Defining Health, Policy and Science: Legitimating Vertically Integrated Expertise in the WHO EMF Project

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Abstract

In 1996 the World Health Organization embarked on an initiative (the WHO EMF Project) that aimed to provide a science and policy consensus on the EMF debate. The following discussion will analyse two aspects of the project: (a) The processes through which the project attempted to extend the scope of its expertise via the production of knowledge packages which provide ideal problem solutions to scientific and regulatory challenges. (b) The way documents produced by the project engaged in a process of ordering the boundaries between science / health / politics and policy so as to naturalize the breadth of the areas over which it could authoritatively pronounce. Discussion will contribute to the understanding of the processes by which institutions manipulating vertically integrated knowledge attempt to maintain legitimacy for what are extremely broad epistemologically and politically hybrid activities.

Expertise and the EMF Controversy

Scientific controversies have long been recognised as offering the opportunity to explore the 'condition' of modern science where otherwise more difficult to observe processes of interpretive flexibility and social pressures encouraging or discouraging closure are more open to the analyst's view (Collins & Pinch 1993; Mercer 1996). Longer standing controversies also offer the opportunity for the analyst to examine processes of social learning, as claims shift over time in response to rival claims and new contexts of evaluation (Mazur 1981; Yearley 2005). In the brief discussion which follows I will contribute to the study of the processes by which knowledge claims in longer standing scientific controversies can take on the quality of what I have described elsewhere as being 'vertically integrated' (Mercer 2004; 2007; Daemmrich 1998).

The economics inspired metaphor of *vertical integration* highlights the emergence of experts and institutions that are able to actively participate in shaping scientific knowledge claims at multiple points from upstream knowledge making contexts, such as laboratories, through to the contexts where knowledge claims are being interpreted and translated into policy applications, such as courtrooms. The emergence of such expertise in areas of long standing scientific controversies can be understood as a response to problems of uncertainty and struggles for control over interpretations of contested knowledge claims. Vertical integration may offer the possibility to control negative feedback and help facilitate the shaping of the environments in which knowledge claims are received. In longer standing controversies the continuous interaction between adversaries allows for the fine tuning of claims: for positions to be learnt, improved, modified and increasing sensitivity to the context and capacity to intervene in the contexts where knowledge claims are being interpreted and translated into action (Mirowski & van Horn 2005). In such contexts it is also common for knowledge claims to be packaged in forms reflecting their epistemologically multifaceted role. Briefs prepared for courts, reports of government committees, consensus documents prepared by associations of eminent scientists exemplify these forms of knowledge. Notably, a feature of such 'knowledge packages' are overt statements about things like scientific method, standards for the quality of science, and blending of different forms of authority (scientific, legal etc.), into epistemologically hybrid forms, showing how various scientific knowledge claims can be linked to complimentary policy instruments and policy outcomes.

In the case study below I will examine a small example of the vertical integration of expertise in one particular arena of the long-standing controversy over the health effects of Electric and Magnetic Fields (EMF). I have previously examined the way expertise in this debate has operated, commenting on the reluctance of regulators to take public perceptions of EMF claims seriously (Mercer 1998; 2001), the construction of scientific claims in submissions to public inquiries via the deployment of scientific method discourses (Mercer 2002), and the role of hyper-experts participating in legal proceedings providing input into the construction of materials like court briefs (Mercer 2004; 2007). In the following discussion

I will broaden my focus further and analyse a World Health Organization initiative hoped by its promoters to provide a science and policy consensus on the EMF debate. This initiative, the WHO EMF Project (which I will describe in more detail below, from here on 'the project') has involved many of the same experts who have previously been involved in EMF litigation and regulation. I will focus on two main themes: (a) the processes through which the project has extended the scope of its expertise via the production of knowledge packages which provide ideal problem solutions to scientific and regulatory challenges, and (b) the way documents produced by the project engage in a politically motivated process of ordering the boundaries between science, health, politics and policy so as to naturalize the breadth of the areas on which it authoritatively pronounces. This boundary ordering rhetoric (Gieryn 1999) can also be used to reflect on processes by which institutions manipulating vertically integrated knowledge attempt to maintain legitimacy for what are extremely broad epistemologically and politically hybrid activities.

