

RENCONTRE SCIENTIFIQUE

Radiofréquences et santé :

la recherche face à des technologies
en évolution rapide

23 novembre 2022
Espace Diderot - Paris 12

#RadiofrequencesRS



World Health
Organization

Exposition aux radiofréquences (et symptômes)

E. van Deventer
Radiation and Health Unit
World Health Organization
Geneva, Switzerland

Outline

- Introduction
- The Radiofrequency fields activity
- The WHO approach to assessing RF risks
- Discussion



The World Health Organization

- Established on **7 April 1948**
- **Function:** act as the UN directing and coordinating authority on international health work
- **Objective:** attainment by all peoples of the highest possible level of health
- **Health:** “A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO Constitution, 1948)





SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD





Health in all policies

The WHO 3-level structure



Over 7000 people work for WHO in

- Headquarters (Geneva)
- 6 Regional Offices
- 150 Offices in Countries, Territories and Areas
- International Agency for Research on Cancer (IARC)

HOW THE ENVIRONMENT IMPACTS OUR HEALTH

People are exposed to risk factors in their homes, work places and communities through:

AIR POLLUTION
including indoors and outdoors



INADEQUATE WATER, SANITATION and hygiene



CHEMICALS and biological agents



RADIATION
ultraviolet and ionizing



COMMUNITY NOISE



OCCUPATIONAL RISKS



CLIMATE CHANGE



BUILT ENVIRONMENTS
including housing and roads



AGRICULTURAL PRACTICES
including pesticide-use, waste-water reuse

POWER LINES



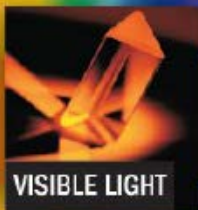
TRAINS



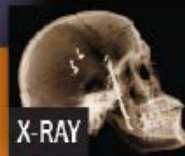
RADAR

0 Hz 10² 10⁴ 10⁶ 10⁸ 10¹⁰ 10¹²

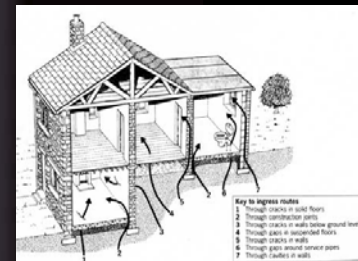
FREQUENCY (Hz OR CYCLES PER SECOND)



VISIBLE LIGHT



X-RAY



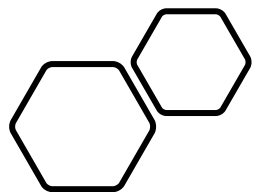
PERSONAL COMPUTER



CELL PHONE

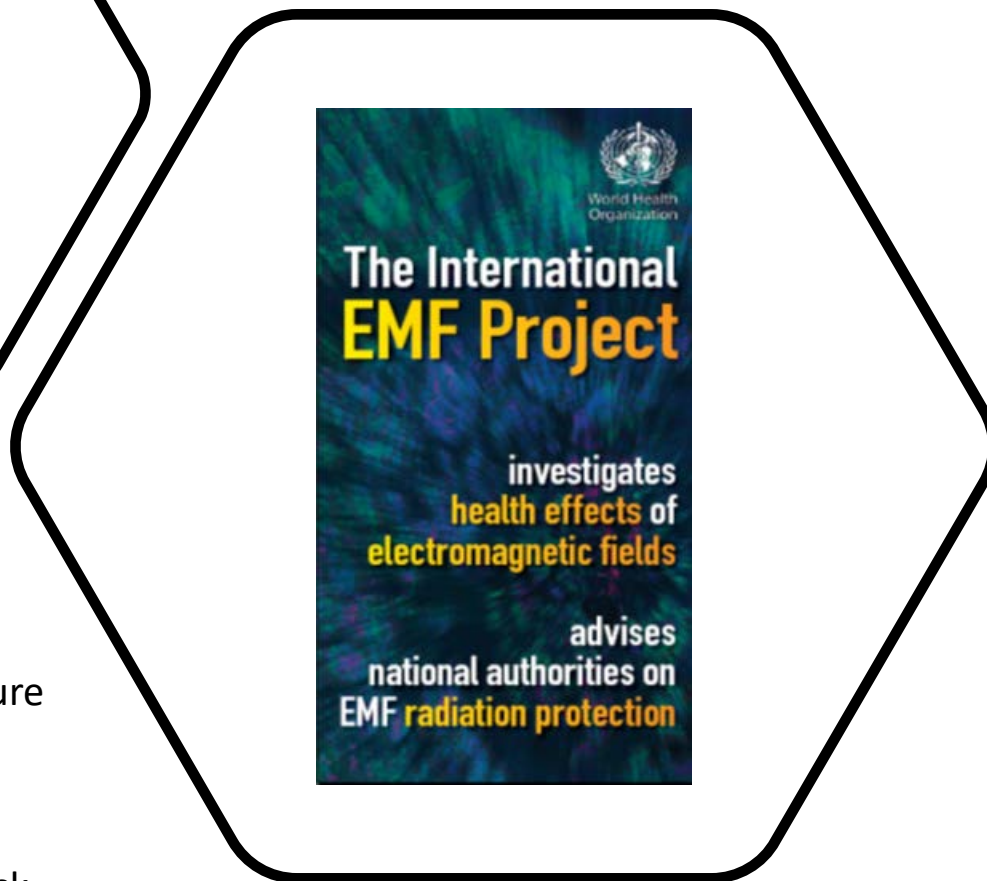
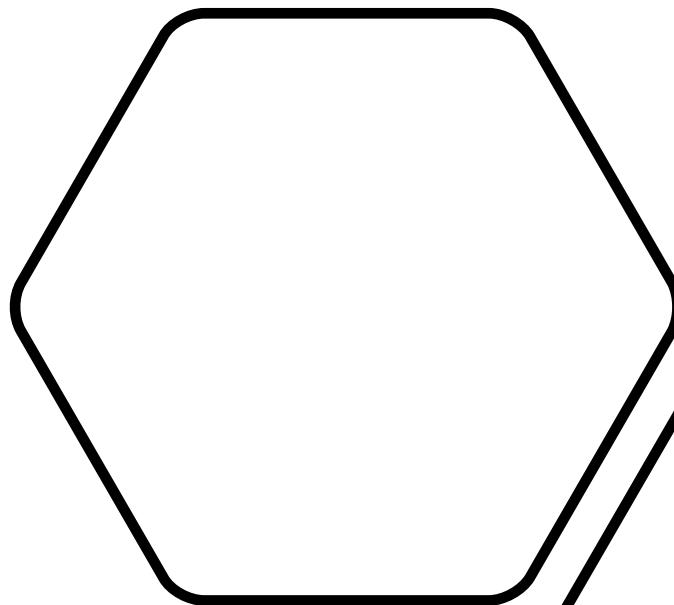


