RF and Health:
A WHO Perspective

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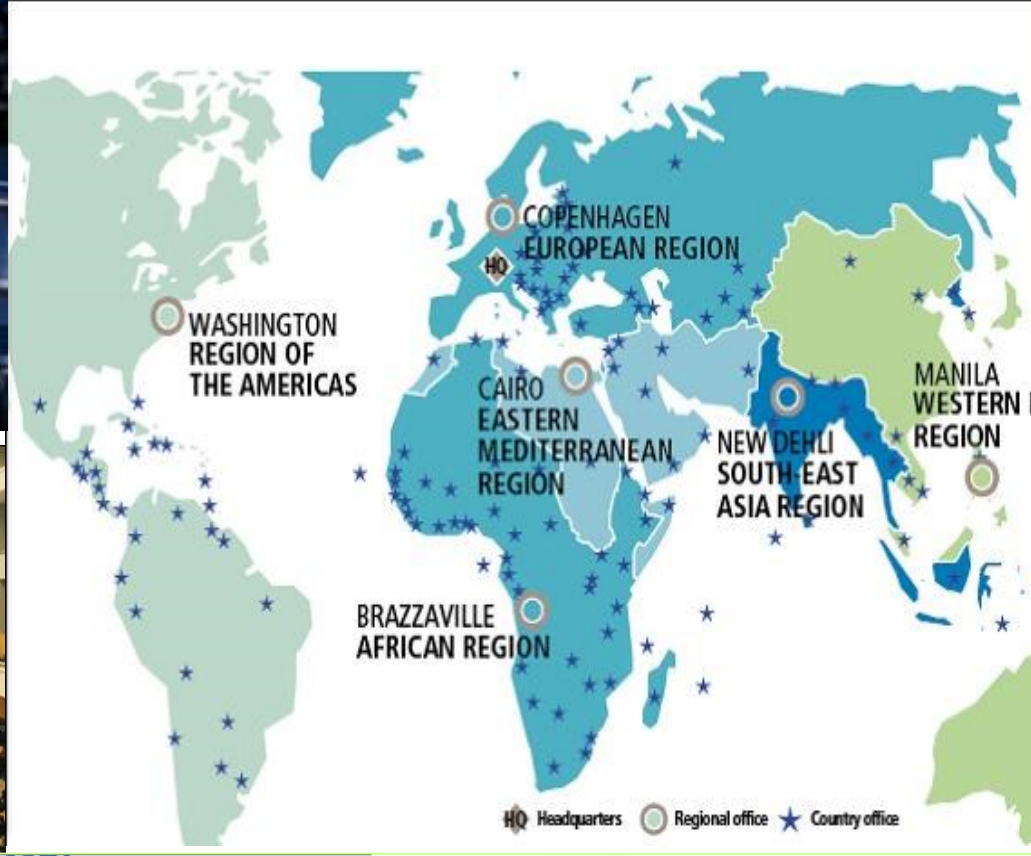
OUTLINE

- Introduction
- Assessing the health risk
- Managing the potential risk
- Conclusions



PEOPLE

Last but not least, WHO is people. Over 8000 public health experts including doctors, epidemiologists, scientists, managers, administrators and other professionals from all over the world work for WHO in 147 country offices, six regional offices and at the headquarters in Geneva, Switzerland.

When diplomats met in San Francisco to form the United Nations in 1945, one of the things they discussed was setting up a global health organization. WHO's Constitution came into force on 7 April 1948 – a date we now celebrate every year as World Health Day.

Delegates from 53 of WHO's 55 original member states came to the first World Health Assembly in June 1948. They decided that WHO's top priorities would be malaria, women's and children's health, tuberculosis, venereal disease, nutrition and environmental sanitation – many of which we are still working on today. WHO's work has since grown to also cover health problems that were not even known in 1948, including relatively new diseases such as HIV/AIDS.

1948

International Classification of Disease

WHO took over the responsibility for the International Classification of Disease (ICD), which dates back to the 1850s and was first known as the International List of Causes of Death. The ICD is used to classify diseases and other health problems and has become the international standard used for clinical and epidemiological purposes.

1952–1964

Global yaws control programme

One of the first diseases to claim WHO's attention was yaws, a crippling and disfiguring disease that afflicted some 50 million people in 1950. The global yaws control programme, fully operational between 1952-1964, used long-acting penicillin to treat yaws with one single injection. By 1965, the control programme had examined 300 million people in 46 countries and reduced global disease prevalence by more than 95%.

1952 Dr Jonas Salk (US) develops the first successful polio vaccine.

1967 South African surgeon Christiaan Barnard conducts the first heart transplant.

1974 The World Health Assembly adopts a resolution to create the Expanded Programme on Immunization to bring basic vaccines to all the world's children.

1977 The first Essential Medicines List appeared in 1977, two years after the World Health Assembly introduced the concepts of "essential drugs" and "national drug policy". 156 countries today have a national list of essential medicines.

1974

Onchocerciasis control programmme

WHO worked for 30 years to eliminate onchocerciasis – or river blindness – from West Africa. 600 000 cases of blindness have been prevented and 18 million children spared from the disease. Thousands of farmers have been able to reclaim 25 million hectares of fertile river land that had been abandoned because of the risk of infection.

Mr Ali Maalin (left), from Somalia, was the last person known to be infected with smallpox. Here he stands with the doctor who treated him more than 25 years ago. Ali has since worked on polio eradication campaigns.

1979

Eradication of smallpox

The eradication of smallpox – a disease which had maimed and killed millions – in the late 1970s is one of WHO's proudest achievements. The campaign to eradicate the deadly disease throughout the world was coordinated by WHO between 1967 and 1979. It was the first and so far the only time that a major infectious disease has been eradicated.

1983 Institut Pasteur (France) identifies HIV.

2003

WHO Framework Convention on Tobacco Control

21 May 2003 was a historic day for global public health. After nearly four years of intense negotiations, the World Health Assembly unanimously adopted WHO's first global public health treaty. The treaty is designed to reduce tobacco-related deaths and disease around the world.

2004 Adoption of the Global Strategy on Diet, Physkal Activity and Health.

1978 The International Conference on Primary Health Care, in Alma-Ata, Kazakhstan sets the historic goal of "Health for All" – to which WHO continues to aspire.

1988

Global Polio Eradication Initiative established

Since its launch in 1988, the Global Polio Eradication Initiative has reduced the number of cases of polio by more than 99% – from more than 350 000 per year to 1956 in 2006. Spearheaded by national governments, WHO, Rotary International, the US Centers for Disease Control and Prevention and UNICEF, it has immunized more than two billion children thanks to the mobilization of more than 20 million volunteers and health workers. As a result, five million children are today walking, who would otherwise have been paralysed, and more than 1.5 million childhood deaths have been averted.

THE GOAL IS TO ERADICATE POLIO WORLDWIDE SO THAT NO CHILD WILL EVER AGAIN BE PARALYZED BY THIS DISEASE.