The WHO EMF project

The debate surrounding the health risks of EMF radiation is now a number of decades old. A small stream of scientific studies still continue to appear indicating possible negative health effects, and a number of commentators and scientists still voice concern with the inadequacy of safety standards and regulatory processes (Blackman et al. 2007). The WHO's EMF project was established in May 1996 'in response to growing public concern in many member states over possible health effects from exposure to an ever increasing number and diversity of *EMF* sources'. The project brought together the knowledge of over 60 national organizations and a number of key international and national scientific agencies and institutions 'in order to develop scientifically sound recommendations for health risk assessments of exposures to static and varying electric and magnetic fields in the frequency range 0–300 GHz' [and] 'provide authoritative and independent peer-review of the scientific literature' (Repacholi 1999).

The project is coordinated by the Radiation and Environment Health Unit (RAD) part of the Department of Public Health and Environment (PHE). RAD oversees WHO activities relating to Ionizing and Non-Ionizing Radiation. RAD has until quite recently, been co-ordinated by well-known EMF scientist Michael Repacholi who officially retired from this post in 2006. Repacholi has been a key scientific player across the broader history of the EMF debate, overseeing WHO endorsed scientific literature reviews, coordinating laboratory research, acting as an expert witness in legal settings, and spending long terms occupying the chair of the International Commission for Non-Ionizing Radiation Protection (ICNIRP) (WHO 2007b). Since 2006 Repacholi has worked as an industry consultant (Slesin 2006). I have commented on the breadth of Repacholi's involvement in upstream and downstream EMF science and policy issues elsewhere (Mercer 2004).

Whilst the International EMF project's website emphasises the breadth of its sources of international input and scientific review, in practice, the project has been dominated by a smaller number of larger organizations and individuals, most significantly ICNIRP and Repacholi. ICNIRP predates the project as one of the key organizations producing health and safety guidelines, scientific reviews of the EMF question and has constituted the WHO's long standing chief source of advice on the EMF question. This role can be traced back to the 1970s and was in part a spin off of the WHO's interests in broader radiation protection issues. Some analysts have noted that the origins of ICNIRP in ionizing radiation protection has meant that its approach to EMF standard setting has been dominated by the scientific perspectives of physicists ahead of biologists. This in turn has been used as one of the explanations for ICNIRP's reliance on thermal energy models for setting safety guidelines which only offer protection against immediate biological hazards of heating or 'electrocution' and effectively dismiss the possibility of risk from long term low levels of exposure. More precautionary orientated models for standard setting remain open to the possibility of subtle less understood long-term biological effects (Miller 2005).

ICNIRP and the WHO have also been subject to critique from various activists and commentators who have suggested that ICNIRP's safety

standard and guideline policies have also been shaped by more overt political influences. They claim that the WHO via ICNIRP has allowed commercial interests from the electrical and telecommunication industries to influence the direction of EMF research funding and secured inappropriate levels of influence into policy formation ahead of other stakeholders especially non-ICNIRP scientists (Maisch 2006; Slesin 2005; 2006).

The EMF Project has a particularly wide set of tasks, these have been formulated in slightly different terms in different places but have consistently followed the objectives set out below:

(a) Coordinate international response to EMF health concerns

(b) Assess scientific literature

(c) Identify gaps in knowledge and identify key areas for new research better suited to make better health risk assessments

(d) Encourage focussed research programs in collaboration with funding agencies

(e) Incorporate research into formal risk assessments

(f) Facilitate development of international standards (harmonization)

(g) Information on management / risk perception communication and management

(h) Advise national authorities and public about hazards and mitigation (Repacholi 1999).

