

PRESENTATION

Raymond Neutra
California Department of Health Services
Emeryville, CA

Raymond Neutra made the presentation for this last Topic. Material that adds to what has been presented in the synopsis is found below. This summary has been prepared from the transcript of the proceedings and from slides prepared by the presenter. The material has been reviewed by the presenter for accuracy.

Neutra's stated purpose in addressing policy implications in this presentation was to show how risk assessment, exposure assessment, and engineering information can be "packaged" to address concerns of stakeholders who will contribute to EMF policy. Such stakeholders might include the following: utility companies, unions, other employers, electrical contractors, appliance manufacturers, individual citizens, the state or federal Department of Transportation, planners, and school representatives. The California Department of Health Services (DHS) is conducting such a process in California now.

As a visual aid to his discussion, he presented a basic decision tree outlining the types of decisions that stakeholders will encounter. (Figure 14-1) Decisions will have to be taken regarding mitigation options (from doing nothing to doing more research to questions of cheap vs. expensive solutions), the certainty of hazard (on a scale from safe, through degrees of increasing likelihood to "beyond doubt"), dose-response relationships (from flat to steep linear), and dose-frequency distribution after mitigation (low to high). One of the difficulties that scientists face in interacting with laypersons making these decisions is that scientists and engineers tend to distinguish choices and effects in terms of shades of gray, while others may wish or may choose to divide issues sharply into areas of snow-white or coal-black. The decision tree attempts to codify shades of gray.

Neutra suggested that there are two respected traditions in making decisions with ethical implications: the "Jeremy Bentham utilitarian" approach (the greatest good for the greatest number) and the "Moses" approach (do the right thing no matter what). Scientists may be more likely to fall into the former category, and "just about everybody else" (including lawyers) into the latter.

These different approaches come into sharp focus when the issue of environmental justice (see below) is raised. Questions such as who gets exposure risk costs and benefits, degrees of certainty about hazard, lifetime risk to the most highly exposed group, and personal mitigation choices can be raised. Those who look at questions as to whether certain groups of people bear the weight of more health or environmental hazards than the average citizen tend to take the "do the right thing no matter what" approach. They feel they ought to have a stronger voice in location of such burdens in their neighborhood (for instance: whether a line should be located or upgraded in a corridor that already contains, say, refineries with possible toxic wastes, superhighways, or other potential polluting elements).

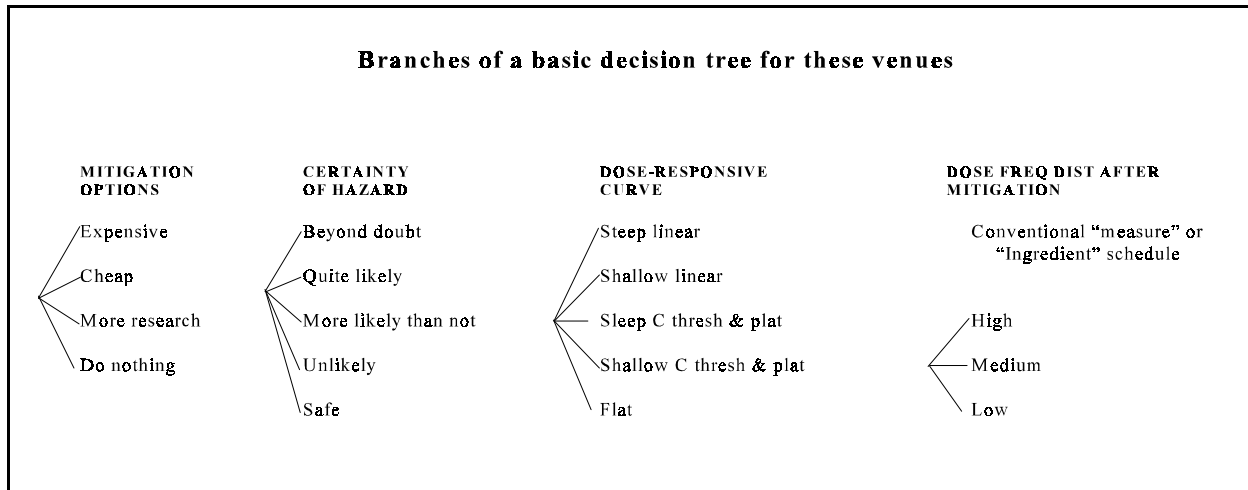


Figure 14-1. Branches of a basic decision tree for these venues.

Although the RAPID program has not focused on such issues (which are often associated with class or race), epidemiologists are interested in them because, for instance, race is related to disease. A utilitarian will look at the incremental cost of mitigation options to see whether they are cost-effective; the “Moses” ethicist will ask about fairness. Neutra noted that utilitarians feel very uncomfortable with the environmental justice issue, while the environmental justice people feel uncomfortable with having costs and benefits raised.

