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Beyond Paternalism and Strategy: Understanding Radiological Risks as a Mutual Learning Experience

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ABSTRACT

This discussion paper aims to elaborate on the issue or risk communication by situating it in a governance perspective that starts from the question of what it would imply to fairly deal with the complexity of nuclear risk governance. Taking into account the focus of the seminar in which this paper was invited as a contribution (namely the post-accident conditions in Fukushima), I also chose to enlarge the scope of the paper and to elaborate on the idea of fair risk governance in general and on conditions for post-Fukushima social justice in particular instead of restricting it to the 'too narrow' emphasis on risk communication as such.

The reason is that the idea of 'effective' risk communication, although valuable in itself, remains problematic if not taken up as a necessary element of concern of a fair approach to risk governance. As nuclear energy risk assessment in general has to take into account knowledge-related uncertainties and value judgements, one can understand that all nuclear energy risk perception is 'relative', not only with citizens, but also with activists, scientists, engineers and policy makers. How good the intentions may be, one has to acknowledge that the approach to effective risk communication remains paternalistic if seen only as a one-directional transfer of information from 'experts' to 'lay people' instead of as a dialogue set up as a mutual learning experience. Therefore, from a social justice perspective, involving the (potentially) affected in making sense of the risks and in consequent decision making should be the prime concern.

In Fukushima, the uncertainties and fears among the population with regard to possible negative health effects of low doses are not only due to 'ineffective communication'. Currently, scientific discussions are going on with regard to possible concrete health effects in the areas under investigation, and the Linear Non-Threshold hypothesis and the current limit of 1 mSv per year for the public should therefore be maintained as the principles to inform post-accident governance. In Fukushima, the issue of the so-called '100 mSv threshold' is an issue in urgent need of formal public deliberation among all concerned actors. Although there is major scientific support for the vision that no such threshold exists, it now serves post-accident politics that are not to the benefit of the citizens.

抄録

この討議論文は、原子力に関連したリスクガバナンスの複雑さを公平に扱うことの意味対する問いを含めたガバナンスの視点から、リスクコミュニケーションの課題を詳しく述べることを目的としている。この論文は招待を受けた国連大学のセミナー（すなわち福島の事故後の状況）への貢献として作成され、セミナーの焦点をかんがみ、リスクコミュニケーションという「非常に狭い」トピックに限局するのではなく、本論文はそのスコープを広げ、一般的な、そして、特に福島の状況の社会的公正という公平なリスクガバナンスの概念について意見を展開する。

その理由として、「効果的な」リスクコミュニケーションの概念は、それだけでも重要であるが、リスクガバナンスの公平なアプローチに関する必須の要素であることとして捉えない限り、問題が残ることが挙げられる。原子力エネルギーのリスク評価は概して知識に関する不確実性と価値判断を考慮しなければならず、原子力エネルギーに関するリスク認知は全て、市民のみならず、活動家や科学者、技師、政策立案者にとっても「相対的」であることを念頭に踏まえなければならない。その意図がどれほど良いものであっても、相互学習経験として対話を設けるのではなく、「専門家」から「一般人」への一方通行の情報移転としてとらえれば、リスクコミュニケーションは温情主義に留まる。したがって、社会的公正の観点から、リスク定義およびそれに基づく意思決定に（潜在的）被災者を巻き込むことが最も重要なのである。

福島の住民が抱く低線量放射線の潜在的な健康影響に関する不確実性と恐れは、「非効果的なコミュニケーション」だけによってもたらされたものではない。現在、福島で起こりうる具体的な健康影響についての科学的議論は継続中であり、閾値無し直線仮説（Linear Non-Threshold仮説）や現行規制の一般公衆上限線量1ミリシーベルト／年を事故後のガバナンスを示す原則として維持するべきである。福島では、いわゆる「100 ミリシーベルト閾値」の問題をすべての関係者間で公式に審議することが急務である。このような閾値は存在しないという見解の科学的サポートが、現在、市民の利益の為ではなく、事故後の政治に使用されている。

