

# **Statement on Mobile Phones and the Potential Head cancer risk for the EMF Hearing on EMF, Council of Europe, Paris, February 25<sup>th</sup> 2011**

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## **Introduction**

We are grateful for this chance to provide some input into this timely hearing on EMF. You are responding to increasing public awareness and concern about the potential hazards of electromagnetic fields, particularly from mobile phones.

The European Parliament<sup>1</sup> has responded to this public concern with a resolution on EMF in 2009 which, among other things, called for lowering exposure to electromagnetic fields and for lower exposure limits that would better protect the public from health hazards. We share these recommendations.

The EP Resolution followed the EEA's first "early warning" on EMF issued in September 2007, which was updated, with a focus on mobile phones and head tumours, in Sept 09<sup>2</sup>.

We confine our evidence to a summary of the evidence on mobile phones and head cancer.

Today we would like briefly:

- to describe the role and mandate of the EEA;
- to summarise our views about some of the benefits and potential costs to health of mobile phones;
- to share with you some practical implications of the current evidence on the head cancer risks from using mobile phones, especially for children and young adults; and
- to conclude with brief observations about three relevant and more general issues: transparency in the evaluation of scientific evidence; the adequacy and funding of independent research into

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<sup>1</sup> European Parliament resolution of 2 April 2009 on health concerns associated with electromagnetic fields (2008/2211(INI))

Statement on Mobile Phones for Conference on Cell Phones and Health: Science and Public Policy Questions, Washington, 15 September 2009, Professor Jacqueline McGlade, Director, European Environment Agency, Denmark.

environmental and health hazards; and the harassment of early warnings scientists.

We have also tried to provide this information in ways that would help improve the understanding of how other potential environmental stressors can be identified, evaluated, and minimised.

### **The role of the EEA and past work on the precautionary principle**

The EEA provides data, information and knowledge on the environment, including its impacts on public health, to EU institutions (the European Parliament, European Commission, and European Council of Ministers), to the 32 Member Countries of the EEA, and to the general public .

The EEA does not routinely carry out *specific* risk assessments on individual hazardous agents, such as radio frequencies from mobile phones. However, the EEA does have relevant knowledge and expertise about the way in which the overall scientific evidence on hazards and risks is evaluated.

Some of this knowledge is to be found in the EEA Report, 'Late Lessons from Early Warnings: the Precautionary Principle 1896–2000' published in 2001. This report reviews the histories of a selection of public and environmental hazards, such as asbestos, benzene, X rays, acid rain, and PCBs. These histories run from the first scientifically based early warnings about potential harm to subsequent inactions, or to precautionary, and then preventative, measures.

The EU Commission and the EEA sees the precautionary principle as central to public policymaking where there is scientific uncertainty and high health, environmental and economic costs in acting, or not acting, when faced with conflicting evidence of potentially serious harm.

This is precisely the situation that characterises EMF at this point in its history. Waiting for high levels of proof before taking action to prevent well known risks can lead to very high health and economic costs, as we have seen with asbestos, leaded petrol and smoking.

For example, taking effective *precautionary* action to avoid the *plausible hazards* of smoking in the late 1950s or early 1960s would have saved much harm, health treatment costs, and productivity losses from smoking. Waiting to *prevent* the then *known risks* of smoking in the 1990s, or later, incurred very these large costs to smokers, their families, and taxpayers.

Both the precautionary and preventative principles, along with the principles of the polluter pays and the reduction of hazards at source, are provisions of the EU Treaty, and all are applicable to health, consumer, and environmental issues, such as EMF.

Over 60 international treaties, including the Third North Sea Ministerial Conference, 1990, have included reference to the precautionary principle, or to the precautionary approach. A recent legal review points out that there is little, if any, practical difference between these two concepts<sup>3</sup>.

However, there remains an absence of a clear and comprehensive definition of the precautionary principle at EU level. The EEA, in response to the debates on the precautionary principle since its 2001 report, has produced a working definition:

*‘The Precautionary Principle provides justification for public policy actions in situations of scientific complexity, uncertainty and ignorance, where there may be a need to act in order to avoid, or reduce, potentially serious or irreversible threats to health or the environment, using an appropriate strength of scientific evidence, and taking into account the pros and cons of action and inaction’*

The definition is proving useful in promoting a shared understanding of the precautionary principle. It is explicit in specifying both uncertainty and ignorance as contexts for applying the principle; it is couched in the affirmative rather than the negative; and it explicitly acknowledges that a case specific sufficiency of scientific evidence is needed to justify public policy actions, given the pros and cons of action or inaction.