2003 Severe Acute Respiratory Syndrome (SARS) first recognized and then controlled.

2005 World Health Assembly revises the International Health Regulations.

World Health Organization

Non-ionizing radiation

Ionizing radiation

The Present EMF Context

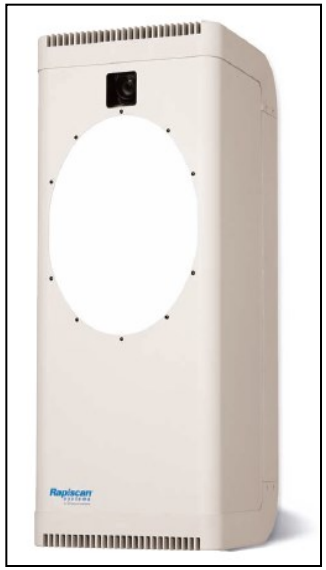
- Increasing EMF human exposure due to electricity demand, medical technologies and wireless devices
- Increasing concern from the public

Radio Frequency Fields (100 kHz – 300 GHz)

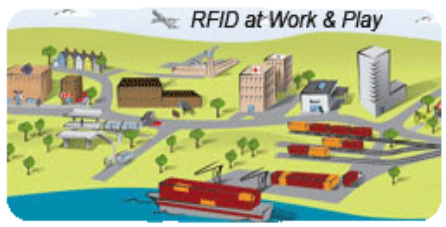
Telecommunications

Residential sources

Commercial



Security scanners



Emerging technologies

Broadcasting

World Health Organization

Daily Mail
24 October 2002
Page 43

Mobiles 'boost cancer'

Radiation

use are still unclear.

The biggest British study, led by Sir William Stewart two years ago, could find no evidence of a risk to

Cancer develops when control signals in a normal cell go wrong and an abnormal cell results. Instead of destroying itself the mutant cell

Stop Smart Meters!

Fighting for health, privacy, and safety

Home | About | Donate | FAQ | Why Stop Smart Meters? | Actions You Can Take | Direct Action | The Science | Protest "Opt Out" Fees

Defend Your Analog Meter | Sample Letter to Utility | SSM Bulletins | Press Releases | Local Contacts | Links | Order/ Download Flyers

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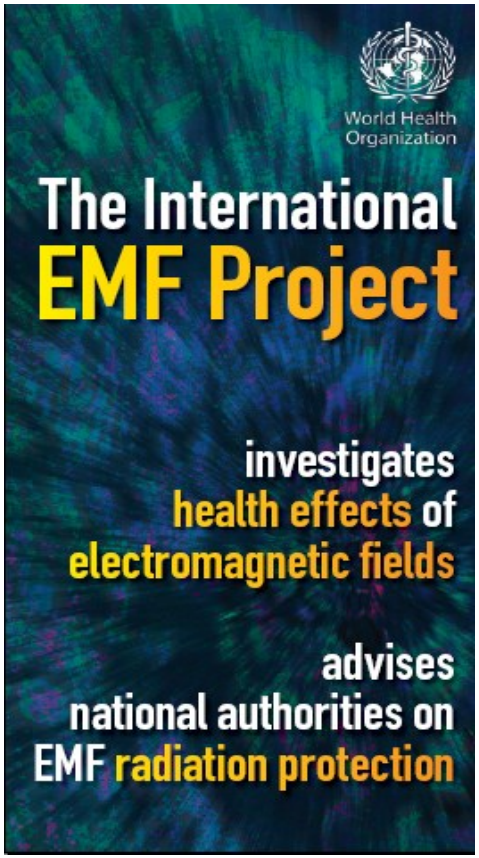
The Present Scientific Knowledge

- Large and increasingly sophisticated database
- Known mechanisms
- Health effects not established below international guidelines
- Scientific uncertainty

WHO International EMF Project

- Established in 1996
- Coordinated by WHO HQ
- A multinational, multidisciplinary effort to create and disseminate information on human health risk from EMF



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WHO Partners in Radiation

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mHealth
an ITU/WHO initiative

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Statistics | Media centre | Publications | Countries | Programmes and projects

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ITU and WHO launch mHealth initiative to combat noncommunicable diseases

Plan to save lives and reduce costs agreed at ITU Telecom World 2012

Joint ITU/WHO news release

17 OCTOBER 2012 | DUBAI, UNITED ARAB EMIRATES - The International Telecommunication Union (ITU) and WHO today launched a new partnership called the 'mHealth' Initiative to use mobile technology, in particular text messaging and apps, to help combat noncommunicable diseases (NCDs) such as diabetes, cancer, cardiovascular diseases and chronic respiratory diseases.

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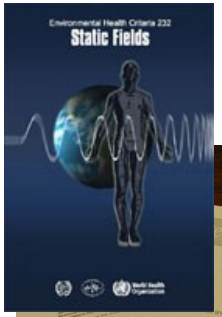
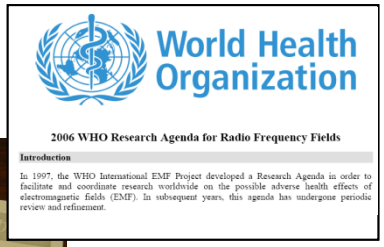
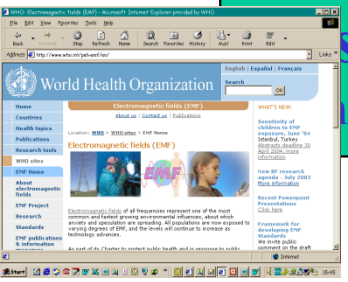
Do EMFs pose a heath risk?

Risk Assessment
The Evidence

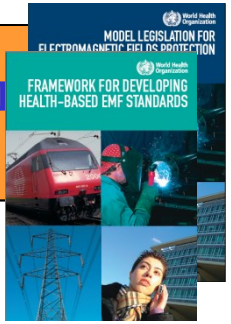




sk Perception
e Public Concern



Risk Managemer
The Policies



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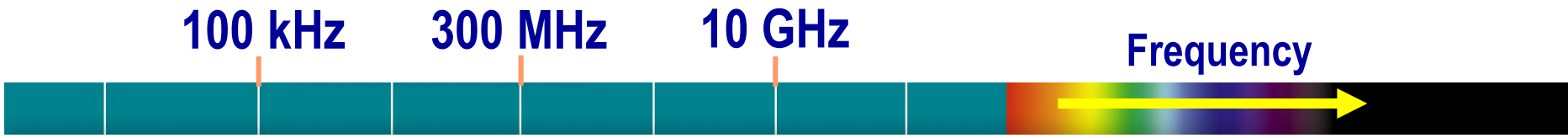
OUTLINE

- Introduction
- **Assessing the health risk**

What do we know?



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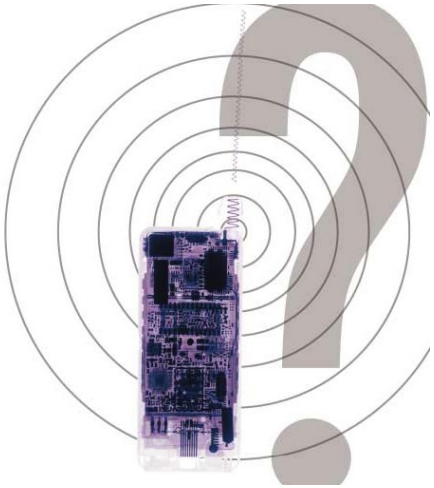