1. The trouble with justification – a characterisation of the nuclear energy risk.

What do we talk about when we talk about the risk that comes with the use of nuclear as an energy technology? In the general case of evaluating a practice or conduct that involves a health risk, we obviously need knowledge about the nature of cause and effect and about the probability that an adverse effect will occur. However, similar to the case of many other risk-inherent technologies with a wider impact on society (such as the use of fossil fuels, food preservatives or genetically modified organisms), the assessment of the nuclear energy risk as a collective health risk, in the sense of *the evaluation of its acceptability* as a possible threat to our health and the environment, is complicated in two ways. First, there is the fact that, in judging whether in view of the anticipated 'benefits' the risk is acceptable or not, one has to deal with uncertainty due to incomplete

and speculative knowledge. Secondly, there is fact that evaluations of the nuclear risk are also done with reference to the existence of alternative energy technologies or with reference to more 'fundamental' values such as the value of nature. Let me briefly comment on both of these[1].

In short, the elements of knowledge-related uncertainty or thus the 'epistemic complexity' to take into account can be summarised as follows:

- The possibility of a nuclear accident (due to technology failure, human error or force majeure (such as the Fukushima earthquake and tsunami) or a combination of those factors);

- The lack of ultimate control of the future behaviour or integrity of a nuclear waste disposal facility; and

- Because of the stochastic nature of low dose effects and of the fact that health effects such as leukaemia and solid cancer can have other causes too, the prediction of radiation health effects at low doses remains a complex endeavour. What we know of low dose effects can be summarised in three steps:

  1. We have evidence of health effects below 100 mSv, which means that we can say for sure that the 'so-called' 100 mSv threshold hypothesis is false;

  2. Accumulating evidence tends to favour a proportionate relationship at low doses between radiation dose and cancer risk, but there is no definitive conclusion. This insight supports the idea that the Linear Non-Threshold hypothesis that was first introduced based on the precautionary principle is the right hypothesis to maintain; and

  3. We have scientific discussions going on with regard to possible concrete health effects of low doses in concrete situations (such as the scientific discussion on the INWORKS epidemiological study (see f.i. (Richardson et al. 2015), (Leuraud et al. 2015) and (Doss 2015)) and the scientific discussion on the possibility of thyroid cancer with children in Fukushima ((Tsuda et al. 2015), (Kageyama 2015)). As long as serious scientific discussions are taking place, we have to acknowledge that there is no definite scientific conclusion on the actual manifestation and predictability of these concrete health effects in these concrete situations, which doesn't mean that specific indications cannot be used as a factor to take into account in the evaluation of the acceptability of the risk as such.

Of course, the assessment of a nuclear energy risk is not a pure knowledge-based evaluation problem. The evaluation of whether a nuclear energy risk would be socially acceptable or not is also influenced by 'external' value references. These values could either serve arguments 'in favour' or 'against' nuclear energy and include:

- The value of nuclear energy as a 'low-carbon' energy technology in energy policy concerned with climate change;

- The fact that nuclear technology can be used to develop nuclear weapons;

- The vulnerability of nuclear installations to terrorist attacks;

- The value of alternative energy technologies (taking into account their own 'benefits and drawbacks');

- The value of nature ('one should not mess around with nature' – an argument that, in the context of climate change discussions, is now used as well against nuclear energy as in its favour);

- But also more general values such 'sustainability', 'justice', 'precaution' and 'freedom' (the last in the sense of our possibility of self-determination in caring for our own health or the environment).