Both **ionizing** and **non-ionizing radiation** are covered by the WHO Radiation and Health Unit



WHO International EMF Project

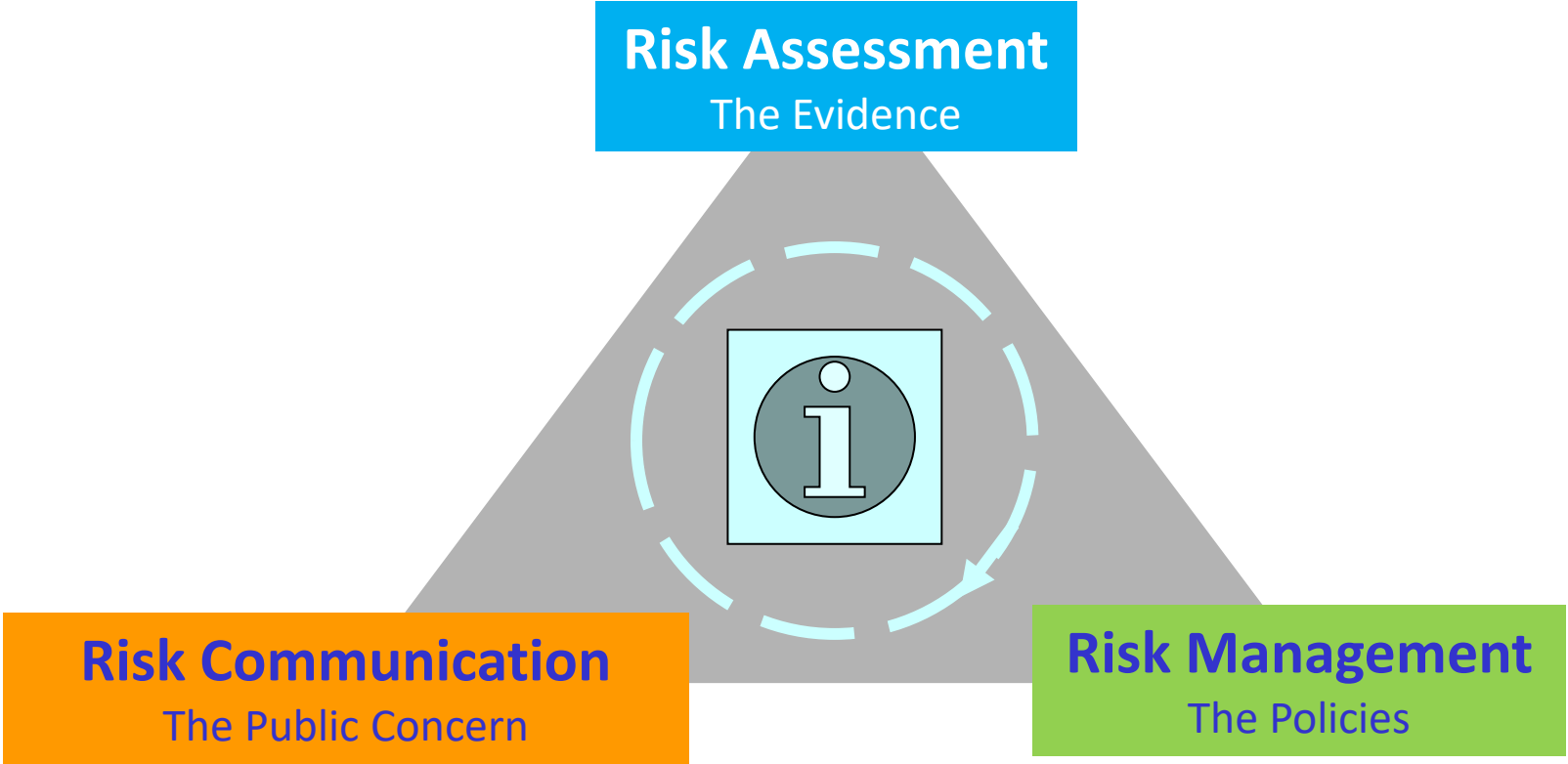
- Established in 1996
- Coordinated by WHO HQ
- Objectives
 - Review the scientific literature on health effects of EMF exposure and formally assess health risks;
 - Promote a focused agenda of high-quality EMF research;
 - Encourage internationally acceptable harmonized standards;
 - Provide information on risk perception, risk communication, risk management



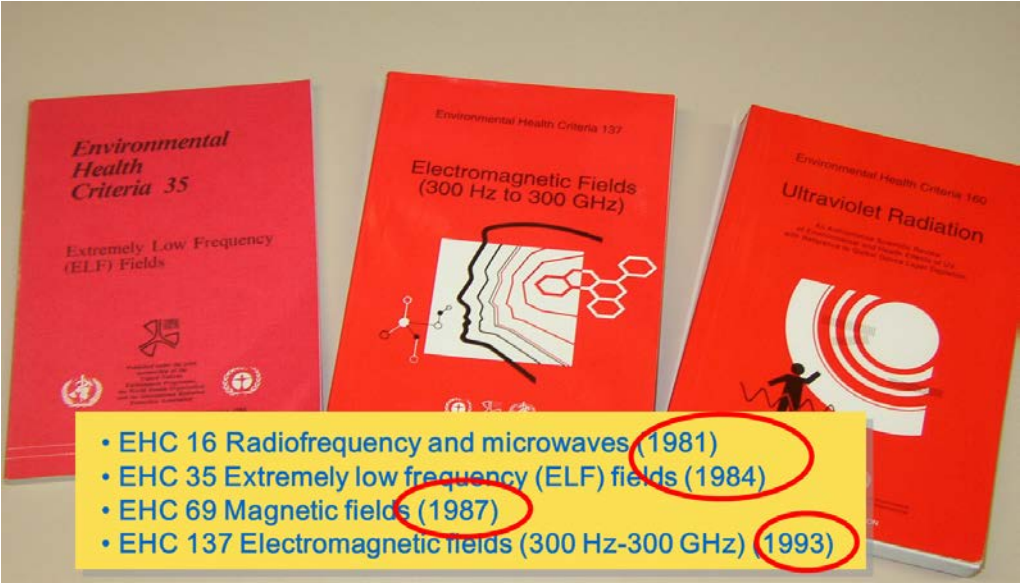
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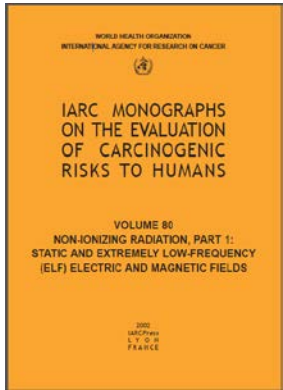
Do EMFs pose a health risk?