The definition also explicitly widens the conventionally narrow, and usually quantifiable, interpretation of costs and benefits to embrace the wider and sometimes unquantifiable, “pros and cons”. Some of these wider issues, such as loss of public trust in science, are unquantifiable, but they can sometimes be more damaging to society than the quantifiable impacts: they therefore need to be included in any comprehensive risk assessment. (See chapter on BSE in “Late Lessons from Early Warnings”, EEA 2001).

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<sup>3</sup> A.Trouwborst, The Precautionary Principle in General International Law: Combating the Babylonian Confusion, RECEIL, 16(2) (2007) p185-195.)

## **The Benefits of mobile phones and potential hazards of EMF**

The EEA greatly appreciates the benefits of mobile phone telephony. Indeed, the Agency is actively encouraging it as a means of communicating environmental and related information to the public.

We have ambitious plans, for example, to help ‘citizen scientists’ to collect data on environmental parameters, such as bird movements, fish stocks, water quality, the flowering season, and alien species, and to communicate such data ,via mobile phones, to central data banks such as those hosted by the EEA and others.

Our promotion of this use of mobile telephony increases our responsibility to provide information that can help ensure the safety of the public when using mobile phones, especially the more vulnerable groups in society such as children, the elderly, pregnant women, and the immuno-compromised.

This is one of the reasons why the EEA issued an “early warning” about the potential hazards of EMF on 17 September 2007, and updated it with a focus on mobile phones on September 15 2009.

In these statements we drew attention to the “BioInitiative” report and to the other main sources of evidence relevant to this debate, from the EU, the WHO, the UK National Radiological Protection Board, and to the special issue on EMF of the journal of The International Society for Pathophysiology<sup>4</sup>-all of which are cited in the References below.

Taken together this evidence provided the basis for our early warnings.

Based on our experience with the “Late Lessons from Early Warnings” reports (EEA, 2001 & 2011, forthcoming) we noted in 2007 that:

*‘There are many examples of the failure to use the precautionary principle in the past, which have resulted in serious and often irreversible damage to health and environments.*

*Appropriate, precautionary and proportionate actions taken now to avoid plausible and potentially serious threats to health from EMF are likely to be seen as prudent and wise from future perspectives”.*

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<sup>4</sup> Physiopathology, Special Issue on EMF, Vol 16, Issues 2-3, August 2009.

Jacqueline McGlade, Sept 17<sup>th</sup> 2007, EEA website.

In 2009 we said that:

*“The evidence for a head tumour risk from mobile phones, although still very limited, and much contested, is, unfortunately, stronger than two years ago when we first issued our early warning”.*

*The evidence is now strong enough, using the precautionary principle, to justify the following steps:*

- 1. For governments, the mobile phone industry, and the public to take all reasonable measures to reduce exposures to EMF, especially to radio frequencies from mobile phones, and particularly the exposures to children and young adults who seem to be most at risk from head tumours. Such measures would include stopping the use of a mobile phone by placing it next to the brain. This can be achieved by the use of texting; hands free sets; and by the use of phones of an improved design which could generate less radiation and make it convenient to use hands free sets<sup>5</sup>.*
- 2. To reconsider the scientific basis for the present EMF exposure standards which have serious limitations such as reliance on the contested thermal effects paradigm; and simplistic assumptions about the complexities of radio frequency exposures.*
- 3. To provide effective labelling and warnings about potential risks for users of mobile phones. Across the European Union, the vast majority (80%) of citizens do not feel that they are informed on the existing protection framework relating to potential health risks of electromagnetic fields. 65% of citizens say that they are not satisfied with the information they receive concerning the potential health risks linked to EMF. (Special Euro barometer report on EMF, Fieldwork Oct/Nov 2006, published 2007).*
- 4. To generate the funds needed to finance and organise the urgently needed research into the health effects of phones and associated masts. Such funds could include grants from industry and possibly a small levy on the purchase and or use of mobile phones. This idea of a research levy is a practice that we think the US pioneered in the rubber industry with a research levy on rubber industry activities in the 1970s when lung and stomach cancer was*

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<sup>5</sup> We have since noted, with some relief, what appears to be an increased use of hands free devices, particularly in the younger generation, due to enhanced applications.