Last but not least, we know that evaluations of the acceptability of the nuclear energy risk (taking into account knowledge-related uncertainty and external value references) are extra complicated as they now unavoidably take place in a socio-political context that is marked by controversy around the nuclear issue as such. Also taking into account that we cannot 'escape' history or make abstraction of it, this controversy is triggered by:

- The accidents that happened;

- The link with the military context;

- The 'democratic deficit' with respect to the way nuclear energy has been introduced and power plant and waste disposal siting has been done in the past (and the present); and

- The fact that nuclear energy policy is associated with neoliberal global strategies of profit and power driven by big corporations and their political supporters.

So taking into account the existence of these external value references and the context of controversy, one has to accept that even if we *would* all agree on the available knowledge to evaluate a nuclear risk, then opinions can still differ on its acceptability. In these cases of 'value pluralism' or 'moral pluralism', science may thus inform us (to a certain extent) about the technical and societal aspects of options,

but it cannot always instruct or clarify the choice to make.

It may be clear that the above characterisation of the nuclear energy risk may support the idea that there is no overall evidence that would unequivocally lead to consensus on the unacceptability of the nuclear energy risk (in view of the (potential) adverse consequences) but neither on its acceptability (in view of its benefit as a low-carbon energy technology). People may have informed, valuable and serene opinions in favour or against nuclear energy, but none of the two camps can 'prove' that the other is wrong. As a consequence, as with many other risk-inherent practices in society, fairness with respect to justifying or rejecting the nuclear energy risk as such in society can only relate to how we make sense of that risk in knowledge generation and decision making. This brings us to a reflection on the idea of 'fair risk governance' and on how to understand it from out of a perspective of ethics.

2. Ethics, fairness and trust: the idea of fair risk governance.

What do we talk about when we talk about ethics? Ethics are about being concerned with questions of right and wrong, but there are different 'levels' of thinking about these questions. Philosophy identifies 'meta-ethics' as that discipline or perspective that deals with concepts of right and wrong (what is rightness? what is goodness?). Next to that, philosophers speak of 'normative ethics' as the discipline or perspective that considers the references that can be used to evaluate a specific practice or conduct. In that sense, normative ethics thus refer to 'what ought to be' in absence of 'evidence' that would facilitate straightforward judgement, consensus and consequent action. That absence of evidence can as well relate to the knowledge as to the values we may want to use to evaluate that specific practice or conduct.

In the previous chapter, it was sketched which factors of uncertainty *must* be taken into account in the assessment of the nuclear energy risk, but also which external value references *may* be taken into account in that evaluation. Similar to the nuclear energy case, one may understand that the evaluation of other risky practices may also be influenced by moral pluralism, in the sense that judging whether that practice would eventually be acceptable can also be done with reference to 'external' values. If we thus consider that an evaluation of the acceptability of a risk-inherent practice in general depends on knowledge-based opinions and values-based opinions, we can then construct a simple picture of four distinct cases as presented in the table below . The table may be oversimplified in the sense that one cannot 'distinct' knowledge from values (in risk evaluation, specific knowledge may influence the importance of specific values and specific values may influence as well the importance of specific knowledge as the way it is used in evaluation) but it can be used as a meaningful tool to determine key concepts of fairness of risk assessment and governance and to understand differences between risky practices in that respect.

The context of this text does not allow broad elaboration on the table, but it shows primarily that the risks of bungee jumping, mobile phones or nuclear energy are incomparable as joint evaluation of their acceptability depends in different ways on knowledge and values.

The bungee jumper will not ask to see the test procedures of the rope before making a jump. In general, the jumper trusts that these ropes will be ok, but, more importantly, he or she makes the decision to jump on a voluntary basis. Despite the fact that more than one million people die in car accidents globally[2], no reasonable person is advocating a global car ban. Similar to bungee jumping, the key concepts of fairness related to taking the risk are precaution, informed consent and fair play. In the case of car driving, precaution not only refers to protection measures such as air bags but also to the value of driving responsibly. And fair play refers in that case to the idea that one can only *hope* that the other drivers also want to drive responsibly.