Consistent with these objectives the project's activities have included: Encouraging Harmonization of Standards; Providing Model Legislation; Ensuring Scientific Quality Control (through providing 'a framework for developing health based EMF standards'); and the promotion of Public Education Programmes (WHO 2007b). These activities involve the obvious extension of the project's more 'natural but still contestable scientific authority' into quasi-economic, legal, epistemological and educational domains. Whilst the breadth of these initiatives fit with the project's interdisciplinary mandate, I will demonstrate in the following discussion, how in practice, the project's main activities as articulated in various public presentations, reports (van Deventer 2005; WHO 2006a; 2006b; 2007a), and official documents available on its website, rather

than incorporating a breadth of competing EMF scientific and policy perspectives, acted to 'close them out'. In general, the project's activities have attempted to shape these various policy areas so as to give them a distinctive ICNIRP flavour dominated by their long-standing interpretation of EMF science that low-level EMF exposures do not really constitute a health risk.

I will briefly comment on the project's four main areas of activity noting how in each case the extension of the authority of the project is anchored in (a) providing models for how expertise can be applied and extended which deny and absorb possible opposing perspectives; and (b), the ordering of boundaries between health policy and science in ways which reinforce the project's authority.

Harmonization of Standards

In an address to a regional WHO workshop held in Melbourne, Australia in 2005, Emilie van Deventer 'speaking for' the project explained the basis for its drive to harmonize standards. She noted that in many areas of public health, various governments have responded to the question of environmental hazards, problems of scientific uncertainty and local political preferences, by making increased reference to 'cautionary policies'. In the context of EMF van Deventer explained that:

> [G]overnmental and industry authorities have responded by implementing a wide variety of different mandatory and voluntary precautionary approaches, based on cultural, social and legal considerations (van Deventer 2005).

Examples of these types of approaches include prudent avoidance in Australia and New Zealand, precautionary emission control in Switzerland and precautionary limits in Italy.

She goes on to suggest that these precautionary approaches constitute a major problem as they ignore the relevant science, provide no known health benefit and can actually stimulate public concern. It is worth quoting van Deventer in full:

> This diversity of approaches by national authorities led WHO's International EMF Project to develop a 'Policy Framework' for rational and cost effective guidance of policy options in areas of scientific uncertainty. A principal recommendation by WHO is that these types of policies be adopted in such a way as not to ignore scientific assessments of risk and science based exposure limits. *WHO specifically recommends not to reduce limit values in international standards to some arbitrary level in the name of 'precaution' since this undermines the science base on which the limits were based* and can introduce an additional cost of compliance for no known health benefit. Also from a sociological standpoint, there is increasing evidence that making *arbitrary reductions in exposure limits leads to increasing public concern rather than reducing it* (van Deventer 2005, italics added).

The quote above shows how the project interprets the harmonization of standards as being synonymous with a 'scientific' based approach which sits on the side of the WHO, and effectively partitions off precautionary approaches which are interpreted as political and aligned with irrational (scientifically) arbitrary local political preferences of national governments which actually undermine science. It is also important to note van Deventer's rhetoric extends from pronouncing 'authoritatively' on the question of scientific arbitrariness to also claiming sociological insight, that scientific arbitrariness and precautionary policies actually increase public concern. This 'move' provides a good example of the epistemic hybridity that features in vertically integrated knowledge packages. Science, standards, policy politics, sociology are blended. This rhetoric also functions politically in the sense of 'closing off' numerous alternative interpretations. The possibility that precautionary approaches are warranted as responses to scientific uncertainty, frequent criticisms that the exposure levels mandated by the ICNIRP standards contain scientifically arbitrary dimensions, and that one of the sources for public concern in the EMF debate has been the reluctance of the WHO to have developed a clear position in relation to questions of precautionary policies are ignored (Slesin 2006). Interestingly the scientific criticism that the ICNIRP standards themselves may contain scientifically arbitrary dimensions has been raised both by those lobbying for stricter standards and those believing that there is no plausible scientific basis for health risks from low-level non-ionising radiation exposures.

The project's vision for harmonization is further 'naturalized' through its mode of representation on its website. The website provides a map of the world, where various countries can be 'clicked on'. Once a country is 'clicked on' a check-list outlining various features of the nations regulatory policies on EMF appear. One of the measures of the adequacy of a national policy is whether or not it is compliant with ICNIRP. The fact that the ICNIRP standards and guidelines have been open to some controversy is denied by them being used as the benchmark norm against which other standards and guidelines are measured. In an important sense the project's website inscribes the world within its coordinates and attempts to domesticate its differences (Latour 1999).