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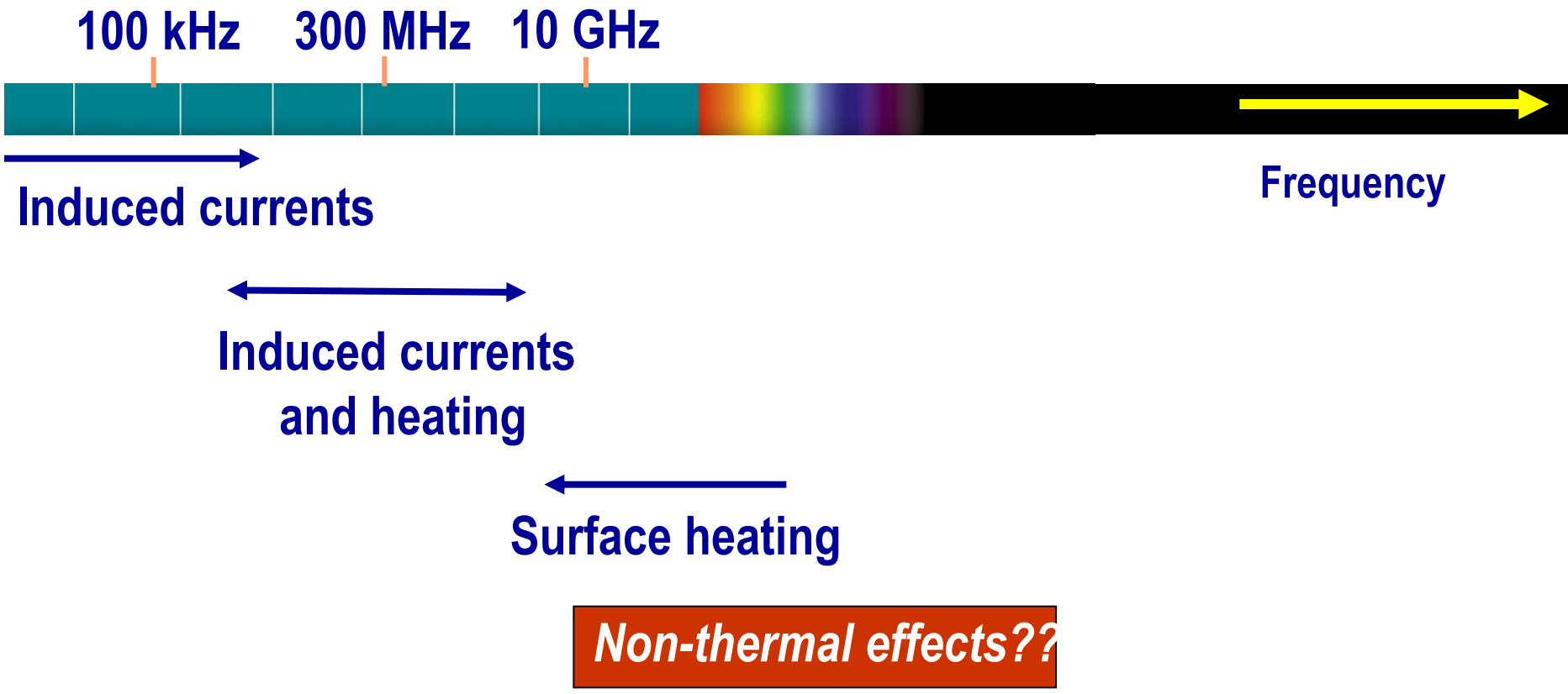
What do we know?

Mechanisms of interaction



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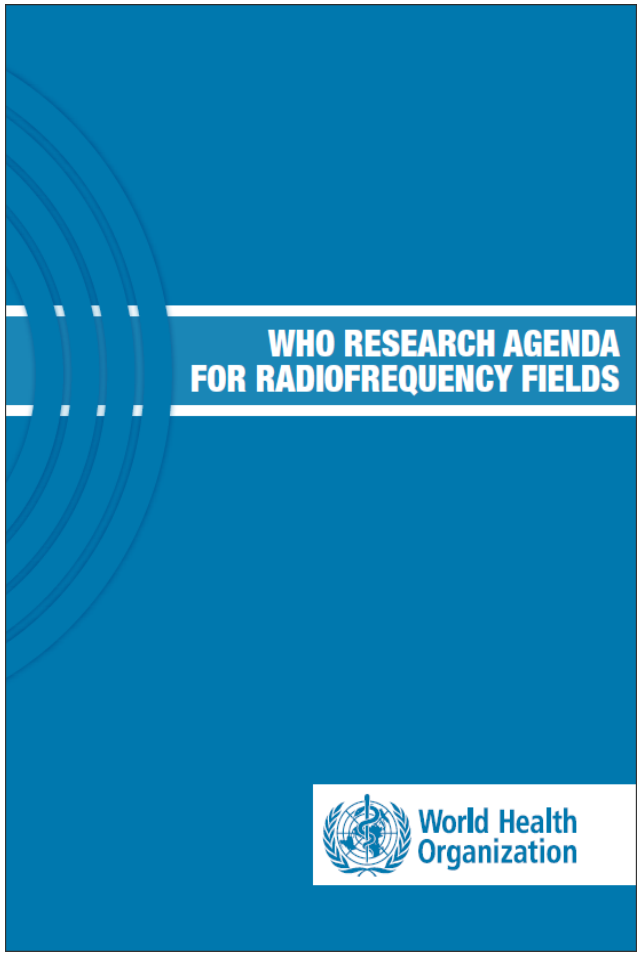
What type of research is needed?

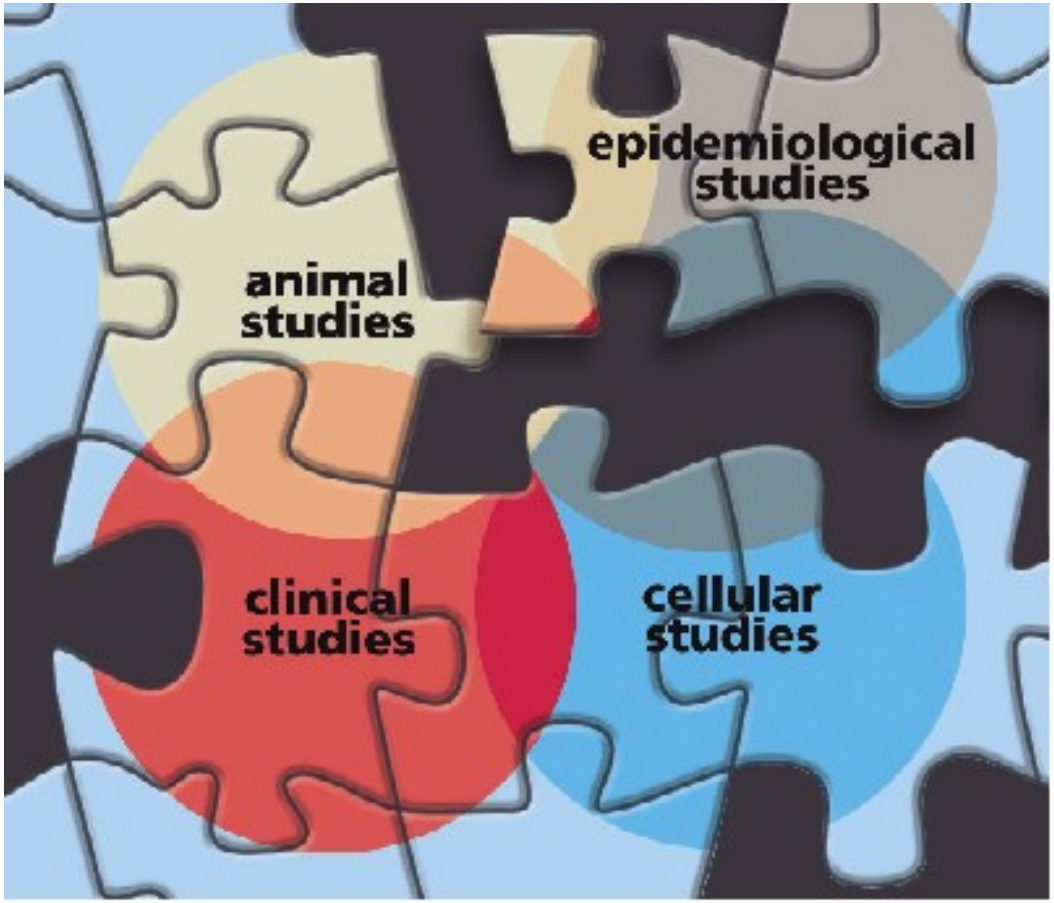
RF Research Agenda



- To promote research areas that have relevance to public health, and can
  - reduce scientific uncertainties: health effects research
  - respond to public concern through better risk communication: social science research
- Useful to researchers and funding agencies
- Uptake of the latest agenda in several countries

Research

Balance of studies needed



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

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Laboratory Studies

- Cellular studies
  - Genotoxicity
  - Gene expression
- Animal studies
  - Cancer
  - Behaviour
  - BBB
  - Skin
- Human studies
  - Sleep
  - EEG
  - Hormones
  - EHS

Short-term effects

(WHO fact sheet 193, June 2011)

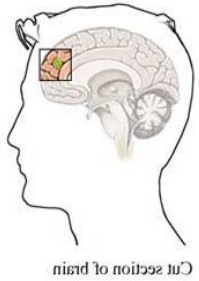
- To date, research **does not suggest any consistent evidence** of adverse health effects from exposure to RF fields at levels below those that cause tissue heating.