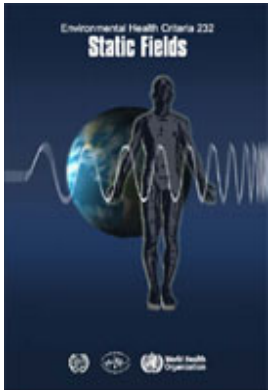
WHO Monographs on EMF



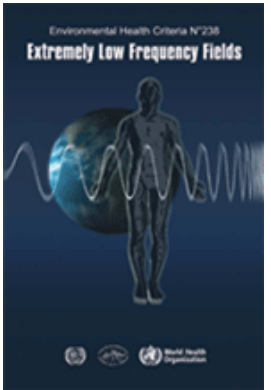
Health risk assessments



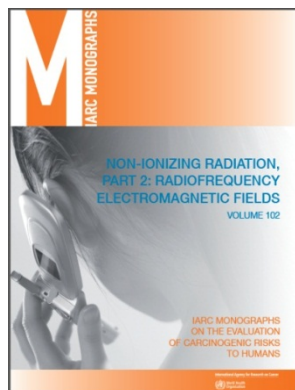
2002



2006



2007

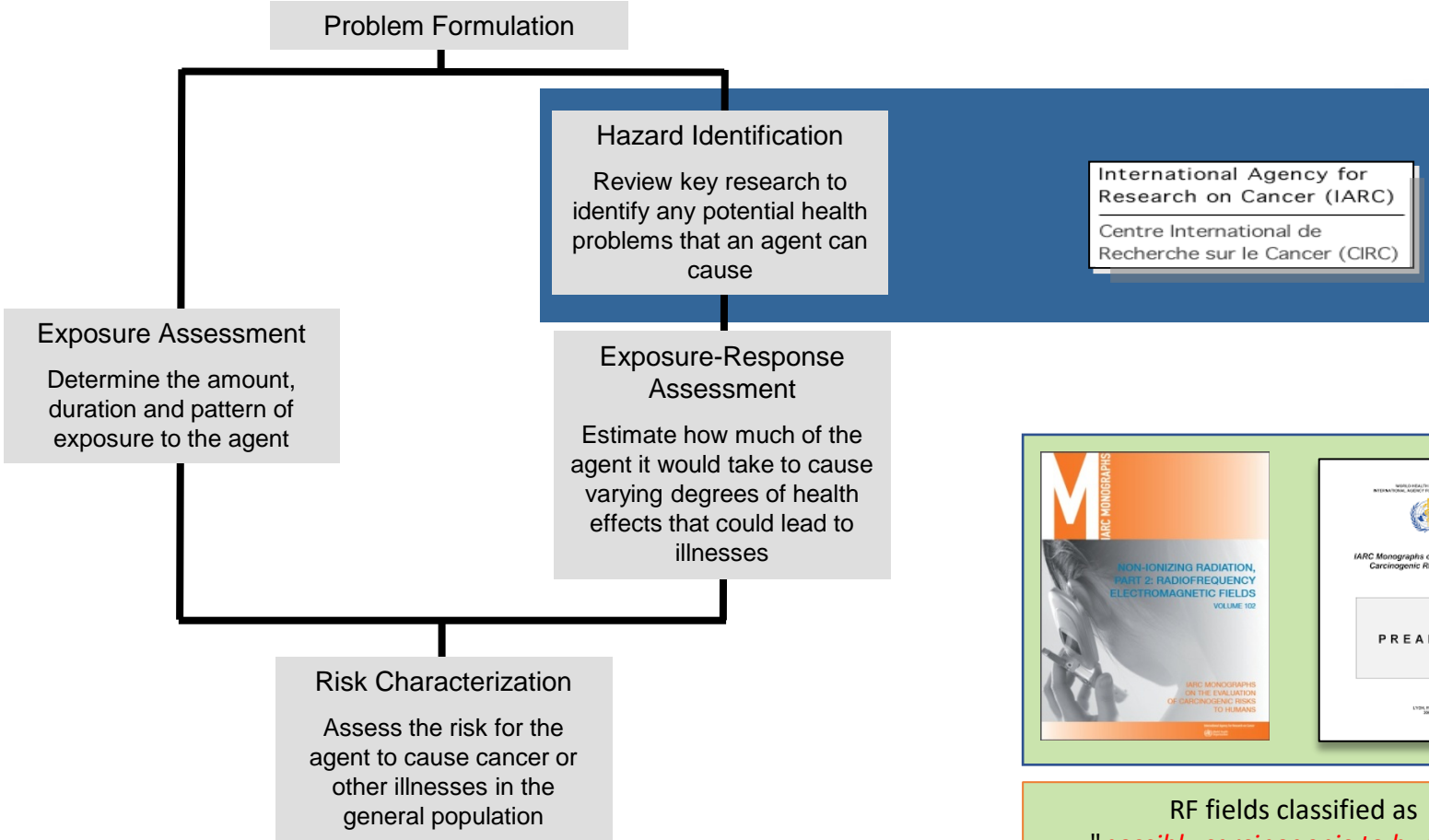


2013



RF Fields

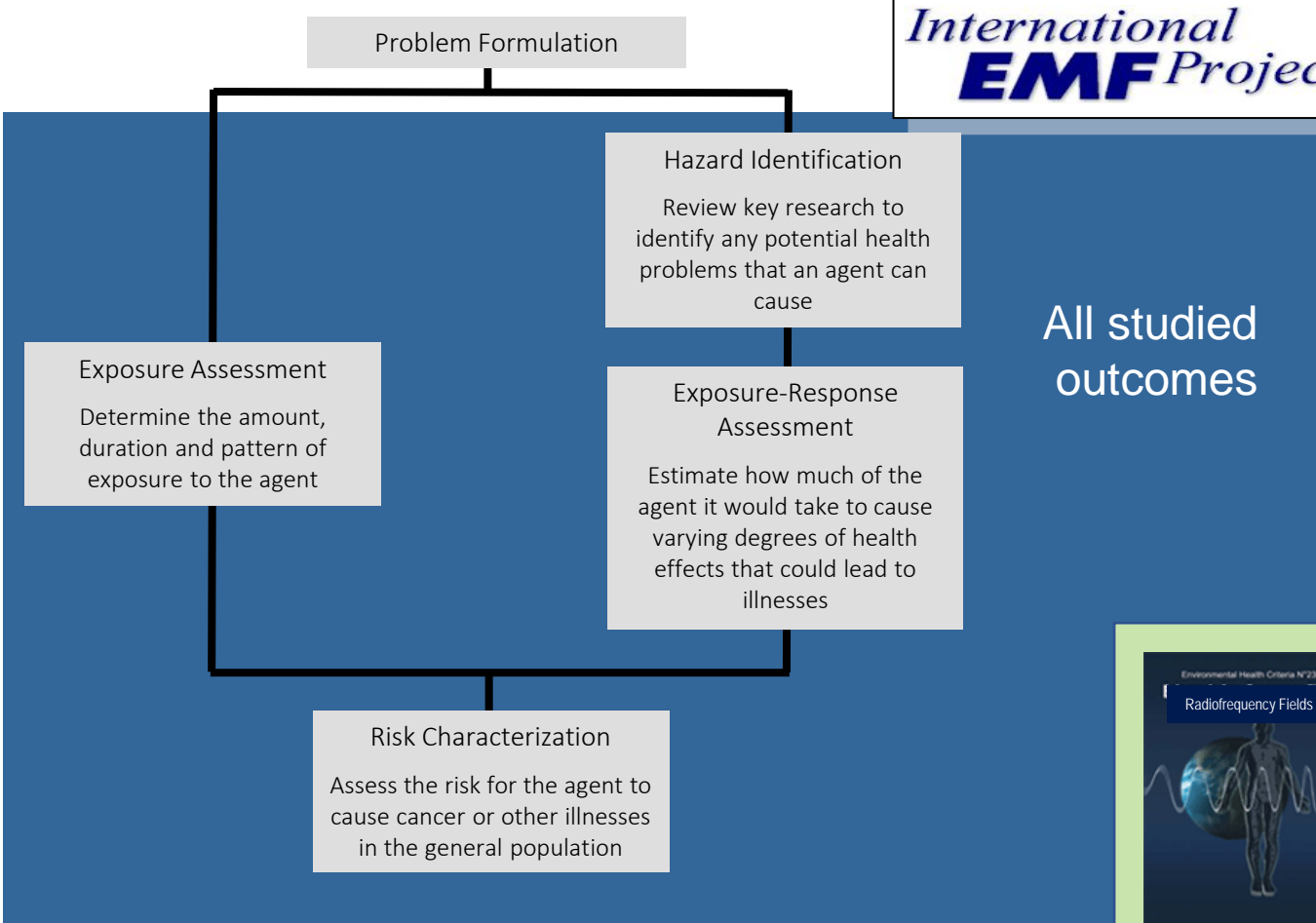
Health Risk Assessment



RF fields classified as
"possibly carcinogenic to humans"
 (Group 2B)

Health Risk Assessment (cont'd)

International
EMF Project



RF Environmental Health Criteria Objectives



- To review the scientific literature regarding **adverse health effects** from exposure to radiofrequency fields
- To perform a **health risk assessment** of all studied health endpoints, as far as the evidence can offer
- To compile a **summary of national policies** around the world (based on a survey performed in Fall 2012 and now being updated)
- To identify gaps in knowledge

Radiation Protection Dosimetry (2014), pp. 1–6

doi:10.1093/rpd/ncu324

RISK MANAGEMENT POLICIES AND PRACTICES REGARDING RADIO FREQUENCY ELECTROMAGNETIC FIELDS: RESULTS FROM A WHO SURVEY