*an emerging problem for that industry. The research funds would be used by independent bodies<sup>6</sup>.*

## **Mobile phones & Head tumours: main features of the current evidence**

There are essentially four types of evidence that can be available to help us make decisions about hazards to health that may arise from environmental stressors: **epidemiological** (studies of the distribution of exposures and disease in people); **experimental, with live animals** (studies of exposure, disease and mechanisms of biological actions in rodents ,rabbits etc) ; **experimental, with biological cells and tissues** (studies of biological activity and responses to stressors); and **experiential**, ie learning from history and its events that may be analogous to the potential stressor being evaluated.

Taken together these lines of evidence about a potential environmental stressor (such as radiations, noise, chemicals, dusts, temperature etc., and of the mixtures of these, which is the relevant reality most of the time) could support a conclusion of **causality**, when the evidence is very strong from all four types, to **no causality**, when the *evidence* (as opposed to mere *absence of evidence*) is strongly against a link between environments and health.

In between these two extremes lies a continuum of evidence from a **scientific suspicion of risk** to **very strong associations** between the environmental stressors and harm

The overall **strength of evidence** that is deemed sufficient to justify specific decisions varies with the circumstances of each case.

For example:

- **very strong evidence** is usually needed to justify condemning a criminal to death or lifelong jail;
- a **medium “balance of evidence”** is usually sufficient to justify awarding compensation to injured people; or claiming that humans are disturbing the climate (IPCC, 2001);
- and **slight evidence** of a serious illness is usually sufficient for a doctor to prescribe some medical intervention; or for a regulatory

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<sup>6</sup> We have noted the increasing evidence of “funding bias” in scientific research whereby results outcomes are strongly linked to source of funding. This observation is based on evidence from pharmaceuticals, tobacco, lead, asbestos, BPA, and EMF, as well as on evidence from other fields such as CBA and Transport construction project cost estimations.

authority to ban some potentially serious activity, such as the US ban on imported beef that may carry BSE; or a ban on a pregnancy pill for which there is a suspicion of potential damage to the foetus.

It follows from the above that statements such as “*there is no convincing evidence that X causes Y*” (frequently found in reviews of evidence) are devoid of practical meaning, unless the implicit assumption, which is buried in that statement, is made explicit ie that the evidence for **causality (the highest strength possible)** is not convincing to the scientists making that statement.

**The choice of which strength of evidence is appropriate for a specific stressor and types of precautionary actions is an ethical issue** that turns upon the costs (quantitative and qualitative) of being wrong in acting or not acting.

For example, Sir Bradford Hill in his classic paper on association or causation in environmental disease written at the height of the smoking controversy in the mid 60s, proposed that “relatively slight evidence” of serious harm would be sufficient to justify banning a potentially teratogenic pregnancy pill, where the costs of being wrong in so acting would be much lower than the costs of being wrong in not acting to prevent exposure. (The thalidomide tragedy in the early 60s and the DES<sup>7</sup> tragedy of the 70s provide powerful analogous evidence when dealing with potential teratogens and other developmental and reproductive hazards. This is an example of “experiential” evidence).

In contrast, Bradford Hill suggested that a much higher strength of evidence would be needed to justify the government banning the voluntary acts of smoking, or eating fatty foods.

Given the serious and largely irreversible nature of the brain tumour risk from mobile phones, it would be appropriate to take action on relatively weak evidence for an effect.

It should also be noted that the *strength of evidence* does not determine the *strength of a recommendation for action*.

For example, there is very strong evidence that cars kill a lot of people but there are no strong society wide recommendations for a total ban on cars because of the large benefits that they bring; and a doctor would

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<sup>7</sup> See chapter on DES in “Late Lessons from Early Warnings”, EEA ,2001.

strongly recommend a particular medicine that had proven to be effective in preventing or curtailing a disease when the evidence for an impending but serious disease may be quite weak in that patient. (The widely adopted GRADE scheme for the evaluation of the evidence for pharmaceutical products and clinical interventions also makes this distinction between strengths of evidence and of recommendations, as does the European Centre for Disease Control).

Whilst the evidence on the head cancer risk from mobile phones is not currently very strong the recommendations on exposure reduction that flows from this evidence, cited above, can be very strong, given their low cost efficacy.

## **The Nature and Strength of the current evidence on mobile phones and head cancers**

### *Epidemiological Evidence*

We were hoping to see by now clear evidence that mobile phones are safe to use, particularly by children, as they absorb more radiation in their heads than adults, from the same phone exposure, and are more sensitive to that radiation.

Unfortunately, the epidemiological evidence for a head tumour risk from mobile phones, although still very limited, and much contested, is, unfortunately, stronger than in 2007 and 2009 when we issued our early warnings on EMF, particularly focused on RF from mobile phones and its possible link to head cancers.