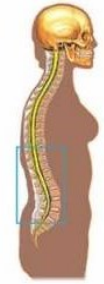
- Research has not been able to provide support for a causal relationship between exposure to EMF and self-reported symptoms, or “electromagnetic hypersensitivity”.

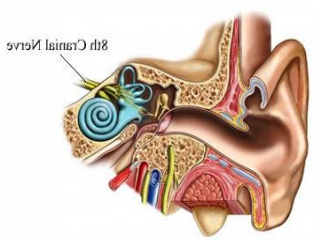
Epidemiological studies

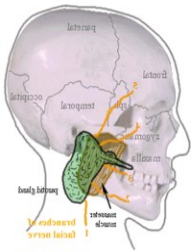
Studies on mobile phones

- Tumours in head and neck
  - Glioma, meningioma, acoustic neuroma, parotid gland









- Over 15 studies on the use of mobile phones
  - Published: USA, Nordic countries, INTERPHONE, CEFALO
  - Ongoing: MOBI-Kids, COSMOS

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INTERPHONE study

(published 18 May 2010)

Published by Oxford University Press on behalf of the International Epidemiological Association

International Journal of Epidemiology 2010;1–20
doi:10.1093/ije/dyq079

Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case–control study

The INTERPHONE Study Group*

5 Corresponding author. Elisabeth Cardis; CREAL, Doctor Aiguader 88,
*List of members of this study group is available in the Appendix.

Accepted 8 March 2010

- **Cases:**
  - 2,765 gliomas
  - 2,425 meningiomas
  - 1,121 acoustic neuroma
  - 109 malignant parotid gland
- **Controls:**
  - 7,658

Long-term effects

(WHO fact sheet 193, June 2011)

- No increased risk of glioma, meningioma or acoustic neuroma with mobile phone use of more than 10 years
- Indications of increased risk of glioma for heavy users
  - Biases and errors prevent a causal interpretation
  - Basis for classification of RF fields as "possible carcinogenic"
- No available data for long-term use (15-20 years)
- Studies on children ongoing
  - No causal relationship seen in CEFALO study (July 2011)

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Media centre

Electromagnetic fields and public health: mobile phones

Fact sheet N°193
June 2011

Key facts

- Mobile phone use is ubiquitous with an estimated 4.6 billion subscriptions globally.
- The electromagnetic fields produced by mobile phones are classified by the International Agency for Research on Cancer as possibly carcinogenic to humans.
- Studies are ongoing to more fully assess potential long-term effects of mobile phone use.
- WHO will conduct a formal risk assessment of all studied health outcomes from radiofrequency fields exposure by 2012.

http://www.who.int/mediacentre/factsheets/fs193/en/index.html

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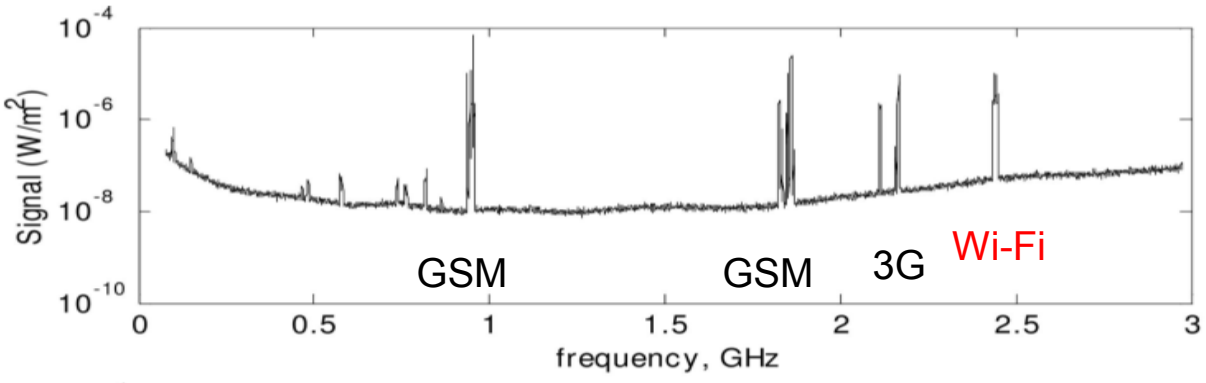
Epidemiological studies

Base stations and wireless networks

- Some studies have been performed
  - Well-being and performance
  - Cancer
- Difficulty of personal exposu nt



Kenneth R. Foster, *Radiofrequency exposure from wireless LANs utilizing WI-FI technology*. Health Phys. 92(3):280 –289; 2007

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Fact sheet N°304
May 2006

Electromagnetic fields and public health
Base stations and wireless technologies

Conclusions:

"Considering the very low exposure levels and research results collected to date, **there is no convincing scientific evidence that the weak RF signals from base stations and wireless networks cause adverse health effects"**

How do we evaluate

the health risk from EMF?

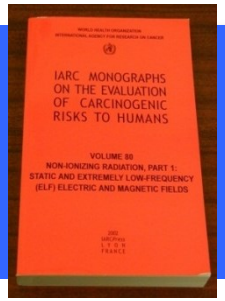
EMF Health Risk Assessment

Problem Formulation

Hazard Identification

Review key research to identify any potential health problems that an agent can cause

Cancer



Exposure Assessment

Determine the amount, duration and pattern of exposure to the agent

Exposure-Response Assessment

Estimate how much of the agent it would take to cause varying degrees of health effects that could lead to illnesses

Risk Characterization

Assess the risk for the agent to cause cancer or other illnesses in the general population

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From V. Cogliano, Workshop on "Characterizing evidence in EMF risk assessment", Berlin, May 2006, http://evidence.pureres.net

Overview of the evaluation process

Cancer in humans

Sufficient evidence
Limited evidence
Inadequate evidence
Evidence suggesting lack of carcinogenicity

Cancer in experimental animals

Sufficient evidence
Limited evidence
Inadequate evidence
Evidence suggesting lack of carcinogenicity

Mechanistic and other relevant data

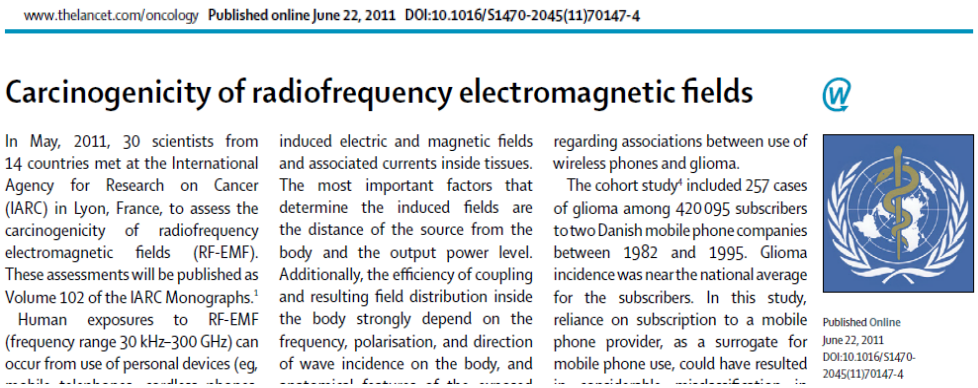
- Mechanistic data "weak," "moderate," or "strong"?
- Mechanism likely to be operative in humans?