Amit Dhungel^{1,*}, Denis Zmirou-Navier^{1,2} and Emilie van Deventer³

¹Department of Environmental and Occupational Health, EHESP School of Public Health, Avenue du Professeur Léon Bernard CS 74312, 35043 Rennes, France

²Lorraine University School of Medicine, av. de la Forêt de Haye, 54505 Vandoeuvre-Les-Nancy, France

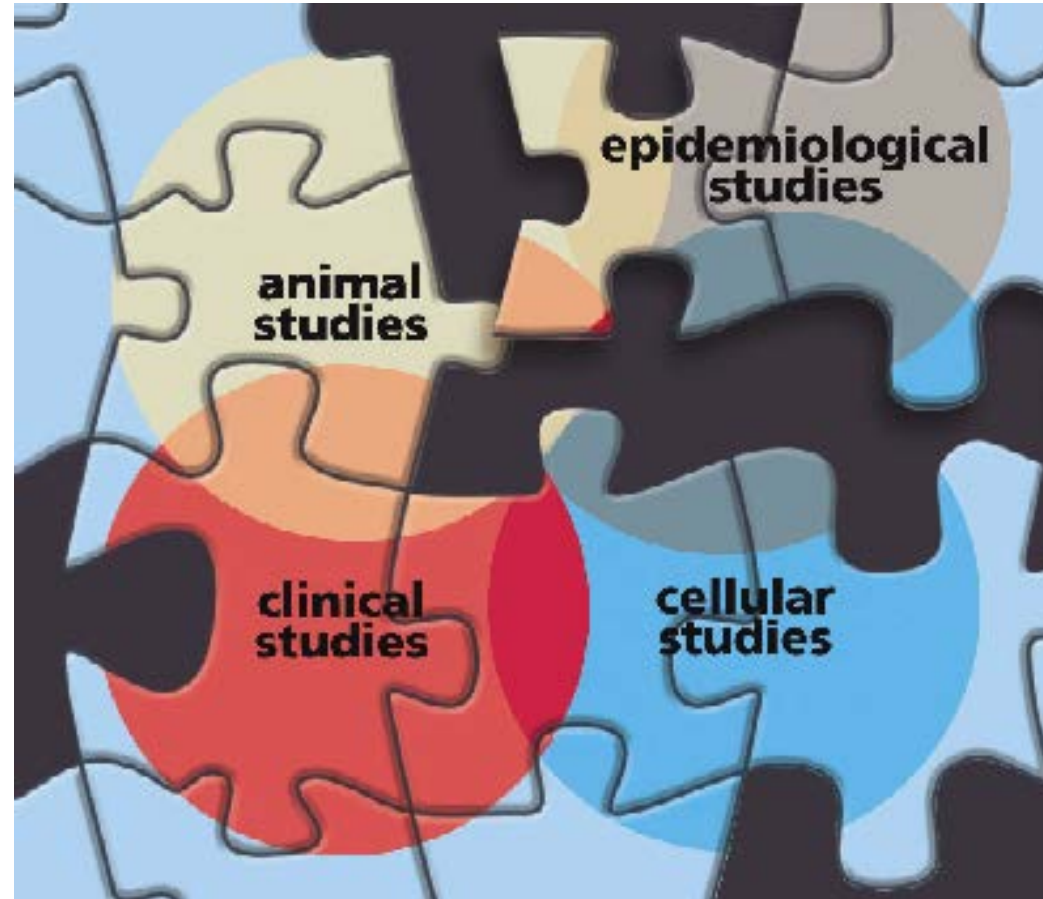
³Radiation Programme, Department of Public Health, Environmental and Social Determinants of Health, World Health Organization, Geneva, Switzerland

Scope and target audience

- Scope
 - Radiofrequency fields from 100 kHz to 300 GHz
 - Public and occupational exposures (not medical exposures)
- Target audience
 - Policy-makers in Ministries of Health, and Ministries of Labour, Environment, Telecommunications, ..
 - Bodies involved in developing exposure guidelines for RF EMF, such as non-governmental organizations
 - Professional societies and academics studying the health effects of RF EMF