The evaluation of the risk that comes with smoking or the use of mobile phones is what one could call a 'semi-structured' or 'moderately structured' problem (Hisschemöller and Hoppe 1995) that can be handled on the basis of 'pacification'. The reason is that, despite of the uncertainties that complicate the assessment of those specific risks[3], people agree to take or allow them on the basis of 'shared values'. Shared values are thus about those situations wherein we have the feeling that we all accept or allow a specific 'risky' practice in light of a shared value. This shared value can be a joint benefit (such as in the case of mobile phones) but also a specific freedom of choice 'to hurt yourself' in view of a personal benefit, taking into account that this behaviour should not harm others (such as in the case of smoking). With reference to the table, one could say that fairness is thus in the way we care for 'intellectual solidarity' in dealing with incomplete and speculative knowledge, and the key concepts of fairness in this sense are precaution, informed consent, transparency (with respect to what we know and don't know and with respect to how we construct our knowledge) and our joint preparedness to give account of the rationales we use to defend our interests ('stakes'). Because of the uncertainties that complicate the assessment, protection measures are essentially inspired on and supported by the precautionary principle. In the case of mobile phones, this principle translates as the recommendation to use them in a 'moderate way' and the recommendation to limit the use by children. For smoking, it translates as anti-smoking campaigns towards (potential) smokers (with special attention to young people) and as measures to protect those 'passively involved' (the passive smoker). Knowing of the addictive character of smoking, additional measures are gradually adopted to 'as-

risk-inherent practice acceptable?		value-based assessment	
		dissent 'moral pluralism'	**consent** 'shared values'
knowledge-based assessment	**uncertainty** (incomplete and speculative knowledge)	governance by **deliberation** examples *nuclear energy* *(fossil fuels)* fairness: caring for 'intellectual solidarity' in dealing with incomplete & speculative knowledge and moral pluralism ↓ key concepts precaution informed consent transparency confrontation of rationales accountability to next generations	governance by **pacification** examples *medical applications of radioactivity* *mobile phones* *smoking* fairness: caring for 'intellectual solidarity' in dealing with incomplete & speculative knowledge ↓ key concepts precaution informed consent transparency confrontation of rationales
	consent (consensus on 'evidence')	governance by **negotiation** examples *(fossil fuels)* fairness: caring for 'intellectual solidarity' in dealing with moral pluralism ↓ key concepts precaution informed consent confrontation of rationales accountability to next generations	governance by **'simple' regulation** examples *traffic* *bungee jumping* fairness: caring for 'intellectual solidarity' in our behaviour towards each other ↓ key concepts precaution informed consent fair play

Justifying risk – Mapping the field (adapted from (Hisschemöller and Hoppe 1995))

sist' smokers who want to quit. In similar sense, evaluating the risk coming with the use of radiation in medical context can also be called governance by pacification. The value of informed consent remains central and also applies to the close relations of the patient (family members), but essentially all agree that the patient takes the risk of a delayed cancer (due to diagnose or therapy) in light of a 'higher' benefit (respectively information about a health condition or the hope that the cancer will be cured).

In contrast to complex problems that can be handled on the basis of 'pacification', justifying or rejecting nuclear energy seems to be an unstructured problem that will always need deliberation. Not only do we need to deliberate the available knowledge and its interpretation, deliberation will also need to take into account the various 'external' values people find relevant to judge this case, and the arguments they construct on the basis of these values. Therefore, the fairness of evaluation relates to 'intellectual solidarity' in dealing with incomplete and speculative knowledge but also in dealing with moral pluralism. The key criteria are then again precaution, informed consent, transparency and (the preparedness for a) confrontation of rationales, now added with a sense for accountability towards those who cannot be involved in the evaluation (the next generations). In comparison with nuclear energy, the evaluation of the risk that comes with the use of fossil fuels is a complex problem that, in principle, can be treated on the basis of 'consent on causality'. The 5th Assessment Report of the Intergovernmental Panel on Climate change states that […] *Human influence on the climate system is clear* […] and that […] *Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen* […] (Intergovernmental Panel on Climate Change 2014). Despite this evidence of a 'slowly emerging adverse effect', the assessment of whether *concrete* droughts or storms can be contributed to human induced climate change or what the *concrete* effect of specific mitigation or adaptation policies would be remains troubled by knowledge related uncertainty. Therefore, also fossil fuel use is a complex problem that requires 'deliberation', and the key concepts of fairness remain the