Overall evaluation

Group 1	*Carcinogenic to humans*
Group 2A	*Probably carcinogenic to humans*
Group 2B	*Possibly carcinogenic to humans*
Group 3	*Not classifiable as to its carcinogenicity to humans*
Group 4	*Probably not carcinogenic to humans*

IARC Monograph on RF

- **<u>Volume 102</u>: Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields, 2013**
  - Expert meeting, May 2011
  - *The Lancet Oncology*, 22 June 2011
  - Monograph publication, 24 April 2013



www.thelancet.com/oncology **Published online June 22, 2011 DOI:10.1016/S1470-2045(11)70147-4**

Carcinogenicity of radiofrequency electromagnetic fields

In May, 2011, 30 scientists from 14 countries met at the International Agency for Research on Cancer (IARC) in Lyon, France, to assess the carcinogenicity of radiofrequency electromagnetic fields (RF-EMF). These assessments will be published as Volume 102 of the IARC Monographs.[1]

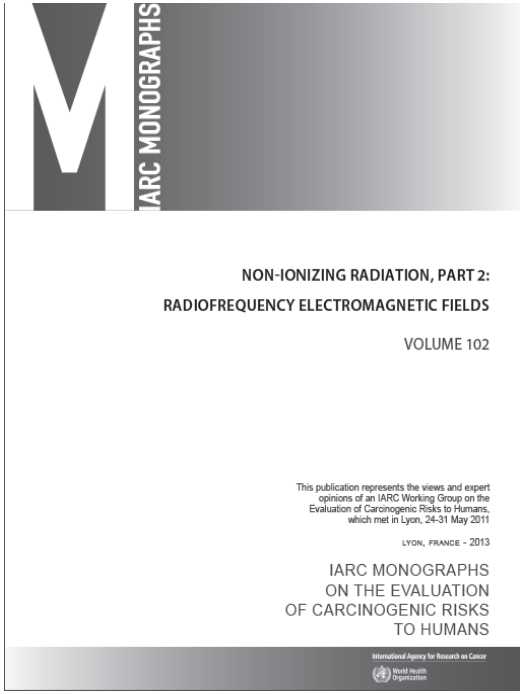
Human exposures to RF-EMF (frequency range 30 kHz–300 GHz) can occur from use of personal devices (eg,

induced electric and magnetic fields and associated currents inside tissues. The most important factors that determine the induced fields are the distance of the source from the body and the output power level. Additionally, the efficiency of coupling and resulting field distribution inside the body strongly depend on the frequency, polarisation, and direction of wave incidence on the body, and

regarding associations between use of wireless phones and glioma.

The cohort study[4] included 257 cases of glioma among 420 095 subscribers to two Danish mobile phone companies between 1982 and 1995. Glioma incidence was near the national average for the subscribers. In this study, reliance on subscription to a mobile phone provider, as a surrogate for mobile phone use, could have resulted

Published Online June 22, 2011 DOI:10.1016/S1470-2045(11)70147-4



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6.1 Cancer in Humans

There is *limited evidence* in humans for the carcinogenicity of radiofrequency radiation. Positive associations have been observed between exposure to radiofrequency radiation from wireless phones and glioma, and acoustic neuroma.

6.2 Cancer in Experimental Animals

There is *limited evidence* in experimental animals for the carcinogenicity of radiofrequency radiation.

6.3 Overall Evaluation

Radiofrequency electromagnetic fields are *possibly carcinogenic to humans (Group 2B).*

6.4 Rationale of the evaluation of the epidemiological evidence

The human epidemiological evidence was mixed. Several small early case–control studies were considered to be largely uninformative. A large cohort study showed no increase in risk of relevant tumours, but it lacked information on level of mobile-phone use and there were several

glioma and acoustic neuroma and mobile-phone use; specifically in people with highest cumulative use of mobile phones, in people who had used mobile phones on the same side of the head as that on which their tumour developed, and in people whose tumour was in the temporal lobe of the brain (the area of the brain that is most exposed to RF radiation when a wireless phone is used at the ear). The Swedish study found similar results for cordless phones. The comparative weakness of the associations in the INTERPHONE study and inconsistencies between its results and those of the Swedish study led to the evaluation of *limited evidence* for glioma and acoustic neuroma, as decided by the majority of the members of the Working Group. A small, recently published Japanese case–control study, which also observed an association of acoustic neuroma with mobile-phone use, contributed to the evaluation of *limited evidence* for acoustic neuroma.

There was, however, a minority opinion that current evidence in humans was *inadequate*, therefore permitting no conclusion about a causal association. This minority saw inconsistency between the two case–control studies

Health Risk Assessment

Problem Formulation

Hazard Identification

Review key research to identify any potential health problems that an agent can cause

Exposure Assessment

Determine the amount, duration and pattern of exposure to the agent

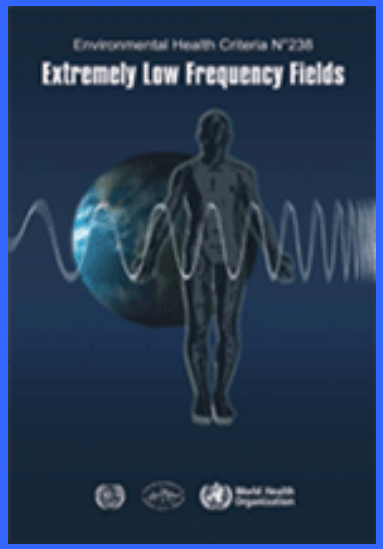
Exposure-Response Assessment

Estimate how much of the agent it would take to cause varying degrees of health effects that could lead to illnesses

Risk Characterization

Assess the risk for the agent to cause cancer or other illnesses in the general population

All studied outcomes



International EMF Project

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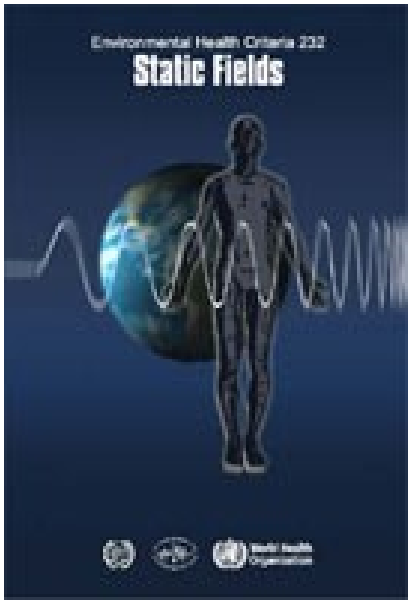
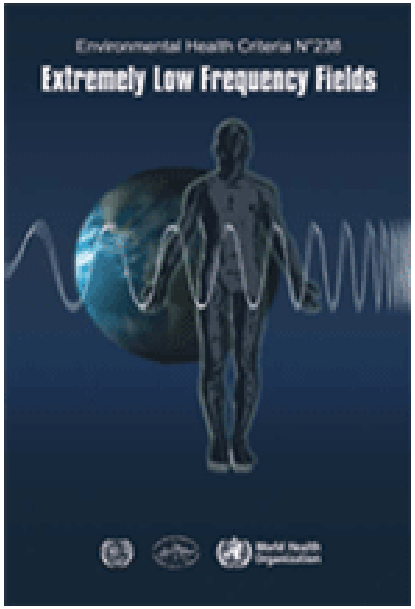
Environmental Health Criteria