Evaluating the health risks

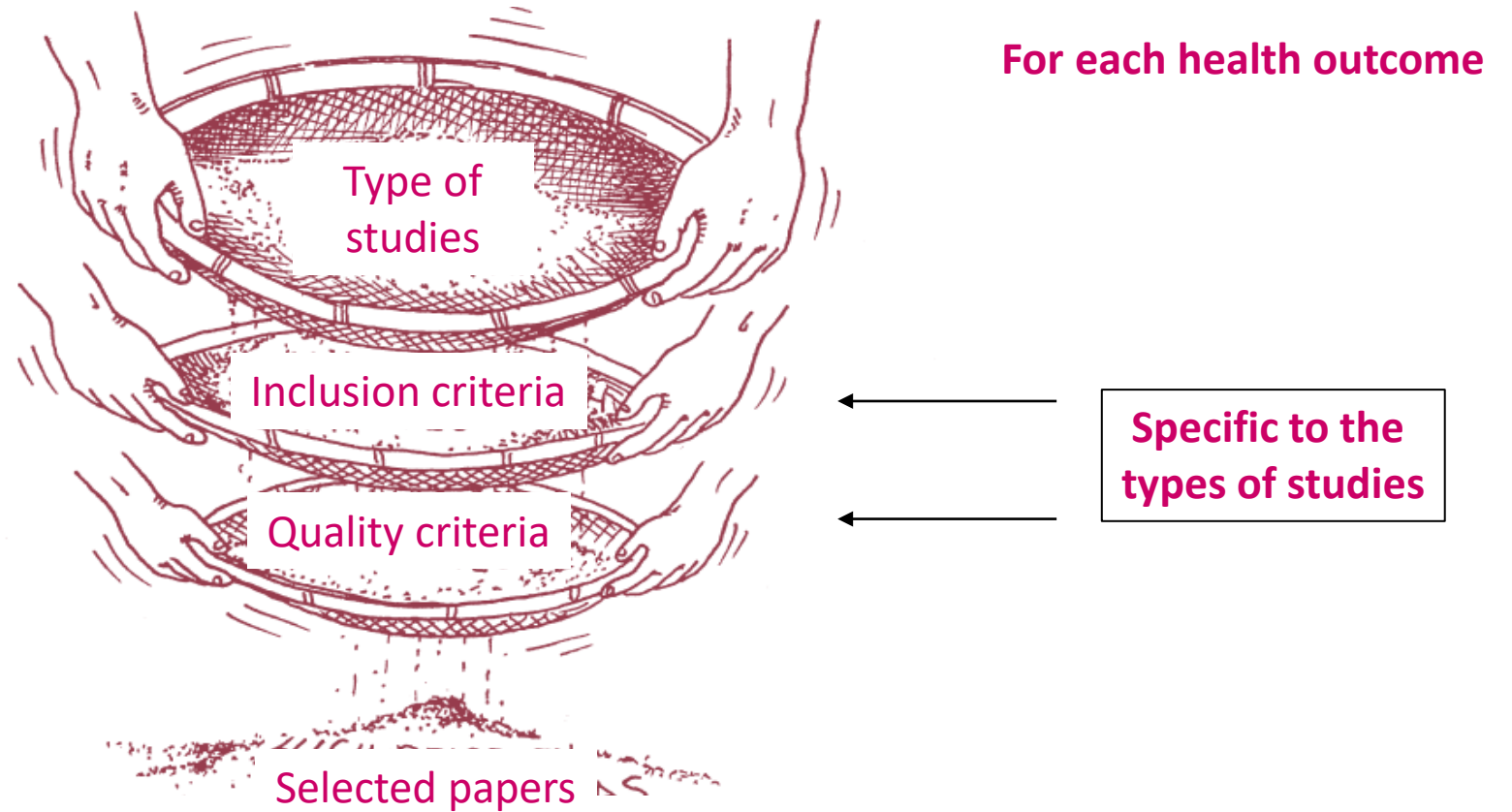
Review of research



<http://www.niehs.nih.gov/emfrapid/booklet/emf2002.pdf>

Screening Process

- 13 main health endpoints
- > 1000 references



Narrative review (2012-17)

- Kickoff meeting of a Core Group of experts (2012)
- International survey of radiofrequency policies (2012)
- International stakeholders meeting, Paris, France (2013)
- Online first draft for comments (Fall 2014) – over 700 comments
- Incorporation of comments in the draft (2015)
- WHO request for systematic review process (2016)
 - *“although the types of questions that are being examined and the statements that will be issued are **not typical ones related to interventions**, they will have global impact and must be based on a systematic review of the evidence and transparent, explicit processes that minimize bias. Thus the **basic principles for guideline development** apply”.*
 - Contracted a methodologist



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Systematic reviews

- A systematic review is a scientific investigation that focuses on a **specific (PECO*) question** and uses explicit, **pre-specified** scientific methods to identify, select, assess, and summarize the findings of similar but separate studies.
- Objective is to summarize evidence from multiple studies using **explicit methods**
- Systematic reviews are designed to provide
 - methodological rigour
 - transparency
 - Reproducibility

***PECO: Population, Exposure, Comparator, Outcome**

Conceptual Considerations

Methodological Considerations

1

Scoping of the guidelines



2

Formulating the questions



3

Synthesizing the evidence



4

Grading of the evidence



5

Formulating recommendations



Relative importance of outcomes

- To prioritize health outcomes, WHO sought the opinion of experts on the topic of radiofrequency electromagnetic field exposures and health
- Online survey titled "Rating Potential Adverse Health Outcomes of Exposure to Radiofrequency Fields" (2018)
- Over 300 RF experts were invited, and 167 responses received.