same as for the evaluation of nuclear energy: precaution, informed consent, transparency, confrontation of rationales and accountability to next generations.

The discussion of the table above allows us now to make three reflections related to ethics, fairness and trust in relation to risk governance. Obviously these reflections are based on my specific understanding of risk assessment in relation to fairness and are therefore presented as list of ideas that are as such open to discussion:

1. The assessment of what is an acceptable health risk for society is not a matter of science; it is a matter of justice.

1.a. A health risk is not a mathematical formula: it is a potential harm that you cannot completely know and cannot fully control but that you eventually want to face in light of a specific benefit. People will accept a risk they cannot completely know and that they cannot fully control simply when they trust that its justification is marked by fairness. And fairness relates primarily to the value of precaution, but even so to the possibility of self-determination ('informed consent').

1.b. Despite the differences between the cases discussed, they can all be characterised in relation to one idea with respect to self-determination: the idea that 'connecting' risk and fairness is about finding ground between ensuring people *the right to be protected* on the one hand and *the right to be responsible* themselves on the other hand. The right to be responsible leans thereby on the prime criterion of the right to have information about the risk and the possibility of self-determination based on that information, but one has to take into account that, in a society of capable citizens, self-determination with respect to risk-taking can have two opposing meanings: it can translate as the right to co-decide in the case of a collective health risk (as in the case of nuclear energy), but also as the freedom to hurt yourself in the case of an individual health risk (as in the case of smoking or bungee jumping).

1.c. For any health risk that comes with technological, industrial or medical practices and that has a wider impact on society, 'the right to be responsible' equals 'the right to co-decide'. And enabling this right is a principle of justice.

2. Societal trust in the assessment of what is an (un)acceptable collective health risk for society should be generated 'by method instead of proof'.

2.a. With respect to nuclear energy, no scientific or political authority can determine alone whether the risk would be an acceptable collective health risk for society. Good science and engineering, open and transparent communication and the 'promises' of a responsible safety and security culture would be necessary conditions but they can never generate societal trust in themselves. The reason is that there will always be essential factors beyond full control: nature, time, human error, misuse of technology.

2.b. The fact that people take specific risks in a voluntary way and often based on limited information may not be used as an argument to impose risks on them that might be characterised as 'comparable' or even less dangerous. That principle counts to the extreme. As examples:

- The fact that the risk of developing cancer from smoking might be 'higher' than that from low-level radiation may not be used as an excuse to impose a radiation risk on people.

- The fact that a nuclear worker may voluntarily accept an accumulated occupational dose of 20 mSv per year may not be used to justify a citizen's dose of 1 mSv per year originating from a nuclear technology application without asking for his or her informed consent.

2.c. Fair risk governance is risk governance of which the method of knowledge generation and decision making is trusted as fair by society. When the method is trusted as fair, that risk governance has also the potential to be effective, as the decision making will also be trusted as fair with those who would have preferred another outcome.

3. A fair dealing with the complexity of risk assessment and justification requires new governance methods.

3.a. Is fair risk governance with respect to collective health risks as characterised above possible today? In other words: do the methods we use to produce policy supportive knowledge and to make political decisions have the potential to enable 'the right to co-decide' (as a principle of justice) and to generate trust by their method instead of by their potential or promised outcome? My short answer is no. In (Meskens 2015), I argue in depth why and how the 'governance methods' we use today to make sense of the complexity of assessment and justification of typical collective health risks remain to be driven by the doctrine of scientific truth and the strategies of political 'positionism' and economic profit. As the context of this text does not allow deeper reflection on this general argument, the following reflections are restricted to the case of nuclear energy in the context of energy governance.

