

ZonMw  
The Board of Directors  
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Evaluation report of the ZonMw programme (EMF&H)

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Dear Members of the Board,

Enclosed please find the evaluation report of the ZonMw programme Electromagnetic Fields & Health (EMF&H). The main findings of the report as well as the comments of the programme committee will be presented in this letter. The programme committee welcomes the point of view of the ZonMw board on the evaluation.

### **The evaluation**

Commissioned by the EMF&H programme committee, the evaluation was carried out by the independent organisation Technopolis BV. To further increase the independency of the evaluation, an external evaluation committee advised Technopolis BV. The evaluation committee consisted of three members:

- Prof. dr. Koos van der Velden is professor of Public Health at the department of Primary and community Care Radboud University Nijmegen Medical Centre.
- Prof. dr. Luc Verschaeve is professor in Toxicology at the University of Antwerp. He is a member of the standing committee of the Dutch and Belgian Superior Health Council
- Prof. dr. Frans Brom is head of the Rathenau Institute's Technology Assessment division and professor in 'Ethics of Technology Assessment' at department of Philosophy/Ethics Institute of Utrecht University.

Subsequently, the finalised evaluation report was discussed by both EMF&H committees, the programme committee and supervisory committee, which supervised the running EMF projects.

The focus of the evaluation was to assess the achievement of the programme goals. We would like to stress that most, but not all, research projects are finished and reporting on study results via scientific publications is still ongoing. The last research project and hence the complete programme will end in 2019. At the end of the programme a final evaluation will be done, which will mainly focus on the project results.

## **Overall conclusions of Technopolis BV**

The evaluation report concludes that the programme has made an important contribution to the Dutch infrastructure for EMF&H research, although the long-term sustainability of this infrastructure may prove limited. Despite some important contributions to EMF research, the total yield of the programme is somewhat modest. In hindsight it should be concluded that the broad approach in the design of the programme has proved an obstacle to the full realisation of the programme objectives and the programme could have benefited from greater thematic coherence.

## **Findings of programme committee**

The EMF&H programme committee considers the report well written. It provides a clear overview of the EMF&H programme and describes its position in the scientific area and society accurately. In general, the committee supports the conclusions and recommendations. Some statements are considered to be somewhat negatively formulated or overstated. The committee notes that the evaluation is based on the current actual research knowledge in the field of EMF. The committee recommends to evaluate all research results created during the full course of the programme (2006 – 2019). Nevertheless, the report correctly describes aspects on for instance the sustainability of the established knowledge infrastructure in the Netherlands. The report provides some valuable recommendations.

## **Starting point in 2006**

At the beginning of this century EMF technology developed rapidly, the use of mobile phones increased exponentially, wireless internet was introduced and EM fields of MRI scanners became stronger. Biomedical research was inconclusive on possible negative health effects of EMF exposure, such as cancer, neurodegenerative disease and electro hypersensitivity. As public concern increased, discussions on EMF often had an emotional aspect, not only among general public but also between researchers. The EMF field was strongly polarized on the question whether exposure to EMF causes health hazards or not. The initiation of the programme in 2006 was more the result from the public concern rather than driven by scientific curiosity. This is only partly reflected in the goals of the programme, which were to strengthen the national knowledge infrastructure and to gain more scientific insights on possible negative health effects.

## **Broad focus and bottom-up approach**

The committee agrees partially with the report's main conclusion that the initial broad design of the programme has been an obstacle for the realisation of the programme goals. More focus could have contributed to one or more strong research centres on EMF in the Netherlands. However, with no evident biological mechanism or clear scientific leads for research, it would have been extremely difficult to narrow the focus on a specific institute, research area, biological mechanism or even a frequency of EMF exposure.

At the beginning of the programme the calls for research proposals were broad in order to be able to introduce and/or establish new research (groups) in the EMF research field. Selection of the research proposals was on quality of the science and research design rather than on specific predefined topics. A more top-down approach would have been complicated and time consuming lacking a clear knowledge infrastructure and could easily have led to the exclusion of possible new and promising research. For several calls, the initial budget was not completely spent in one round, because of lack of sufficient high quality research proposals. Workshops to improve quality of the research proposals were organised and the criteria for submission were subsequently more focussed on specific topics.

Even in retrospect, the committee supports the broad focus and the bottom-up approach at the start of the programme as a way to build a national knowledge infrastructure. A combination of a bottom-up and top-down approach might have been an alternative way to organise the programme. It would also not have been a guarantee to achieve the programme goals.

### **Sustainability of the national infrastructure**

The report's conclusion that the long-term sustainability of the built national knowledge infrastructure is uncertain is supported by the programme committee. Considering the complexity of the EMF research field, the committee is pleased that two out of three chair positions will be maintained after ending of the ZonMw programme.

The main difficulty in maintaining the knowledge infrastructure is the fact that it is impossible to prove that EMF is without any health hazards. So far no scientific evidence for a negative health effects in general public have been found due to exposure to EMF within the programme. These 'negative' results are difficult to publish in peer reviewed scientific journals. This does not make EMF an attractive field for a research career. A second obstacle is the lack of follow-up funding. The interest in this field from society, research community, ministries and politicians appears to be declining. In addition, direct funding from companies is at this stage not desirable due to (the semblance of) conflict of interests. Despite these challenging and unfavourable conditions, the chair positions in the fields of technology and epidemiology created as part of the programme will be continued. Regarding the starting point and the difficulties of the EMV field mentioned above, the committee is not surprised that the long-term sustainability of the national knowledge infrastructure cannot be taken for granted (yet). On the other hand, if a clear negative health effect of exposure to EMF would have been found in this relatively short research period, the sustainability of the infrastructure would not have been an issue. One could also say that the goal of strengthening the knowledge infrastructure should have been formulated better at the start of the programme. This could have been done by describing clear criteria of what is a knowledge infrastructure and what is meant by 'sustainable', ensuring similar expectations to the goal of the programme.