The latest reviews of both the Hardell studies<sup>8</sup> and the Interphone<sup>9</sup> studies on brain cancers from mobile phones have noted their consistency when the analysis is rightly focused on the most likely at risk group ie those with longer than 10 years of exposure, where there is an approximately 1.5-2.0 fold increase in head cancers, particularly on the side of the head where the phone is most used.

The Cardis and Sadetzki review, published this month, is particularly relevant as the lead author, Cardis, was the Interphone study coordinator

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<sup>8</sup> Hardell, L. "Non Thermal effects and Mechanisms of interaction between Electromagnetic Fields and living matter", eds Guiliani L and Soffritti, M, ICEMS, Ramazzini Institute, Bologna, Italy., 2010. p 363.

<sup>9</sup> Cardis, E. Sadetzki S., "Indications of possible brain tumour risk in mobile phone studies: should we be concerned?". *Occup. Environ Med.*, March 2011 vol 68, No 3, p 169-171, downloaded Feb 15 2011.



when working at the WHO International Agency for Research on Cancer, and her co-author is another Interphone study participant.

They review both the Hardell and Interphone results and conclude, after a full discussion of the methodological strengths and weaknesses of the studies, that:

***“It is not possible to evaluate the magnitude and direction of the different possible biases on the study results and to estimate the net effect of mobile phones on the risk of brain tumours. The overall balance of the above mentioned arguments, however, suggest the existence of a possible association”.***

They conclude by recommending:

***”Simple and low cost measures, such as the use of text messages, handsfree kits and/or the loudspeaker mode of the phone could substantially reduce exposures to the brain from mobile phones. Therefore, until definitive scientific answers are available, the adoption of such precautions, particularly among young people ,is advisable.”(p 170).***

A recent paper from Japan<sup>10</sup> was not included in the review by Cardis, but it too found an increase risk for acoustic neuromas in the longer exposed groups. They concluded:

***“The increased risk should be interpreted with caution, taking into account the possibilities of detection and recall biases. However, we could not conclude that the increased risk was entirely explicable by these biases, leaving open the possibility that mobile phone use increased the risk of acoustic neuroma”.***

This paper is also significant because it comes from the same country Interphone study team which did not find evidence of head cancers in its earlier report several years ago-time has probably been the main factor in now revealing this slightly positive effect.

If the brain cancer risk from mobile phones is real, and we want to prevent, as opposed to merely count, cancers, then there is now sufficient evidence to justify reducing exposures, especially in children, as

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<sup>10</sup> Yasuto Sato et al., *Bioelectromagnetics* 32:85–93, 2011..

recommended by the UK Radiological Protection Board Stewart Report 8 years ago.

As the Interphone report is confined to those aged over 30 at the start of the study we must wait for the results of the Mobikids<sup>11</sup> Study funded, by the EU, before we have any results on possible cancer effects in children and young people.

However, it is of particular concern that the increased risk for the under 20 at first exposure group in the Hardell studies display a 5 fold increase in risk, compared to the roughly 1.5- 2 fold risk for the average of all long term users.

Finally on the epidemiology, although the overall trends in specific cancer rates can be a poor guide to the presence of cause/effect links (because of other causes of the same cancer, long latency, and small numbers of exposed in the early days) it is of some concern that the trend in cancer of the paratid gland, which is adjacent to the head location of the mobile phone, in Israel is rising now rising<sup>12</sup>, with the steepest rise after 200, whilst other salivary gland tumours have remained stable; and the trend of brain cancers in Sweden appears to be rising<sup>13</sup>. Both Israel and Sweden are amongst the heaviest and earliest users of mobile phones.

### *Experimental Evidence*

The evidence from experimental studies in animals and cells is largely confined to short term studies of non cancer biological effects and to mechanisms of biological actions. The long term studies of ELF and RF are rare, methodologically weak, and largely negative. The exception is the recent large scale and foetal to mortality rat study by the Ramazzini Institute<sup>14</sup>. Preliminary results show an increase in mammary gland tumours from the combination of ELF and gamma radiation.

This evidence on these non thermal effects of ELF and RF has been recently and comprehensively reviewed by the Ramazzini Institute<sup>15</sup>. It contains much detailed evidence which, taken as a whole, provides

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<sup>11</sup> Contact [ecardis@creal.cat](mailto:ecardis@creal.cat) for details.