3.b. For the nuclear energy case in particular, I argued in (Meskens 2013) that, because of the doctrinal working of science and of the strategies of political 'positionism' and economic profit, the nuclear energy issue is now locked in a comfort of polarisation that does not only play in public discourse but that is deeply rooted in the working of science, politics and the market. As a result, in sharp contrast with the way fossil fuel energy technologies are now subject of global negotiations driven by the doom of climate change, nuclear energy technology remains to 'escape' a deliberate justification approach as an energy technology on a transnational level.

3.c. The question of whether one is 'in favour' or 'against' nuclear energy remains meaningless if not integrated in a consensus framework for energy governance as such. In principle, that consensus framework is possible, as it would follow three policy principles with which everyone cannot but agree. These principles are (in that specific order):

1. The policy principle to minimise energy consumption (or thus to maximise energy savings) through democratic deliberation on how and where;

2. The policy principle to maximise renewables through democratic deliberation on how and where; and

3. The policy principle to organise a fair debate on how to produce what cannot be done with 1 and 2 yet, and 'confront' in that debate fossil fuels and nuclear, being the two 'nasty' risk-inherent energy technologies, with each other. Democracy in this sense implies that a society would need to be able to decide on how to produce 'the rest' of its needed energy for the time to come: with nuclear, with fossil fuels or with a combination of both. In line with the reasoning above, a fair method of decision making would in this context be a method that would be sensed as fair because of its method by all concerned, regardless of whether the decision making would result in the acceptance or in the rejection of nuclear energy or fossil fuel use. The fact that we are in a historically evolved situation where nuclear and fossil fuels are present while there have never been real democratic debates on their introduction cannot be used as an excuse to not organise this kind of debate now. While it is true that, in terms of their adverse effects, nuclear and fossil fuels are 'incomparable', that additional complexity would not prevent a democratic society to make deliberate decisions on them.

Although we don't live in a world where politics, science and the market would be prepared to engage in deliberation that would put policy principles 1 and 2 upfront and that would take principle 3 serious, we have the capacity to put that deliberation in practice. Justice with regard to how a specific collective health risk such as the risk of nuclear or fossil fuels is evaluated in society remains the central ethical principle, and that ethical principle translates in practice as the need for transdisciplinarity and civil society participation in scientific research and the need for participation of the potentially affected in democratic decision making.

3. What is complicating fair and effective post-accident deliberation in Fukushima?

It may be clear that the vision on fair risk governance presented above also applies to post-accident conditions such as in the case of Fukushima. In Fukushima, the uncertainties and fears among the population are not only due to 'ineffective communication'. In this short chapter, I will highlight two 'factual' issues that need to be taken serious in a fair and effective dialogue and two political issues that are today hindering that dialogue but that, in principle, can be overcome.

First, we have to take into account a specific difference in dealing with knowledge-related uncertainty between the culture of science and the culture of politics: simply the fact that, in studying low radiation dose effects, scientists are concerned with avoiding false positives (or thus the observation of a presumed effect) while decision makers, activists and citizens are concerned with avoiding false negatives (or thus the ignorance of an actual real effect).

Secondly, we have to take into account the influence of the historical context in two ways.

- Considering that, in Japan (as, in principle, in all other countries), there has never been an inclusive democratic debate on the eventual use of nuclear energy in the past, post-accident governance has to take into account an a-priori situation of distrust with members of the general public with regard to nuclear energy policy as such. If the public felt excluded by the political supporters of the nuclear industry back in time, why should they trust them now after an accident?