Electromagnetic Fields



2006



2007

RF fields

2014

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Scope

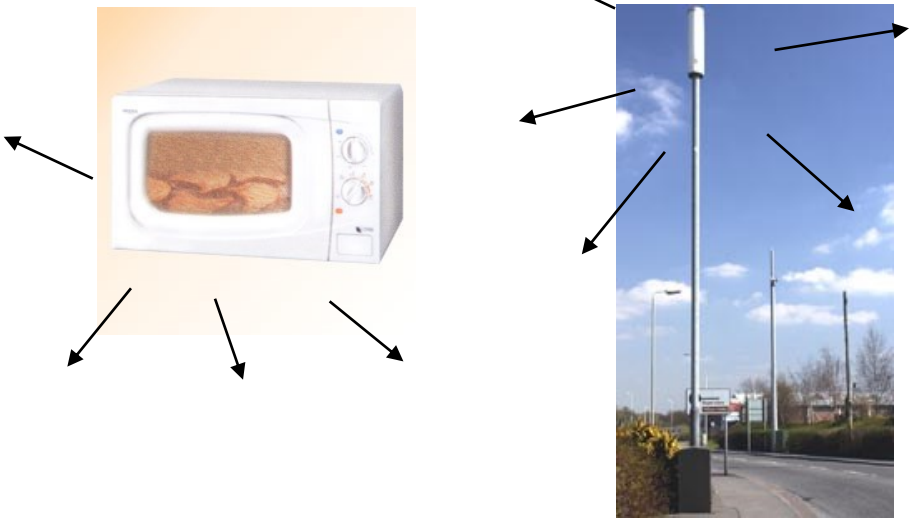
- Frequency range:
  - 100 kHz - 300 GHz
  - Include UWB, pulses, mm-waves
- Sources:
  - RFID, EAS, mobile telephony, radar, smart meters, …
- Health benefits not included
  - Hyperthermia, MRI, medical treatments, diathermy, RF ablation surgery
- Systematic review of scientific evidence of health risks
- Update on research recommendations
- Review of national RF policies

OUTLINE

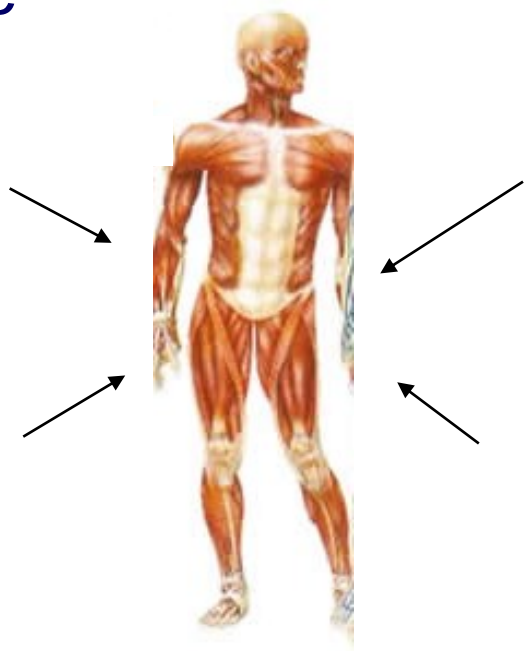
- Introduction
- Assessing the health risk
- **Managing the health risk**
  - **Developing standards and regulations**
  - **Communicating the scientific knowledge**

Norms, Standards and Guidelines

- **Emission standards** have specifications that limit the EMF emissions from devices



- **Exposure standards** have specifications that limit EMF exposure to people



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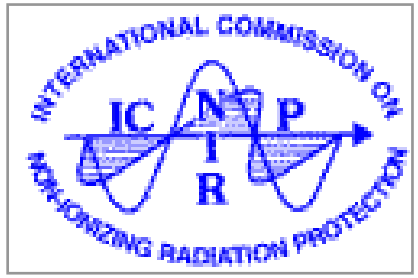
Relevant Authorities

Non-governmental and international organizations

- **Emission standards**
- **Measurements standards**
- **Exposure standards**



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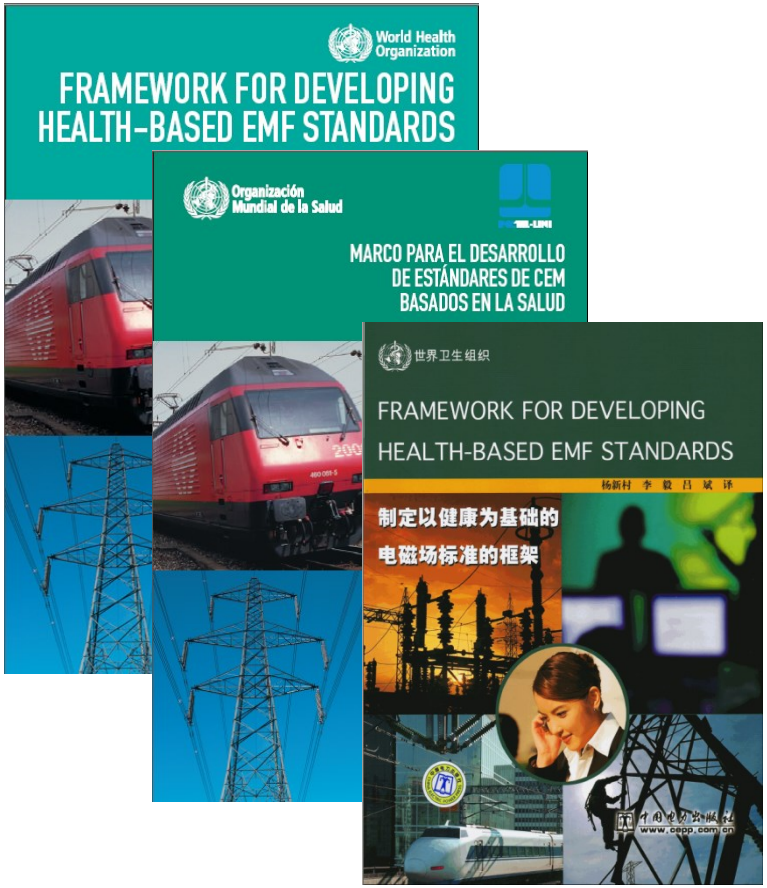
Policy documents ….