<sup>12</sup> Czerninski et al, "Risk of Paratid Malignant Tumours in Israel (1970-2006)", *Epidemiology*, Jan 2011, v 22, Issue 1, p130-131

<sup>13</sup> Hardell , ref 8.

<sup>14</sup> Soffritti M et al, "Mega-experiments on the cacinogenicity of ELF Magnetic fields" . Chapter In ref 15.

<sup>15</sup> "Non Thermal effects and Mechanisms of interaction between Electromagnetic Fields and living matter", eds Giuliani L and Soffritti, M, ICEMS, Ramazzini Institute, Bologna, Italy., 2010.

further grounds for heeding the early warnings and taking the precautionary measures outlined above.

It is sometimes claimed that:

- the scientific basis for the current ICNIRP limits for exposure to EMF are safe;
- that children are no more sensitive than adults to the RF from mobile phones;
- that there are no biologically significant effects from non thermal levels of EMF, and
- that, if there are such effects, there are no acceptable mechanisms of action that could explain these effects.

However the recent 400 page review by the Ramazzini Institute and ICEMS provides a wealth of evidence to the contrary.

Its main findings are therefore summarised in the **Annex** to this evidence.

### **Transparency in the Evaluation of Evidence**

We are pleased that Chris Wild, Director of IARC, finally managed, in 2010, to get the Interphone study published after 4 years delay, apparently caused principally by the 13 scientists who were unable to agree on interpretations of the results.

However, we were disappointed that the large differences of interpretation within the group of Interphone scientists about the strength, direction and implications of methodological biases were not clearly explained in the published report.

In 2009, the EEA asked Chris Wild to make these differences of interpretation transparent when they published their report so as to help decision makers and the public better understand how different scientists can come to very different conclusions about the same data.

There are at least 4 possible interpretations of the Interphone or any similar type of study: there is no link between mobile phones and brain cancer; the few suggestive results of a risk are the result of biased methodology; the links are just random; or they are indicative of a true risk.

It would have been helpful to see which of the scientists who authored the Interphone paper thought what, and for which reasons, when it was

published in 2010. Not doing so caused the kind of confusion amongst journalists, policymakers and the public that we had predicted.

For example, from media reports (Microwave News May 17<sup>th</sup>), we learn that Cardis, the coordinator of the Interphone study, thought that “overall..the results show a real effect”; Armstrong thought that “it shows some indication of a risk of gliomas but I cannot say this with certainty”; and Sadetzki thought the results have consistency in indicating a risk but whilst not “strong enough for a causal interpretation they are sufficient to support precautionary policies”. In contrast, another co-author ,Feychting, thought that “the use of mobile phones for over ten years shows no increased risk of brain tumours”.

(Feychting and Ahlbom, another Interphone author, took part in a press conference at their Institute a day before the IARC embargoed release date for the study, which seemed to compound the confusion, at least in Sweden.)

Without the detailed transparency and honest dialogue about opposing views and their rationale that we called for in 2009, the public had to work it out for themselves via the rival media statements from the different Interphone factions, and varying journalistic interpretations, which appeared on publication of the results. (See the opposing headlines in the Daily Telegraph (there is a risk) with BBC News (there is no risk) on the same day of May 15, 2010, when the Interphone results were published.

We therefore strongly re-iterate our plea for greater transparency in the reporting of different interpretations of controversial data. This would also help clarify and better communicate the nature of the methodological and intellectual biases in all studies, which, along with periodic funding bias, contributes to differing evaluations of evidence and to controversy.

### **Adequate independent research into potential hazards to environment and health.**

If the public and environment are to be adequately protected from hazards of new technologies there needs to be sufficient independent research into potential risks early enough to prevent them. We are concerned that over the last three decades there have been large reductions in independently funded scientific research on environmental and related health risks compared to privately funded research on developing the new technologies.

For example, compare the excess of £220m spent on applications of nanotechnologies by the UK Engineering and Physical Sciences Research Council with less than £20m on the potential environment, health and safety hazards from nanotechnology by MRC and other government funded bodies, between 2004-2009.<sup>16</sup>

Meanwhile, industries are not forthcoming in releasing key risk data on, for example, GMOs<sup>17</sup> and nanotechnology<sup>18</sup>. In some areas, such as electro-magnetic fields<sup>19</sup> and GMOs<sup>20</sup>, significant barriers to independent research have also been created.

This not only leaves the public and the environment vulnerable to new hazards but the new technologies can themselves become vulnerable to premature restriction if hazards are not foreseen and minimised.

