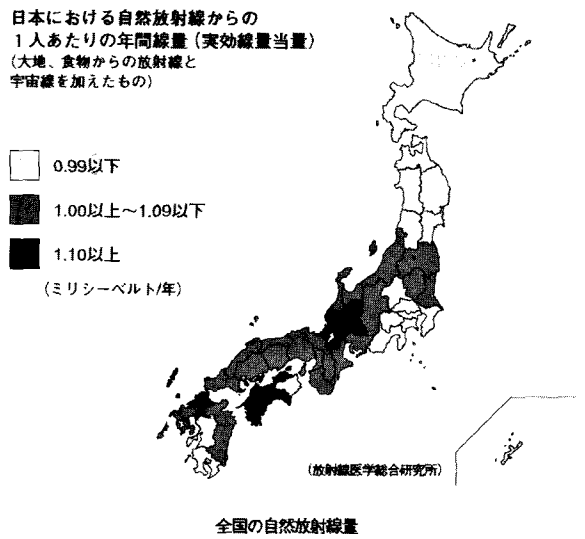

Fig. 2 Variations in natural background radiation levels in Japan[3]

If they could be persuaded that this is not the case then they would be left with two other possibilities: systematic lying by the authorities as to levels of radiation in the zone; or a cruel and unnecessary destruction of entire whole lives by forcing them away from their homes for such a long period for no significant health benefit. Indeed, if health were the aim it would make much more sense to evacuate the population of Tokyo into the exclusion zone, helping them to avoid the airborne pollution that kills over 2 million people every year in the world's major cities, than the opposite.

Let us take another example – the decision to siphon off water from the hills above the plant, decontaminate it to stricter levels than apply to drinking water, then release it to the ocean. What is the intelligent layperson to make of this? For this hugely expensive policy to make sense it must mean two things: that the permitted levels of radioactivity in drinking water are dangerously high (so the regulators clearly cannot be trusted); and that what has already been released into the ocean must be vastly more damaging than anyone has yet 'admitted'.

The irony, I suspect, is that these measures have been taken in the mistaken belief that they will put people's minds at rest. In reality they are more likely to stir up a great deal of entirely unnecessary fear and anxiety. The concept of 'erring on the side of caution' is a dangerous one when one takes no account of the negative effects of measures such as excluding people from their homes and homelands. Tragically, it is well established that evacua-

tion for any reason has a number of adverse consequences for the health of the population involved.

3. Subliminal Messages

The tone of discussions that I took part in or observed in my visit to the JAIF Conference was worrying. They appeared to include two major messages. First, it was recognised that the mantra that major nuclear accidents were impossible – the 'nuclear myth' – has to be abandoned. The second was what steps needed to be taken to make sure that another nuclear accident would be impossible.

The three major civil nuclear accidents so far – Three Mile Island in 1979 (USA), Chernobyl in 1986 (Soviet Union) and Fukushima – all happened for different reasons. With the benefit of hindsight none should have happened – operators 'should' have realised that a valve was stuck open at TMI and not made things worse; Chernobyl 'should' never have been operated below 25% of its normal output; anti-tsunami measures 'should' have been installed at Fukushima. But almost all major accidents are like this. Once a particular accident has happened measures can be taken to prevent it recurring. The next major release of radioactivity will not, I suspect, be caused by poor instrumentation, positive void coefficients or flooding. It will be something else, something which with the benefit of hindsight 'should' have been recognised

The nuclear myth was and is harmful not only because it is patent nonsense (a negative can never be proved) but because of what it implies. No other industry talks about making sure a major accident 'never happens again', despite accidents on the scale of the Benhixu Colliery (1942, China, coal, 1550 deaths), Banqiao (1975, China, hydro, 170000 deaths) or Bhopal (1984, India, chemical plant, 4000 – 20000 deaths). The underlying, subliminal message is not that nuclear companies are especially responsible and take safety very seriously indeed; it is that a nuclear accident would be in a different league from any other accident that could befall mankind. When such an accident does happen, then, it is very difficult for people to accept the truth – that there are unlikely to be any discernible deaths from radiation at Fukushima. So the ground is very fertile for those with political or quasi-religious objections to nuclear power to feed on fears which have been nourished by the actions and words of the 'nuclear family' itself. Continuing to talk about radiation as though it is very dangerous (rather than a constant and not very interesting feature of the natural world) by going on and on about measures being taken to protect people inevitably creates deep-seated fears. Of the many irrational beliefs that seem to be held by the nuclear family, not just in Japan but worldwide, perhaps the worst is the idea that if a great deal of publicity is given to something being made a little safer, people's minds will be put at rest. A more rational human response would be to suspect that the activity was more dangerous than had first been admitted and that therefore to become even more anxious.

4. Conclusions

To retrieve the situation will not be easy but a few first steps should include the following.

- Giving people a realistic assessment of how dangerous the various areas of the exclusion zone might be – perhaps comparing them to the hazards of Tokyo city air – and then allowing residents to decide for themselves whether they wish to return to their homes, supporting them whether they choose to do so or not.
- Abandoning any indefensible policies, such as decontaminating what is effectively clean water or banning food containing low levels of contamination, which are being pursued with the sole aim of 'putting minds at rest' – in reality they achieve the precise opposite.

Ultimately, far from being irrational, the Japanese public will be trying to make sense of the conflicting information it is being given. In particular, they will be trying to square the complacent verbal and written messages that are being promulgated with the overblown and exaggerated actions that are being taken. They may come to an incorrect conclusion but that is because the policies being followed are irrational. No amount of clever communication or education will overcome that problem.

– References –

1) UNSCEAR, Levels and effects of radiation exposure due to the nuclear accident after the 2011 great east-Japan earthquake and tsunami, United Nations (2013).
2) W. Weiss, The UNSCEAR 2013 report: major findings and the way forward, World Nuclear Association Annual Symposium (2014).
3) Online at http://1.bp.blogspot.com/-uuzaaAfzkLE/TeNi6jiJtzI/AAAAAAAADcs/H4OUMxxmS5k/s1600/Natural+radiation+in+Japan.jpg

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