### **Contribution to the EMF discussion**

According to the evaluation report the contribution of the programme in terms of research results is modest. The committee does not support this conclusion. Although no clear positive or negative health effects of non-occupational exposure to EMF are found in the programme, this is worthwhile in itself and in agreement with the results published in the international scientific literature. Important results were found in an occupational and therapeutic setting and interesting leads were found for follow-up research which could be relevant for exposure of the general population. Some examples are:

- The occupational work of the epidemiological group of prof. Hans Kromhout; The development of the Job Exposure Matrix will be useful in research worldwide. As well as the study showing negative effects of exposure to static fields of MRI which are important for MRI personnel and the introduction of a guideline for EMF exposure for employees in 2016;
- Studies of the universities of Wageningen and Nijmegen suggesting mechanisms through which EMF can influence the immune system. Results from Lieke Golbach from the group of prof. Huub Savelkoul on NET formation are an important lead for a biomedical mechanism which EMF interact with cells.
- Studies from the group of prof. Danielle Timmermans showing that information about exposure can greatly influence risk perception in the general public;

- The findings in the study on the cumulative exposure of children to Electromagnetic Fields by dr. Jurriaan Bakker in the group of prof. Gerard van Rhoon contributed to the adaption of the national EMF exposure guidelines as ascertained by the Health Council of The Netherlands. These modifications will certainly be included in the future ICNIRP guidelines (international guidelines for exposure to EMF).
- The demonstration by prof. Roland Kanaar's group that low level EMF RF or ELF exposure does not cause direct DNA damage is providing the definitive push to close this topic for future research.

On account of the programme, the Netherlands has obtained a strong position in international research, especially the technological and epidemiological studies. Prof. Kromhout is involved in large European initiatives as the COSMOS, GERONIMO and Mobi-kids cohort studies.

The programme is not finished yet; 12 research projects are still running. Currently only eight out of 19 PhD students have defended their thesis. The committee expects for instance that the cohort study (including COSMOS) from the group of prof. Hans Kromhout will undoubtedly generate many publications of interesting and important results in the near future.

### **Recommendations to ZonMw for future programmes**

#### *Grants for chair positions*

Chairs (in Dutch: hoogleraren) are important key figures for building a knowledge infrastructure. Therefore for future programmes grants for establishing chair positions should be made available early in the programme which gives them the opportunity to submit more proposals in following calls. The early start of the chair projects might enlarge the involvement of the chairs in further strengthening the infrastructure.

#### *Supervisory committee*

A separate committee was installed to monitor and supervise the running projects. The reason to do so was that the international character of the programme committee hampered the ability to meet regularly or at short notice with the researchers. The task of this so called supervisory committee (in Dutch: begeleidingscommissie) was to inform the programme committee on the progress of the projects. They made recommendations on the design and implementation of the projects, but also advised on communication of results and stimulate collaboration. Both committee's advise to have one committee, which reviews the research proposals and supervises the projects. If for future programmes two separate committees are desired, we recommend that at least some of the members should be on both committees to optimize interactions, communication and clarity on the various considerations and decisions of each committee in order to steer better on the expectations.

#### *National collaborations grants*

The international collaboration and exchange grants (max. 10 k€ and 50 k€) were one of the instruments to ensure a high quality contribution to the international research effort. The committee advises to make similar grants available for stimulating national collaboration. As it will enhance interlinking between different disciplines and thereby further strengthening the Dutch infrastructure.

### **Recommendation for follow-up of the programme EMF&H**

The ZonMw programme was a substantial investment in the Dutch infrastructure on EMF research starting in a turbulent time in which the safety of exposure EMF for general public was unclear. The ZonMw programme has greatly contributed to the growth of this infrastructure, but was not able to create a robust long-lasting infrastructure. After almost ten years of progress, the strengths and weaknesses of Dutch EMF research have become quite clear.

The programme committee advises a continuation of specific programme activities following a top-down approach. To enable quick responses to future questions about (new) negative or positive health effects to exposure of (new) EMF systems, it is important for the Netherlands to maintain core expertise in the field of EMF. The long-term sustainability of the initiated national infrastructure can only be ensured by continuing the support of specific research (groups) which have shown to be successful within the current EMF programme.

The programme committee agrees with the recommendations by Technopolis BV on follow-up funding (page 34 of the report), which are development of therapeutic interventions or support for electro hypersensitive people, occupational work of prof. Hans Kromhout (exposure of MRI employees), potential use of EMF for therapeutic application (treatment of cancer and depression), and risk communication protocols. In addition, the committee advises the continue the monitoring done by the national cohort and the international COSMOS study of prof. Hans Kromhout . This will enable the Netherlands to reap the full benefits of the programme, to do justice to the international commitment created with the programme and to be prepared for questions concerning new health effects on new EMF systems in the future.

Finally, we would like to point out that the programme committee will continue to advise ZonMw for the remainder of the programme. As ZonMw continue strengthening the knowledge infrastructure by organising national and international meetings, communicating on research project results in collaboration with the Knowledge Platform EMF&H and supervising the remaining research projects that are still operational.

Yours sincerely,  
(on behalf of the programme committee)

Prof. dr. Jean Savelkoul  
Chairman of the programme committee