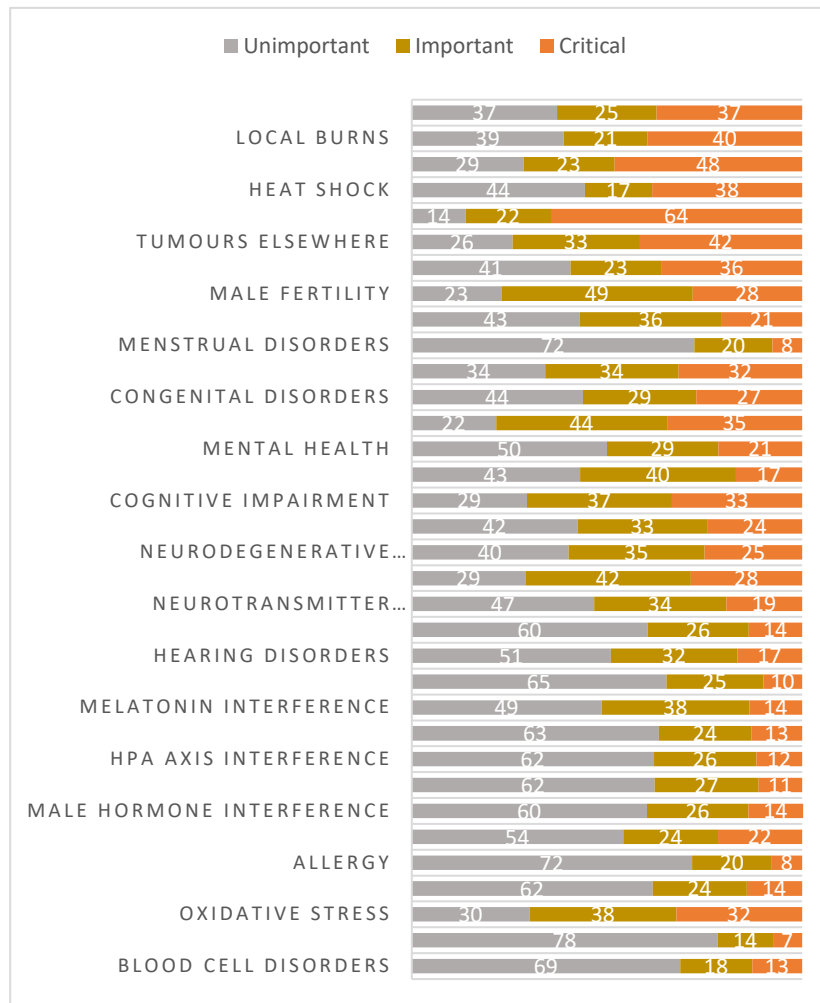


Prioritizing health outcomes when assessing the effects of exposure to radiofrequency electromagnetic fields: A survey among experts

Jos Verbeek ^{a,4}, Gunnhild Oftedal ^b, Maria Feychting ^c, Eric van Rongen ^d, Maria Rosaria Scarfi ^e, Simon Mann ^f, Rachel Wong ^g, Emilie van Deventer ^h

^a Amsterdam University Medical Center, Cochrane Work Review Group, Amsterdam, the Netherlands
^b Department of Electronic Systems, Norwegian University of Science and Technology - NTNU, Trondheim, Norway
^c Unit of Epidemiology, Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden
^d Health Council of the Netherlands, Den Haag, the Netherlands
^e National Research Council, Institute for Electromagnetic Sensing of the Environment, Naples, Italy
^f Public Health England, Chilton, Didcot, United Kingdom
^g University of Toronto, Toronto, Canada
^h Department of Environment, Climate Change and Health, World Health Organisation, Geneva, Switzerland

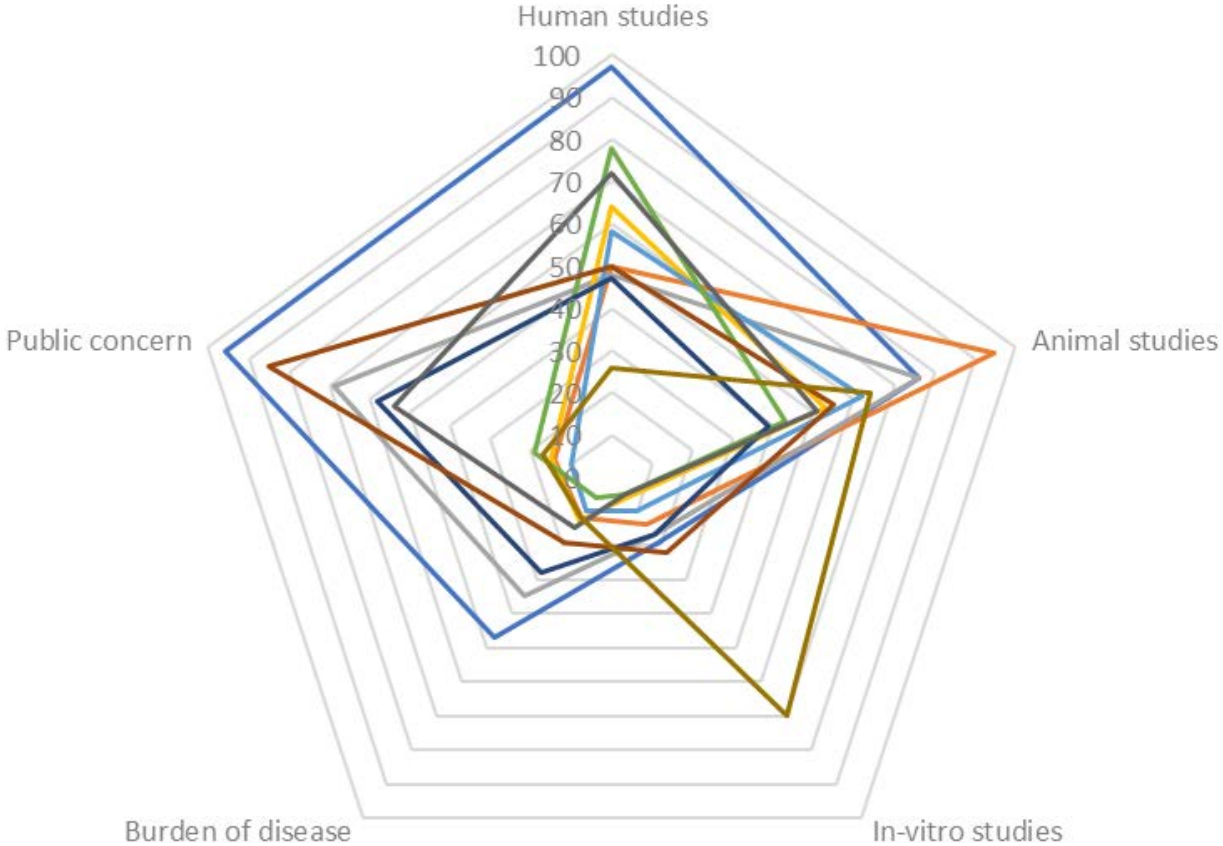
International survey of priority outcomes



1. Cancer
2. Heat related
3. Fertility
4. Symptoms
5. Cognitive performance
6. Oxidative stress

Priority outcomes

Rationale



- Cancer (head)
- Ocular temp
- Tumours elsewhere
- Local burns
- Exhaustion, dehydration, heat shock from increased core body temp
- Local pain due to local increase in temp
- Haematological malignancies
- Electromagnetic hypersensitivity (EHS) (various symptoms)
- Cognitive impairment
- Oxidative stress