### **Harassment of “Early Warning” Scientists.**

It is important for society, science, and public health that scientists who bring early warnings of possible later harm are encouraged, rather than harassed.

It is disturbing to see that ever since Galileo was persecuted for publishing his “Starry Messenger” just 400 hundred years ago, claiming that the sun and not the earth was at the centre of the universe, those who prefer not to hear “inconvenient warnings” have tried to “shoot the messenger” rather than deal openly with the strengths and weaknesses of the new message.

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<sup>16</sup> (UK House of Lords Science & Technology Committee report on Nanotechnologies and Food, 8 Jan 2010, para 4.46.).

<sup>17</sup> In order to access Monsanto test data on the safety of a GM product, submitted to EFSA, independent scientist had to use the German courts to access and verify the data. De Vandemois et al, “Debate on GMOs Health Risks after Statistical Findings in Regulatory Tests”. Int J.Bio.Sci.,2010,6.

<sup>18</sup> The UK House of Lords report : “criticises the food industry for failing to be transparent about its research into the uses of nanotechnology and nanomaterials”. Ref 16.

<sup>19</sup> “This approach (long term cohort studies) was blocked in the USA through litigation”. Saracci R, Samet, J, “Commentary: a look at the Interphone study results”, In J Epidemiology, 2010,1-4, May 18, 2010.

<sup>20</sup> See letter from 24 leading corn insect scientists to the US EPA concerning the way GMO technology agreements “explicitly prohibit research”, Feb 19, 2010. Their names had to be withheld “because all of us require cooperation from industry at some level to conduct our research”. See “Conducting public sector research on commercialised transgenic seed”, Sappington et al, www.landbioscience.com v. 1, issue 2, 2010, Mar/April

In our reports on “Late Lessons from Early Warnings”<sup>21</sup> we have observed how early warning scientists in the lead and mercury stories have been harassed, frequently suffering from discrimination, from loss of research funds, and from unduly personal attacks on their scientific integrity.

This practice of harassment appears to be continuing with scientists studying Climate Change<sup>22</sup>, GMOs<sup>23</sup>, and electro-magnetic fields<sup>24</sup>. Scientific associations, lawyers, and politicians should therefore consider ways in which societies could provide greater protection for early warning scientists.

An interesting precedent has been set in Germany, where the Federation of German Scientists has been recognising the contribution that ‘whistle blowing’ scientists and others can make to robust and transparent democracies. Although “early warning” scientists are not reporting on whistleblowing activities, which often involve criminal actions, principle of their protection is the same.

## **Conclusion.**

We hope that there turns out to be no cancer risk, or indeed any risk from using mobile phones, and that our early warnings, which some might say are already a decade or so too late, will be proven unnecessary. However, we would rather be wrong in issuing an unnecessary warning than be wrong in failing to alert the public about potentially serious, irreversible harm in time to avoid such harm: especially as we are promoting mobile telephony through “citizen science”.

Three main scenarios seem to face us all with EMF, particularly with the RF from mobile phones. The first is similar to the case studies in the EEA reports on “late lessons”, where inaction caused much avoidable harm. The second is where precautionary actions to reduce EMF exposures avert much potential harm, whilst stimulating more sustainable

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<sup>21</sup> “Late Lessons from Early Warnings: the Precautionary Principle 1896-2000”, (EEA 2001), Vol 2 appears in late 2011.

<sup>22</sup> See the recent letter from many scientists to the “Science” journal who “are deeply disturbed by the recent escalation of political assaults on scientists in general and on climate scientists in particular”.  
www.sciencemag.org SCIENCE VOL 328 7 MAY 2010

<sup>23</sup> See press release from the European Network of Scientists for Social and Environmental Responsibility, (ENSSER) May 10, 2010 [www.ensser.org](http://www.ensser.org); and [claudia.neubauer@sciencescitoyennes.org](mailto:claudia.neubauer@sciencescitoyennes.org);

<sup>24</sup> Louis Slesin, producer of Microwave News, has details of those EMF scientists who have suffered for their views. Louis Slesin [mwn@pobox.com]

innovation in the production and use of mobile phone technologies and energy systems. And the third is where such precautionary actions to reduce exposures are taken but they turn out to have been unnecessary, if reasonable, given the state of knowledge today.

The choice that now faces us is whether or not to act.

Thank you for your attention.

Professor Jacqueline McGlade, Executive Director of the European Environment Agency, and David Gee, Senior Adviser, Science Policy, and Emerging Issues. EEA, Copenhagen, 25 February, 2011

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