http://www.who.int/peh-emf/standards/

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Extraordinary

National Assembly Journal

No. 62 Abuja - 17th April, 2012 Vol. 8

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Worldwide EMF standards

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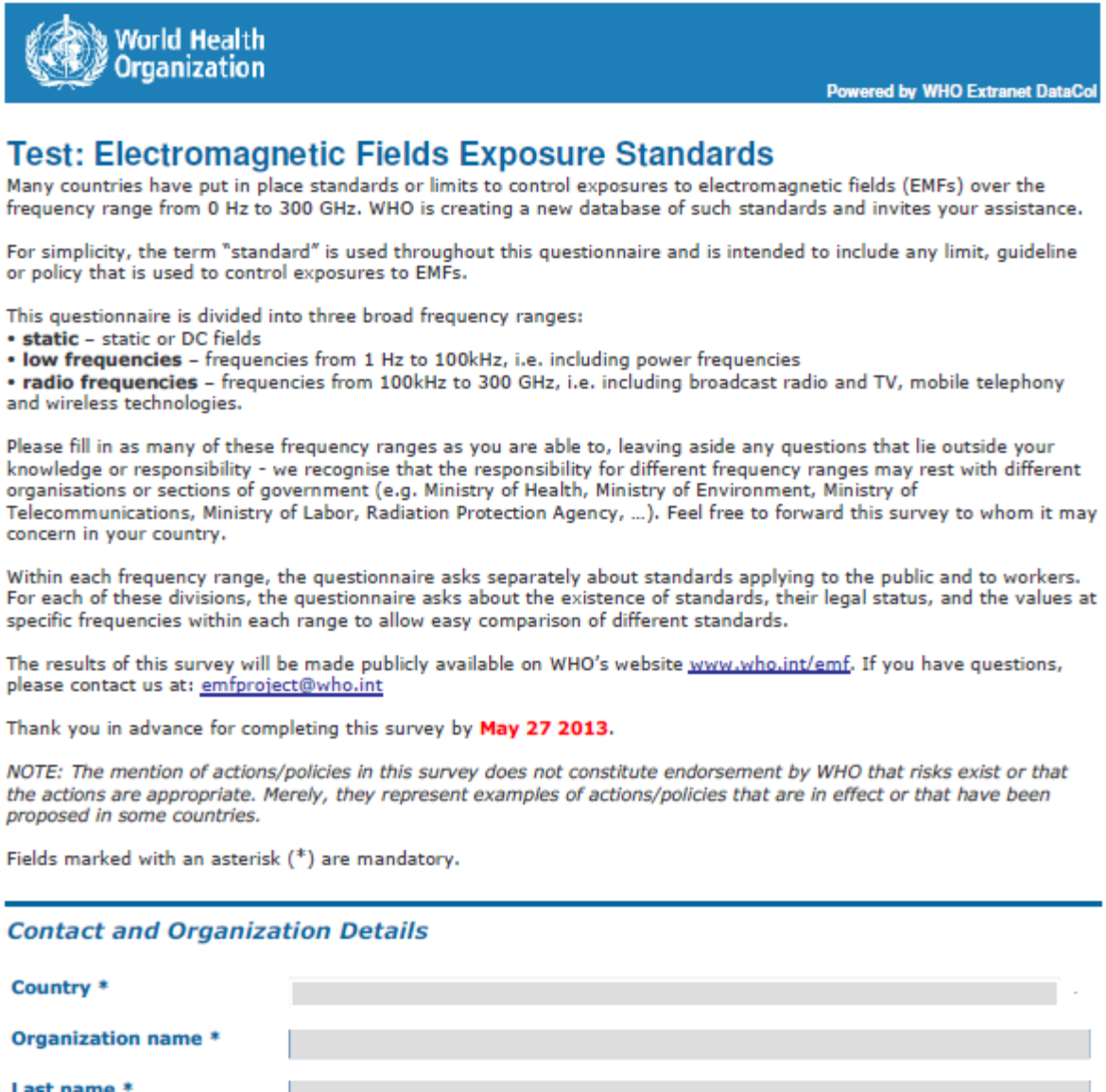
Survey on EMF Standards
May 2013



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Test: Electromagnetic Fields Exposure Standards

Many countries have put in place standards or limits to control exposures to electromagnetic fields (EMFs) over the frequency range from 0 Hz to 300 GHz. WHO is creating a new database of such standards and invites your assistance.

For simplicity, the term "standard" is used throughout this questionnaire and is intended to include any limit, guideline or policy that is used to control exposures to EMFs.

This questionnaire is divided into three broad frequency ranges:
- **static** – static or DC fields
- **low frequencies** – frequencies from 1 Hz to 100kHz, i.e. including power frequencies
- **radio frequencies** – frequencies from 100kHz to 300 GHz, i.e. including broadcast radio and TV, mobile telephony and wireless technologies.

Please fill in as many of these frequency ranges as you are able to, leaving aside any questions that lie outside your knowledge or responsibility - we recognise that the responsibility for different frequency ranges may rest with different organisations or sections of government (e.g. Ministry of Health, Ministry of Environment, Ministry of Telecommunications, Ministry of Labor, Radiation Protection Agency, ...). Feel free to forward this survey to whom it may concern in your country.

Within each frequency range, the questionnaire asks separately about standards applying to the public and to workers. For each of these divisions, the questionnaire asks about the existence of standards, their legal status, and the values at specific frequencies within each range to allow easy comparison of different standards.

The results of this survey will be made publicly available on WHO's website www.who.int/emf. If you have questions, please contact us at: emfproject@who.int

Thank you in advance for completing this survey by **May 27 2013**.

NOTE: The mention of actions/policies in this survey does not constitute endorsement by WHO that risks exist or that the actions are appropriate. Merely, they represent examples of actions/policies that are in effect or that have been proposed in some countries.

Fields marked with an asterisk (*) are mandatory.

Contact and Organization Details

Country *

Organization name *

Last name *

World Health Organization

Global Health Observatory Data Repository

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- World Health Statistics
- Environmental health
  - Children: environmental health
  - Climate change
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  - Lead
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  - Outdoor air pollution
  - Second-hand smoke
  - Total environment
  - UV radiation
  - Electromagnetic fields (EMF)
    - Exposure standards
    - Limits values
    - Legislative status

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Exposure standards for electromagnetic fields (EMF)

Location	Year	Standards applying to the public: Static fields	Standards applying to the public: Low frequencies	Standards applying to the public: Radio frequencies	Standards applying to workers: Static fields	Standards applying to workers: Low frequencies	Standards applying to workers: Radio frequencies
Afghanistan	2013	No	Yes	Yes	No	No	No
Albania	2013	No data	Yes	Yes	No	No	No
Algeria	2013	No	Yes	Yes	Yes	Subnational	Subnational
Andorra	2013	No data	No data	Subnational	No	No	No
Angola		No	Yes	Subnational	No	No	No
Antigua and Barbuda		No	No	No	No data	No data	No
Argentina		Yes	Subnational	Subnational	Yes	No	No
Armenia		No	Yes	Yes	No	No	No
Australia		No	Yes	Yes	Yes	Yes	Yes
Austria		Yes	Yes	Yes	Yes	Yes	Yes
Azerbaijan		No	Yes	Yes	No	No	No

National management approaches

- Relevant authorities
  - National level (different ministries)
  - Provincial level
  - Local level

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CITY INSIDER

The people, politics & places of San Francisco

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Supervisors vote to settle on cell phone emission levels

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San Francisco moved closer to dropping its fight against the wireless industry to require that cell phone retailers post radiation warnings.

In 2010, the Board of Supervisors passed then-Mayor Gavin Newsom's legislation that tried to force phone vendors to post in their stores the level of radiation emitted by their devices. But the cell phone industry fought back hard, and a federal appeals court decided last year that first-of-its-kind legislation violated first amendment rights.

So at Tuesday's board meeting, most supervisors held their nose and voted to approve a settlement promising that the city would agree to a permanent injunction against the ordinance, in exchange for the Cellular Telecommunications and Internet Association to wave their claims to attorney's fees.