Model legislation

The project explains that it has developed model legislation at the request of its International Advisory Committee: this legislation enables 'government agencies to limit the exposure of people to electromagnetic fields (EMF)' and 'facilitate[s] the introduction of appropriate measures to protect the public and workers from potential adverse effects of EMF'. The project goes on to note, yet again, the centrality of the ICNIRP standards in satisfying this role, '[an] important aspect of this model legislation is that it uses international standards that limits EMF exposure of people (ICNIRP exposure standards) and international standards that limit the emissions of EMF from devices (IEC and IEEE device emission standards)' (WHO 2006b, 5). Interestingly, whilst packaged as an initiative to 'limit' the exposure of people to electromagnetic fields the legislation through its foundation in ICNIRP, and as an extension of the harmonization initiative (noted above), is more consistently able to be explained as an initiative to encourage nation states *not* to develop more stringent standards relying on precautionary approaches (see further discussion below). Again, as with the project's 'harmonization map', the documents relating to model legislation go beyond providing information and advice, but actually also provide a simulated materialization, an enactment, of ICNIRP's preferred EMF policy.

Providing 'a framework for developing health based EMF standards'

This activity constitutes the project's most comprehensive effort to shape the EMF question and bring Nation States considering precautionary policies back into the ICNIRP fold. In a preface to their document for providing a framework for standards the WHO explain their rationale in the following terms:

> While the WHO strongly promotes the use of international standards, some countries feel the need to develop or refine their own standards. This Framework is intended for national advisory and / or regulatory bodies that are developing new standards for EMF, reviewing the basis of their standards, or reconsidering specific quantitative values such as reference levels and safety factors. The overall purpose of this Framework is to provide advice on how to develop science-based exposure limits that will protect the health of the public and workers from EMF exposure (WHO 2006a, 5).

Mirroring van Deventer's earlier position, the project explains the problem of differing national standards for global trade causing confusion and anxiety amongst the public and problems for manufacturers. Adding to the project's earlier concern with national political and social differences providing a source for standards not being science based, further explanations are provided in more detailed terms:

> Some of the disparities in EMF standards around the world have arisen from the use of only national databases, different criteria for accepting or assessing individual studies, varying interpretations of scientific data or different philosophies for public health standards development (WHO 2006a, 7).

Some of these challenges can also be explained according to the 'deficiencies in communications among scientists from different regions' (WHO 2006a, 7).

Building on earlier preoccupations with harmonizing of standards these concerns begin to feedback 'upstream' into the actual processes of interpreting and communicating science. These more overtly epistemic concerns are developed in more detail later in the document. The project

presents the following selection criteria to establish whether individual studies are worthy of inclusion in the database for health risk assessments:

- Quality of study design
- Quality of study conduct
- Quality of reporting
- Peer-reviewed publications
- Usefulness for standards (WHO 2006a).

The document goes on to explain these criteria and provides explanatory commentary in sections titled 'Assessment of the Scientific Research' (WHO 2006a, 15–21) and a detailed appendix 'Criteria for Research Studies' (reproduced from Repacholi 1998) for evaluating human, animal and cellular studies (WHO 2006a, 35–39). Similar to other 'quality in science' movements such as the US Supreme Court decision in *Daubert v Merrell Dow Pharmaceuticals, Inc.* and Evidence Based Medicine (Edmond & Mercer 2004a; 2004b; Mercer 2008), criteria for what should count as good science for the purposes of standard setting are elaborated upon in some detail.

Interpreted in isolation, the criteria, commentary and appendix, reproduce fairly unexceptional models for maintaining quality in science, taken as a whole nevertheless, and in the context of the EMF debate more generally, they can be better interpreted as an epistemological template providing reasons to reject the value of all but a small number of studies for guideline / standard setting.