- There is also the observation that many people in Japan relate the Fukushima accident to the Hiroshima and Nagasaki atomic bombing. For them, both disasters provoke the same feelings of powerlessness and resignation towards the politics of power and conflict. While this may complicate the dialogue even more, these references must be taken serious, especially because the global nuclear industry is not making efforts itself to cut the link between peaceful and military use.

But then there are the political issues that are hindering a fair and effective dialogue today.

In post-accident situations, one could say that 'science is under pressure to deliver evidence' even more than in normal conditions, and this obviously influences concrete scientific discussions on potential health effects such as those referred to in chapter 1. It is clear that these scientific discussions (which could be called as an essential element of scientific research as such) should be able to take place in an open, transparent and serene atmosphere. A simple internet search on the combination of the key words 'Fukushima' and 'misleading' reveals the existence of expressions of suspicion and accusation back and forth among concerned actors. Without judgement on the rightfulness and credibility of any of these expressions, their existence may simply support the claim that this needed atmosphere was and still is largely missing in public discourse around Fukushima. On the other hand, civil society initiatives such as the Citizen-Scientist International Symposia on Radiation Protection[4] prove that it is in principle possible to create that atmosphere. Specifically with respect to low dose effects, also in Fukushima, the issue of the so-called '100 mSv threshold' is an issue in urgent need of formal public deliberation among all concerned actors. Although there is major scientific support for the vision that no such threshold exists, it now serves post-accident politics that are not to the benefit of the citizens.

Secondly there is the simple observation that, in the aftermath of the accident, an opportunity to create societal trust is lost, given the fact that the Japanese authorities have not invited the public and civil society to participate in deliberating a possible restart of nuclear energy production.

4. Conclusion – 3 reflections

4.1. In general, with respect to complex social problems such as energy governance, one can formulate concepts of advanced governance methods with the potential to generate trust by their method instead of by anticipated or promised outcome, and normative visions on these methods exist since long in the academy. The context of this text does not allow further elaboration on the motivation, form and practical working of these methods, but they can be identified as follows:

- Inclusive democratic deliberation as a collective holistic learning process, bottom-up, connecting the local and the global;
- Transdisciplinary and inclusive research, seeking synergy among 'disciplines' and between expert knowledge and lay knowledge; and
- Education inspired by plurality and with a focus on developing an ethical sense and the capability of critical contextual thinking.

We don't need to wait for a utopian total reform of society. These new forms of democracy, research and education are possible today.

4.2. We are done with the traditional technocratic understanding of risk communication.

The characterisation of the nuclear risk done in chapter 1 makes clear that, in terms of risk communication, we have to accept that the nuclear risk cannot be proven to be justified on the basis of a 'convincing communication' (in the sense of a convincing explanation) from an informed sender (the nuclear expert) to an uninformed receiver (the citizen). In the same sense, the nuclear risk cannot be proven to be unjustified on the basis of a 'convincing communication' (in the sense of a convincing explanation) from an informed sender (the anti-nuclear activist) to an uninformed receiver (the citizen). While these may be trivial findings for many academic and civil society circles, especially the idea that you can defend the use of nuclear energy 'based on sound scientific arguments', eventually simplified for a lay audience, still persists in traditional nuclear science and engineering social worlds.

The previous reflections may make clear that the idea of effective risk communication, although valuable in itself, remains problematic if not taken up as a necessary element of concern of a fair approach to risk governance. In other words, normative reasoning about communication is meaningless if not taken up in a critical assessment of the political modes wherein that communication is meant to operate. As radiological risk assessment has to take into account knowledge-related uncertainties and value judgements, one can understand that all radiological risk perception is relative, not only with citizens, but also with scientists, activists and policy makers. In cases where knowledge-related uncertainty leaves room for interpretation with regard to possible adverse effects of low-level radiation, one should remain vigilant for the fact that actors with specific views on nuclear energy may understand effectiveness as referring to the success with which they manage to influence the public with their views as part of their pro- or antinuclear political strategies.