These views can be associated with the distinction between a “gray” approach and a “coal-black/snow-white” approach to policy making, and affect who makes policy. Politicians and regulators are comfortable with a finding (such as that by the National Academy of Science) that applies a standard of “beyond a reasonable doubt” for evidence of positive proof of a relationship and that therefore states that there is no clear and conclusive evidence. However, such a position can lead to inaction where action might really be advised. On the other hand, where scientists specify a “shade of gray,” the politicians must make the policy in response to the finding. The difficulty is that the public is, in general, less than comfortable with “gray” findings. Who acts at varying degrees of certainty (shades of gray) is shown in Figure 14-2.

Neutra discussed how the selection of a dose-response relationship affects the number of persons affected by an environmental agent such as EMF. To estimate the number of affected persons, say, cases of cancer from EMF, requires 1) an estimate of the distribution of exposure in the population (number of people versus intensity of exposure); and 2) the added rate of disease for a given intensity of exposure (dose-response curve). The number of cases at a given intensity is given by the product of the number of people at that intensity and the added rate of disease at that intensity. By summing over all intensities the total number of cases is determined. The selection of a dose-response curve will directly affect the number of cases at each intensity and the total number. If the dose-response curve is a step function (the simple yes-no response typically used in epidemiologic studies), then lower exposures (where most people are in a log-normal distribution) contribute no cases. On the other hand, if the dose-response curve is linear, then the highly populated low-exposure group can contribute a significant number of cases, while the high-exposure group contributes a similar number of cases as with the simple model. The result

POLICY IMPLICATIONS

can be a substantial change in the total number of cases depending on the dose-response curve. The dose-response relationship is therefore an important factor in any cost-benefit analysis and in the outcome of the decision analysis.

Degree of certainty is usually a shade of gray, not snow white (safe) or coal black (beyond doubt)	
DEGREE OF CERTAINTY	WHO ACTS AT THIS THRESHOLD
hazardous beyond doubt (coal black) > 99%	regulatory science, criminal law “consistent and conclusive evidence”
quite likely to be a hazard (darker gray) 75-96%	cautious decision-makers guilty in civil law
more likely than not a hazard (dark gray) 50.1-74%	cautious decision-makers guilty in civil law
not so likely to be a hazard (light gray) 26-49.99%	cautious decision-makers innocent under the law
beyond doubt not a hazard (snow white) < 1%	very cautious decision-makers innocent under the law

Figure 14-2. Degree of certainty is usually a shade of gray, now snow white (safe) or coal black (beyond a doubt).

Another factor that needs to be considered in working through the dose-response portion of the decision tree is the multiplicity of “ingredients” that make up electric and magnetic fields. Neutra used an analogy for EMF as a cup of coffee: not only is there more to coffee than caffeine (a host of other factors), but it makes a difference in effects as to whether you drink it in little sips all day or down the whole quart at once. The time period of interest for EMF exposure must also be considered: is the exposure accumulated over a lifetime important (as with ionizing radiation) or is only the instantaneous exposure important (as with bright light that affects only one diurnal melatonin cycle). Both these factors hint at the complexity of the dose-response curve and the difficulty in determining it.

Neutra noted that epidemiology might provide some empirical guidance to reduce the complexity of the dose-response relationship. To use epidemiology to identify whether there is a factor that causes effects and what it might be, two conditions must be met. First, this “ingredient” must exist in the environment where the epidemiology was carried out. Second, if it does exist in the real world, it has to be correlated with wire-code category and TWA. With these two principles in mind, the 400,000 combinations referenced early in the symposium have some hope of being whittled down to a manageable number.

Neutra concluded by presenting some data regarding environmental justice as an issue. Those who become advocates for groups of people who are unduly burdened often assert that those people ought to have priority for retrofitting (to reduce fields), and perhaps defended against new exposures in their neighborhoods. Advocates often argue for action on lower degrees of certainty and for close involvement in the decision process.

As to the question as to whether environmental justice is a real issue: Neutra noted that there are 40 completed studies that find certain groups or neighborhoods have more unwanted impositions—dump sites, refineries, chemical companies, and so on. For EMF, the data are limited. He cited the ongoing California school measurements project: it shows that schools with a high rate of free lunch (lower socioeconomic status) have more video display terminals that give off 2 mG at one foot than do “rich” schools: the probable explanation is older vs. newer equipment. An overlay of data from a study of electric blanket use and pregnancy outcome in the California Bay Area indicated that a person in a VHCC wire-code category was more likely to be near a dump site, and that a person with high PE measurements was somewhat less likely to be near a dump site. The data were also consistent with the findings cited above, that persons who were poor, who only had a high school education, and who were black were more likely to live near a dump site.

To follow up on the dose-response issue, Neutra expressed strong interest in reviewing studies that examined correlations between different measurements and between measurements at different times. These include the Back to Denver study, Carnegie Mellon EMDEX correlation studies, EPRI transients pilot project, the California school study, and others. Resources to carry out such a project would be needed.