Systematic reviews

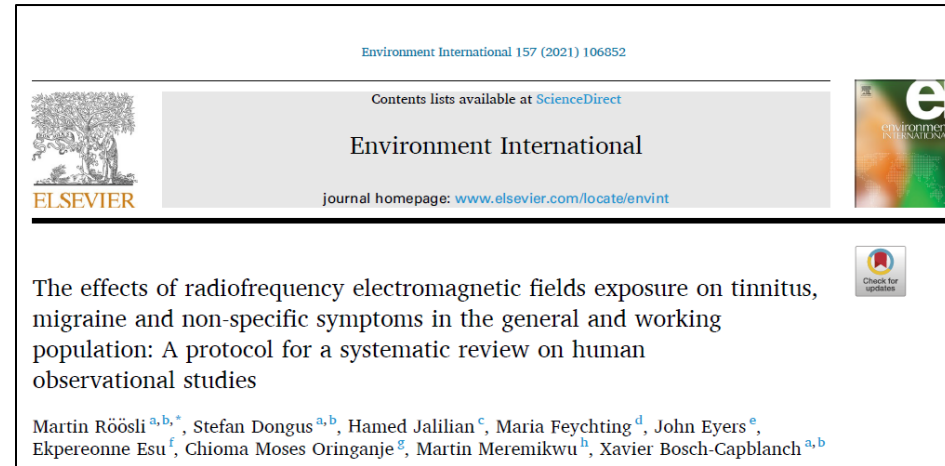
| | Observational studies | Experimental studies | | |
|--------------------------------------|-----------------------|-------------------------|----------------|------------------|
| | | Human volunteer studies | Animal studies | In-vitro studies |
| Cancer | SR1 | | SR2 | |
| Adverse reproductive outcomes | SR3 | | SR4 | SR4 |
| Cognitive impairment | SR5 | SR6 | | |
| Symptoms | SR7 | SR8 | | |
| Oxidative stress | | | SR9 | SR9 |
| Heat and pain, burns, cataract, etc. | SR10 | SR10 | | |

Radiofrequency fields and symptoms

- Concern has been raised that RF-EMF exposure affects health related quality of life, because a part of the population reports experiencing a variety of symptoms related to low exposure levels
- Some people report several types of non-specific symptoms, which they relate to exposure to RF-EMF.
- Because of similarities to other forms of idiopathic environmental intolerance (IEI), such as multiple chemical sensitivity, this condition is referred to as IEI attributed to EMF (IEI-EMF) or “electromagnetic hypersensitivity”
- The types of reported symptoms vary between individuals: most common are headaches, sleep disturbances and tinnitus
- There is the possibility that different symptoms could result from different types of EMF exposure. But cluster analyses have not identified that specific symptom clusters are related to specific EMF exposure sources and the pattern of symptoms is not part of any recognized syndrome

Systematic review of Symptoms

Observational studies

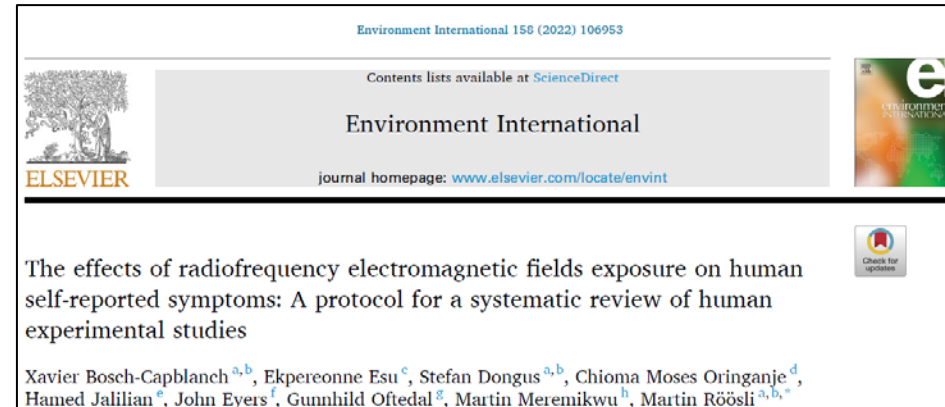


- To systematically review the effects of longer-term or repeated local and whole human body RF-EMF exposure on the occurrence of symptoms evaluating migraine, tinnitus, headaches, sleep disturbances and composite symptom scores as primary outcomes.

Objective (PECO question)

- To assess the effects of continuous or repeated local and whole human body RF-EMF exposure of one week or longer (E) on the occurrence of non-specific symptoms (O), in the general population or workers (P) and to assess whether there is an exposure – response relationship between these outcomes and RF-EMF exposure levels (C)

Systematic review of Symptoms Experimental studies



- To assess the effects of exposure to RF fields (compared to no or lower exposure levels) on symptoms in human subjects. We will also assess the accuracy of perception of presence of exposure in volunteers with and without idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF).

Objective (PECO question)

- in volunteers with IEI-EMF and without IEI-EMF (P), is exposure to RF-EMF (E), as compared to no or lower exposure levels (C), related to immediate effects on symptoms (O)?
- in volunteers with IEI-EMF and without IEI-EMF (P), are different exposure levels to RF-EMF (E, C) (e.g. intensity, duration) related to the intensity of self-reported symptoms (O)?

Systematic reviews: Deliverables

1. **Protocol** submission to *Environment International*
2. **Registration** of the protocol in Prospero (or other appropriate protocol database)
3. **Systematic review** submission to *Environment International*



The screenshot shows the ScienceDirect website for the journal Environment International. The page features a green header with the journal's logo and name, along with its CiteScore (17.1) and Impact Factor (13.352). Below the header, there is a navigation bar with options like 'Articles & Issues', 'About', 'Publish', and a search bar. The main content area displays the title of a systematic review: 'WHO assessment of health effects of exposure to radiofrequency electromagnetic fields: systematic reviews'. At the bottom, it lists the editors: Sharea Ijaz, Jean-François Doré, Sarah Drießen, and Paul Whaley.



The screenshot shows the Prospero website, which is the International prospective register of systematic reviews. The page has a blue and purple background with a network of glowing nodes. A white box in the center contains the text: 'Welcome to PROSPERO International prospective register of systematic reviews'.

Technical outputs

The appraisal of the evidence for health risks associated with exposure to RF fields to result in

- A **Technical Report** (scoping review of the scientific literature of studied health outcomes)
- A series of **Systematic Reviews** on priority health outcomes to be published in a special issue of *Environment International*
- An **EHC Monograph** that will elaborate on the health outcomes highlighted in the review process, using procedures for guideline development as recently required by WHO
- A **RF Research Agenda**
- (Journal publications)

Contributors

- Core Group (6 members) and expert working group members (~ 20-30)
- Systematic review teams
- Task Group members
 - Individual scientists, not representatives of their organizations
 - Composition dictated by range of expertise and views, gender and geographical distribution
- Observers
- Secretariat



Declaration of Interests

DECLARATION OF INTERESTS FOR WHO EXPERTS

WHO's work on global health issues requires the assistance of external experts who **may have interests related to their expertise**. To ensure the highest integrity and public confidence in its activities, WHO requires that experts serving in an advisory role disclose any circumstances that could give rise to a potential conflict of interest related to the subject of the activity in which they will be involved.