World Health Organization

Management Options

Reduce concern

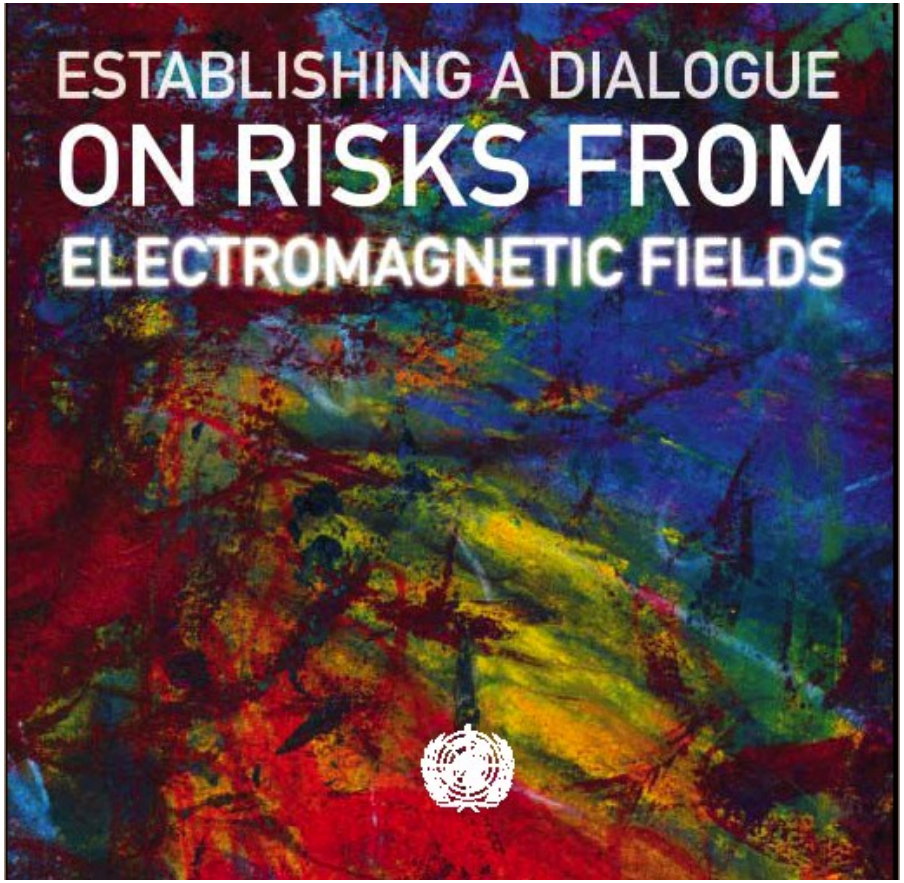
Reduce uncertainty

Reduce exposure

- No action
- Communication
- Research
- Planning measures
- Engineering measures
- Exposure limits
- ….

Risk Perception and Communication

WHO Risk Handbook



- For programme managers who need basic information on EMF risk perception, communication and management
- Available in English
- Translated into Spanish, Italian, German, French, Russian, Bulgarian, Dutch, Polish, Portuguese, Hungarian and Japanese
- Available on the web www.who.int/emf

World Health Organization

World Health Organization

Announcement of

International Stakeholder Seminar on Radiofrequency Policies

5 June 2013, 9:00am - 5:30pm

French Agency for Food, Environmental and Occupational Health & Safety (ANSES)

27-31 avenue du Général Leclerc - 94701 Maisons-Alfort, France

and

Call for examples of good risk management practices

by 30 June 2013

emfproject@who.int

World Health Organization

OUTLINE

- Introduction
- Assessing the health risk
- Managing the potential risk
- **Conclusions**

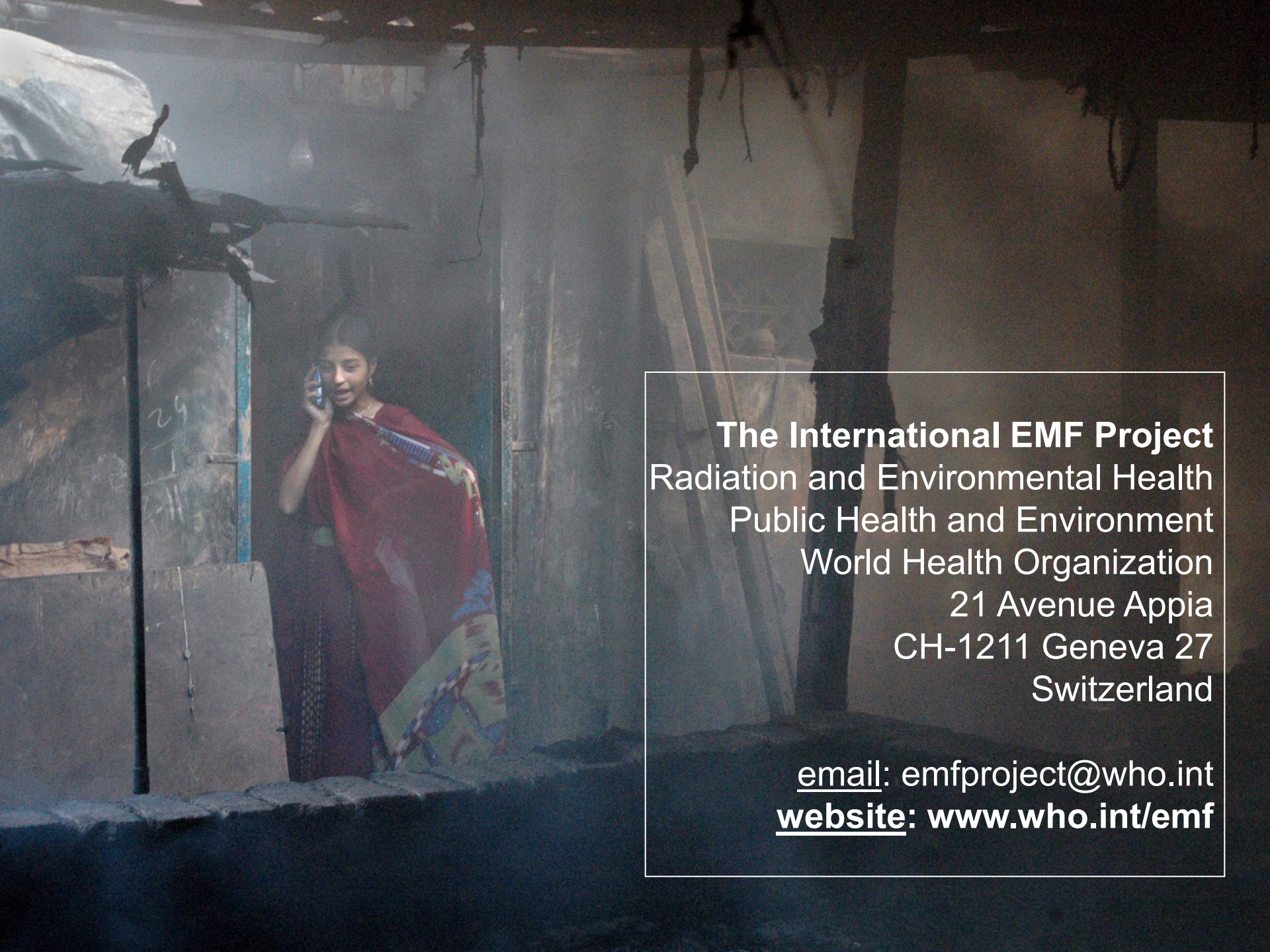
Challenges to governments….

- Rapidly evolving RF technologies
- Launched on the market before health evaluation
- Disparities in risk management measures and regulations around the world
- Concern from the public

Conclusions

- Need for clear roles and responsibilities in government on this topic
- Need for adoption and compliance of health-based standards
- Need for a public information program and dialogue with stakeholders
- Need for promoting research to reduce uncertainty

We are a "global village"



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Public Health and Environment
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