Neutra concluded by noting that the role of the DHS in the ongoing EMF policy formation process in California was to try to be an impartial referee among the various stakeholders and make sure that they get the information they feel they need to argue this issue; that is, to lay out policy options and the likely criteria for judging them. Contractors are assembling the facts about exposure and cost and developing methods to analyze decisions. The stakeholders will critique and use these products in their deliberations. He noted that his department’s responsibility will then be to update the NIEHS hazard identification in a year and one half, and will provide a degree of certainty about hazard. At that time they may also comment on the degree to which they know or do not know the dose-response relationships for differing endpoints.

SUMMARY OF DISCUSSION

Several issues came under discussion following the presentation on policy implications by Dr. Raymond Neutra. The summary below was prepared from the symposium transcript.

Environmental Justice

Dr. Gary Boorman of NIEHS commented that one reason environmental justice questions had not been linked with EMF was the lower rate of childhood leukemia among African-American children compared with that for white Americans. He also noted that an ongoing study of breast cancer among African-Americans and Hispanics has an EMF component.

In response to a comment about the diversity of people using environmental-justice type arguments in an EMF context, Neutra related an observation from an EMF environmental-justice workshop held by the DHS in California. Participants at that meeting noted that, because electrical system impacts are distributed everywhere (as opposed to locally, like those of a dump site), decisions about mitigation for a few who are spread throughout a region become *ethical* questions instead of environmental-justice questions: that is, a question of whether the majority will fund benefits for a minority, say, the 5% or 6% of VHCC houses in a region.

Multitude of Components in Decision Analysis

Several discussants pointed out that there are many more components on the decision trees than just those related directly to EMF, and that we should not lose sight of them. For example, school administrators deciding whether and how to spend money for EMF mitigation are also faced with issues such as class size, number of teachers, installation of metal detectors, and so on. Decisions on EMF could affect these other issues. Another tradeoff for EMF mitigation is cost of service: a small rate increase to support field management can affect the health care and quality of life of fixed-income customers.

Neutra responded that a multitude of issues would be highlighted in the policy discussion for the California process. For example, in schools the same decision-makers would have to budget for rewiring to reduce fields from neutral currents *and* for installation of metal detectors or removal of lead sources. They would have to make tradeoffs between different environmental problems.

Neutra noted that addressing reductions in exposure for the power grid presented different questions. For example, the most cost-effective means of reducing exposure might be for the utilities to buy up all the electric blankets, resulting in a reduction in disease comparable to the more expensive alternative of burying electric lines. Of course, this raises other issues such as impacts on people left living next to lines. According to Neutra, these types of questions need to be laid out fully in the policy analysis and argued in the public venue.

California Policy Formulation Process

Neutra also discussed how the approach being developed by the DHS will allow examination of different assumptions and strategies in the policy-formulation process. These strategies will include the more costly ones that may affect only a few individuals, as well as the more universal and cheaper ones. He hopes that by having a discussion with all the stakeholders and having health educators boil it down so that the issues are clear, the quality of the public discussion on this complex issue will be better.

In response to a comment about how the public view of risk may be tempered by false impressions of risk and other issues such as aesthetics, Neutra noted that there would be opportunities for public input of this type of concern in the California process. The material developed by DHS, its contractors, and the stakeholders will be turned over to the Public Utility Commission (PUC). The PUC will then have hearings where different points of view can be expressed. However, this hearing will be global, in that it addresses much broader questions than those focused on an individual reaction to the siting of a line by a single utility.

NIEHS Risk Assessment Process

One discussant questioned the outcome of the risk-assessment process being pursued by NIEHS: is the process to distill all the research reported at the symposia into a simple yes/no hazard evaluation of magnetic fields with a decision on whether to mitigate, or not? If so, would this process mean that the research to date would be put “in the garage” for no other purpose than the magnetic-field risk assessment? Frank Young commented that the risk-assessment process should acknowledge such questions as: other causes of cancer that EMF research has identified; the cost-effectiveness of mitigation for factors besides EMF; and policy analyses that address other putative causes of cancer besides EMF.

It was the strong opinion of another discussant that this body of research was important and would not be shelved. Our use of electricity is so fundamental and pervasive that anything learned about the interaction of electric and magnetic fields and biological systems will be important in the future.

Alternatives to EMF Mitigation

The use of field-management resources for other activities that might provide larger public-health benefits can also be raised: for example, would the money be better spent on an anti-smoking campaign than on burying lines? Neutra felt that there were limits to what you could expect the PUC to authorize and that an anti-smoking campaign was not likely to be viewed as being within the PUC’s domain of discretion.

Neutra was asked to discuss the reconciliation of the public health professional’s role in helping society allocate resources with the administrative role of seeking support for specific issues that may not have a clear health impact, such as EMF. Neutra responded that DHS is very aggressive and advocatorial in nature when a public health issue is beyond a reasonable doubt. With EMF, which is not beyond a reasonable doubt, it is more difficult to define what our proper role is. At

POLICY IMPLICATIONS

this phase of the policy-development process, the role is to provide the PUC with a policy analysis and with DHS' estimate of the degree of certainty or uncertainty about potential EMF hazards.