Various possible reasons to reject studies for the process of guideline / standard setting are presented, for just a small sample, the following examples can be listed:

- Successfully passing through the process of peer review is not enough in itself for a study to be considered given that the 'rigour of peer review varies widely among scientific journals'.
- Under the criteria of *usefulness for standards* there is a space for studies to be rejected if they involve extrapolation of results from levels of EMF exposure not matching actual exposure regimes.

– Whilst epidemiological evidence is given the premier position for the purposes of standard setting, the reader is reminded of the various qualifications that need to be made when considering epidemiology (and scientific studies more generally) for the purposes of standard setting. Such qualifications include:

  (a) The importance of strength of association, for example, they note that the epidemiology linking EMF and childhood leukaemia only suggests a risk ratio of 1.5–2 and that smoking has a risk ratio of 10.

  (b) The ability of a study to identify true risk without bias and confounding.

  (c) The importance of a dose response relationship between an EMF exposure and a health outcome.

  (d) The existence of laboratory evidence of whole animals not just in-vitro cellular studies.

  (e) Whether a study relies on plausible biological mechanisms for a link between EMF field exposure and the health outcome being considered.

  (f) 'Stand alone' studies are of limited value, as 'the existence of biological effects and health hazards can only be established when research results are replicated in independent laboratories or supported by related studies' (WHO 2006a, 18–20).

Considering the list above the perennial question of politically motivated epistemological gerrymandering reappears: setting standards so high as to protect liberal or passive regulatory regimes, or tailoring scientific standards in 'advance' in anticipation of their likely dampening effect on meaningful regulation (Edmond & Mercer 2004b; Michaels & Monforton 2005). In the context of the WHO's EMF project the integration of these criteria into standards and guidelines and model legislation helps make this dampening process more complete. Consistent with this, there is also a predisposition for the project to indicate models of good science which fit in with what its 'vertically integrated' structure can offer: models which fit its bureaucratic epistemic style. The following quotes reflect these orientations quite explicitly:

> There needs to be a *comprehensive and critical scientific review undertaken by a panel of recognized experts* that include all appropriate scientific disciplines (…) To ensure a comprehensive assessment, it may be helpful to use *standard review forms*, such as those used by the IEEE for dosimetry, in vitro, in vivo, human volunteer and epidemiological studies (WHO 2006a, 16, italics added).
>
> Interpretation of these studies can be controversial as there exists a spectrum of opinion within the scientific community and elsewhere. In order to achieve as wide a degree of consensus as possible, an overall assessment (also called health risk assessment) often draws on *reviews already completed by other national and expert review bodies* (WHO 2006a, 18, italics added).

Further reinforcing these claims the project also suggests the importance of drawing upon pre-existing reviews performed by bodies such as ICNIRP, criteria such as 'Bradford Hill' and previous review papers published by Repacholi on criteria for EMF health risk assessment (Repacholi & Cardis 1997; Repacholi 1998; WHO 2006a, 18).

As important as this extensive epistemic guidance in relationship to establishing quality science for standard setting is, it is also important to set it against the project's overarching policy dictum that Nation States should not really be developing their own standards in the first place. Interestingly, considering the rhetoric that one of the key rationalizations for internationally harmonized guidelines is to provide protection for public and workers from EMF exposure, the extract from the project's website quoted below suggests that one of the WHO's key concerns is less to protect the public or workers from the absence of standards or guidelines, or ones more liberal than ICNIRP, but rather, to 'protect them' from the development of standards more stringent. The project asks Nation States to consider five questions before setting their own standards:

> (1) Do international standards truly not provide adequate protection?
>
> (2) In developing national standards, what is the accrued benefit to health?
>
> (3) Is the development of a separate, more stringent national standard and the additional compliance procedures truly cost-effective from both a public health and an implementation perspective?

(4) Will the more conservative limits be a barrier to the introduction of new technologies, which may have significant benefits to health, and to international trade?

(5) If the underlying reason comes from public concern, will the existence and implementation of these new regulations or guidelines alleviate the problem? (WHO 2006a, 13).