Taking into account the previous considerations, actors concerned with radiological risk governance should, for once and for all, reject the notion of 'risk communication' in its traditional meaning of the transfer of knowledge from an informed sender to an uninformed receiver. Risk communication is simply synonym to 'uncertainty communication', 'believe communication', 'disbelief communication', 'hope communication', 'de-

spair communication', 'fear communication' and, last but not least, 'glossed self-interest communication'.

As an alternative to the traditional meaning, risk communication should be understood as a dialogue set up as a mutual learning experience and, from a social justice perspective, involving the (potentially) affected in making sense of the risks and in consequent decision making should be the prime concern in that dialogue.

So, taking all this into account, one can only conclude that 'effective' risk communication would be that risk communication that succeeds in generating insight into the ways knowledge about the risk is produced and that consequently would succeed in generating consensus about what can and cannot be known (yet) about possible health effects, all this in the interest of finding consensus on necessary policy measures. We may also conclude from the previous reflections that our current governing modes of science and politics do not allow this kind of effective risk communication.

4.3. There is a need for advanced post-accident governance in Fukushima: governance with the potential to generate societal trust by its method instead of by its outcome.

With respect to the Fukushima post-accident situation, research must continue to assess concrete health effects in the interest of social justice. Meanwhile, time will show to what extent these health effects emerge, but we cannot and should not wait for evidence in the interest of a more fair and effective post-accident governance. While one can imagine the possibility of finding a scientific consensus on the actual effects in the future, we have to accept that striving for democratic justice and societal trust in Fukushima will have to be done now while scientific discussions on health effects will continue for some time to come. And in the general interest of rendering that research with credibility, science has no choice but to involve civil society in general and the (potentially) affected in particular in that research.

In light of the previous, an essential criterion for social justice and societal trust is the maintenance of the Linear Non-Threshold hypothesis and the current limit of 1 mSv per year for the public as the protection principles to inform post-accident governance. It is from that perspective that we can understand that the precautionary principle is an ethical principle rather than a scientific principle. While, especially in post-accident conditions, the principle is vulnerable to strategic interpretation in conflicts of interest, it would need to serve post-accident governance in the common interest of all concerned, taking into account the complexity of the problem and with a special concern towards to the vulnerable.

In Fukushima, we are in post-accident conditions, but not in post-crisis conditions. During the citizens-scientist conference in Tokyo last September, I proposed the establishment of a national committee that would facilitate and moderate dialogue on post-accident issues. That dialogue should involve all concerned actors, but it should be facilitated and moderated from out of the academia. This actor is now the only one with the potential to bring everybody together and to organise a dialogue that would transcend polarisation.

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Notes

[1] I elaborate in more detail on these issues in (Meskens 2013).

[2] The World Health Organisation (WHO) Global status report on road safety 2013 indicates that worldwide the total number of road traffic deaths remains unacceptably high at 1.24 million per year (World Health Organisation 2015).

[3] With regard to mobile phone use, the WHO states that 'The electromagnetic fields produced by mobile phones are classified by the International Agency for Research on Cancer as possibly carcinogenic to humans' (World Health Organisation 2014). With respect to smoking, of course there is the known relation with lung cancer, but the lack of evidence is in the delayed effect and especially in the fact that there is contingency into play (there is no evidence (yet) for why apparently some individuals are more susceptible than others). In addition, while the WHO now clearly states that tobacco kills up to half of its users (World Health Organisation 2015), we don't see these statistics 'happening' in our near social environment. To put it more provocative, our shared values support the idea that we should protect the non-smokers from the smokers, but also the idea that we still live in a free and democratic society where people have 'the right' to smoke themselves to death. It is true that the addictive character of smoking is influencing 'the freedom of choice', but nowadays addicted smokers can always decide for themselves to seek medical and social assistance in their attempt to quit smoking.

[4] See http://www.csrp.jp/

[5] See http://www.csrp.jp/csrp2015

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