All experts serving in an advisory role must disclose any circumstances that could represent a **potential conflict of interest** (i.e., any interest that may affect, or may reasonably be perceived to affect, the expert's objectivity and independence). You must disclose on this Declaration of Interest (DOI) form any financial, professional or other interest relevant to the subject of the work or meeting in which you are participating, whether or not you are directly affected by the outcome of the work or meeting (see definition below) and, if applicable, any other interests and which may be relevant to the work of the administrative unit or department to which you are assigned, may, depending on the circumstances, affect your work in the future.

Code of Conduct for WHO Experts

Should be sent with the DOI form

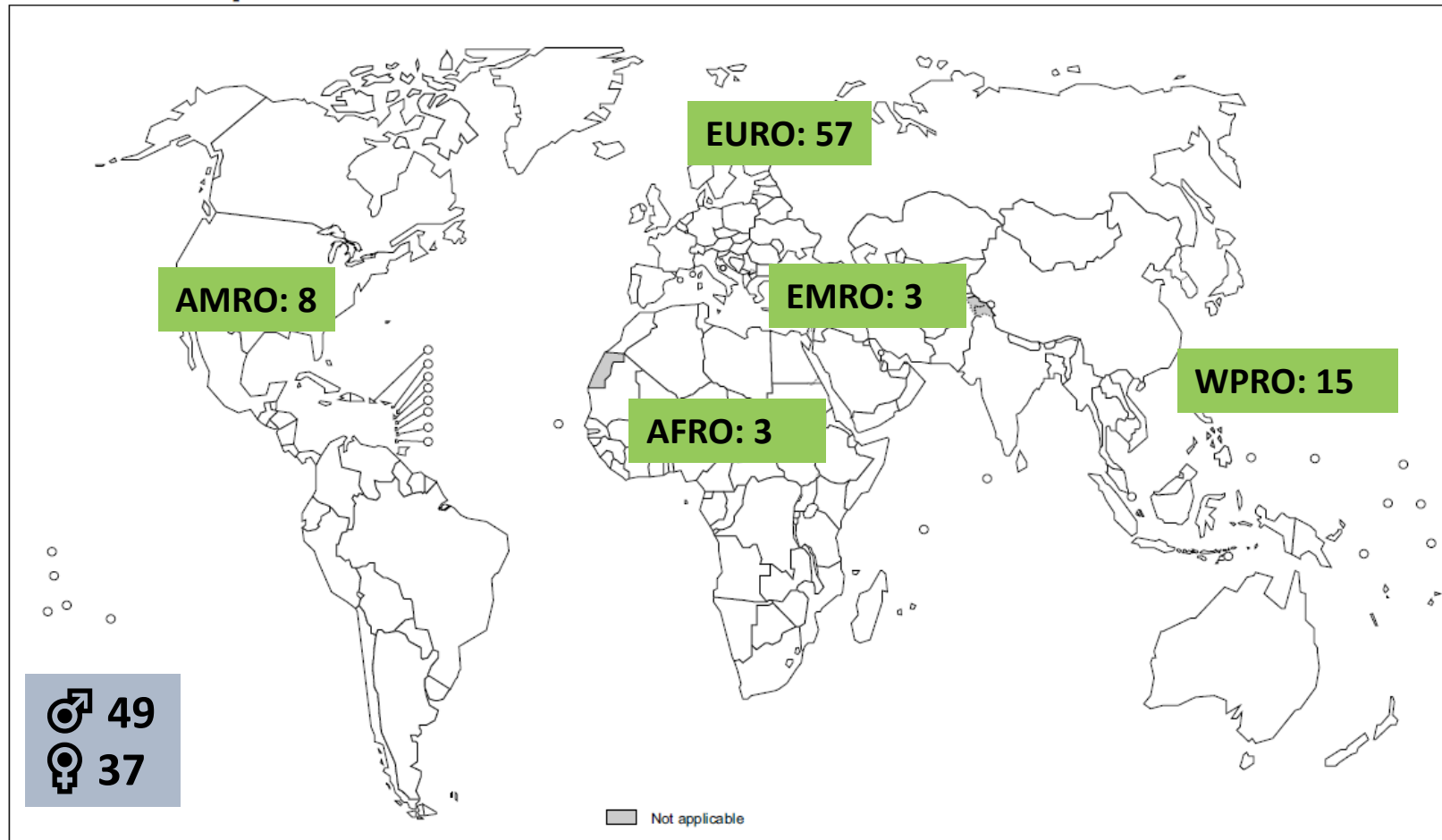
WHO values and relies upon the normative and technical advice that is provided by leading subject matter experts in the context of its advisory processes. Such advice contributes to the development of policies and strategies that are promulgated by WHO for the benefit of humanity.

CONFIDENTIALITY UNDERTAKING

Should be sent with the invitation or appointment letter

1. The World Health Organization (WHO), acting through its Department of [REDACTED], has access to certain information relating to [REDACTED], which information WHO considers to be proprietary to itself or to parties collaborating with it (hereinafter referred to as "the Information").
2. The Undersigned, as a member of the [REDACTED] advisory meeting, group or committee (collectively referred to as the "the Advisory Process"), may have access to the Information in the course of his/her participation in the Advisory Process (whether

Systematic Review Teams Experts



Task Group of Experts

Call for Experts: WHO Task Group on Radiofrequency Fields and Health Risks

***** THE DEADLINE FOR APPLICATION SUBMISSION HAS BEEN EXTENDED TO 15 DECEMBER 2021 *****

21 October 2021 | Call for experts

The World Health Organization (WHO) is seeking experts to serve as members of the Task Group on Radiofrequency Fields and Health Risks that will contribute to the development of a WHO monograph on Radiofrequency fields.

This Call for experts provides information about the Task group in question, the expert profiles being sought, and the application and selection processes.

[https://www.who.int/news-room/articles-detail/call-for-experts-who-task-group-on-radiofrequency-fields-and-health-risks#:~:text=The%20World%20Health%20Organization%20\(WHO,WHO%20monograph%20on%20Radiofrequency%20fields](https://www.who.int/news-room/articles-detail/call-for-experts-who-task-group-on-radiofrequency-fields-and-health-risks#:~:text=The%20World%20Health%20Organization%20(WHO,WHO%20monograph%20on%20Radiofrequency%20fields)

- Call for experts (Fall 2021)
- Over 60 candidates
- 20 experts have been short-listed
- Main tasks
 - review the draft of the scoping report
 - draw conclusions for each health outcome in the EHC monograph based on the scoping report and the systematic reviews

The World Health Organization



"Health is a complete state of physical, mental and social well-being, and not merely the absence of disease or infirmity"

WHO's Constitution (1948)