It is also worth commenting on the fourth point (above), in particular the notion that more conservative limits might constitute a barrier to the introduction of new technology that may offer significant benefits to health. This suggestion is bolstered by the project in a number of places reminding the reader that the WHO's foundational definition of health involves 'complete physical, mental and social well being …'. By emphasising this definition of health the project helps legitimate the extension of its expertise from being closely associated with the traditional core activities of ICNIRP, of evaluating the scientific value of studies for standard setting purposes, to engaging in cost-benefit analysis of the health, economic and social cultural even psychological benefits of EMF producing technologies. For example the possible benefits of mobile telephones in reporting disease and coordinating medical responses on developing countries can be used as an argument for avoiding stricter EMF safety standards. Interestingly the drive for the international harmonization of standards can then be used to keep standards liberal in developed countries where different cost benefit outcomes may apply.

Public education programs

In various places the project identifies public anxiety as a major problem fuelling the EMF debate. The project suggests that a major contributor to public anxiety is inadequate scientific information about EMF, something that the project can help alleviate by providing various information packages and through organising various forums and conferences examining the problems of risk communication (WHO, 2002). Much of this activity is framed in terms of a public literacy deficit model (Wynne 1995; Irwin

& Wynne 1996). Interestingly, and a little more idiosyncratically, the project also suggests that an important part of its warrant for engaging in public education, is not only to help the public more clearly understand the science of EMF, but also to in the process of helping the public avoid irrational stresses over concerns about EMF contribute to the material improvement of public health. As noted above in a number of places the project reminds the reader that this broader role is consistent with the foundational definition of health developed by the WHO. In keeping with one of the WHO's priority areas of children's health one of the project's initiatives in terms of public education has been to establish an online survey for children administered by Kwan-Hoong Ng from the department of Biomedical Imaging at the University of Malaya, Malaysia (WHO 2008). The initiative titled 'Survey on the students' understanding of mobile phones and electromagnetic fields' involves 20 questions and notes that only children between 6 and 17 years of age are allowed to answer. The information gained from it will be used in helping the project: 'to prepare an educational website and other materials especially for school children to learn more about mobile phones and electromagnetic fields' (WHO 2008, 1). Interestingly rather than health, the bulk of the survey is concerned with questions such as:

> How many mobile phones have you ever had including the present one? How long have you been using your mobile phone? How often do you use your mobile phone a day? How many text messages do you send a day? Do you think mobile phone is an essential item for you? (WHO 2008, 2).

The following questions are the only ones that touch directly on health:

> Have you ever heard that using a mobile phone can affect you health? If yes, where did you hear this? Do you think using a mobile phone can affect your health? If yes, what kind of health problems do you think mobile phones could cause? (WHO 2008, 3).

These questions are accompanied by a small number of 'multiple choice' boxes that may be ticked.

It is a little difficult to see how such an unfocussed and limited survey is likely to contribute much robust information to enhance public education,

perhaps more interestingly in the context of the current discussion the style of the survey clearly demonstrates how comfortable the project is in extending its primarily scientific based expertise into broader domains.

Concluding comments

The brief case study above of the vertical integration of expertise in the WHO's EMF project highlights the importance of STS analysts becoming sensitive to the processes involved in the extension of scientific expertise across multiple domains in longer standing scientific controversies. The analysis of the project provided an opportunity to document a number of the rhetorical strategies it adopted in the processes of extending and legitimating its authority. One of the important themes that stood out was the way the project packaged its knowledge claims into strategically coherent wholes. Knowledge claims were in a sense packaged holistically and projected into an ideal world that was being simultaneously rhetorically constructed. Two examples of this process stood out: First, the way the project was 'articulated' with the best science by offering templates for what should count as the best EMF science consistent with the types of science that the project supported, and second, the way claims for the harmonization of standards were not only linked to the authority of ICNIRP, and accompanied by critiques of alternative approaches, but also involved the construction of exemplary templates of legislation and maps of the world allowing measurement and visualisation of the processes of harmonization. In both examples the project manufactured projections of the world to suit its political vision of a world in which the EMF debate was already closed.

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