A Caution on Precaution – Radio Base Stations and EMF

Peter Zollman,
Chair GSM Association EMF Expert Panel
Local base stations are needed to support the personal voice/data communications services which provide economic and social benefits.

Limiting exposure according to ICNIRP recommendations protects all people from proven RF EMF health risks.

The WHO* and most expert reviewers now consider there is little plausible risk to the general public from base station RF signals.

However some people remain concerned...

*WHO fact sheet No 304, [www.who.int/emf]
Some people remain concerned

Better to have a fence at the top of a cliff rather than an ambulance at the bottom...
Some people remain concerned

- But if you don’t know if there is a cliff and where it may be…
Some people remain concerned

- But if you don’t know if there is a cliff and where it may be…
- Where do you put the fence(s)?
Some people remain concerned

- But if you don’t know if there is a cliff and where it may be...
- Where do you put the fence(s)?
- What is a useful warning?
Some people remain concerned

Which landscape is better for your wellbeing?

Are the public safer with these fences and warnings?

How to judge if a proposed measure is appropriate?
Some cost-benefit criteria

<table>
<thead>
<tr>
<th>European Commission</th>
<th>Some cost-benefit criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examining costs and benefits entails comparing the overall cost to the Community of action and lack of action, in both the short and long term. This is not simply an economic cost-benefit analysis: its scope is much broader, and includes non-economic considerations, such as the efficacy of possible options and their acceptability to the public.</td>
<td>Low financial cost?</td>
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<tr>
<td></td>
<td>Low environmental impact?</td>
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<tr>
<td></td>
<td>Reduces potential health risk?</td>
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<tr>
<td></td>
<td>Reduces general public anxiety?</td>
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EC COM(2000) 1

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Two types of precautionary base station policies

Compliance limits lower than ICNIRP*

- Restricting exposure to base station EMFs to a fraction of ICNIRP recommended public limits

WHO says “...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.”

*Note the EU Recommendation 1999/519/EC is very closely aligned to ICNIRP recommendations for restricting general public exposure so only ICNIRP is referred to here.

Planning exclusion zones

- Prohibiting base stations within arbitrary distances of defined “sensitive” locations (e.g. schools, hospitals..)

UK, Health Protection Agency (now Public Health England) says “…there is no scientific basis for establishing minimal distances between base stations and areas of public occupancy... There are many sources of exposure to RF fields, and it would in practice have little impact on people’s overall exposure.”

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Compliance limits lower than ICNIRP - Does this reduce potential health risk?

No known/anticipated health effect to mitigate so do lower compliance limits reduce general public exposure?

- Consider simple roof top 3G antenna

“The general RF exposure level of the population from the fixed RF sources including LF/MF broadcast, VHF broadcast, UHF TV and telecommunications is very low. The range is between 0,01-1 V/m in Europe that is many times below the exposure limits of EU recommendations.” EFHRAN 2010
Compliance limits lower than ICNIRP—do not mean lower exposure

- Now apply 1/10 ICNIRP compliance limit without any other change
- Size of compliance zones increases (reassuring or alarming?)
- But public exposure remains at the same low level in areas outside these zones where people live and work

Exposure < 1% ICNIRP limit

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Compliance limits lower than ICNIRP—do not mean lower exposure

Belgium
GSM900 limit = 3 V/m
Measured average = 0.93 V/m

Netherlands
GSM900 limit (ICNIRP) = 41 V/m
Measured average = 0.38 V/m

9.6% of Belgium limit
0.01% of ICNIRP limit

Joseph et al., 2012.
Compliance limits lower than ICNIRP—Cost / Environmental impact?

ICNIRP compliance 1/10 ICNIRP compliance

Compliance change does not reduce public’s exposure
Compliance limits lower than ICNIRP - Cost / Environmental impact?

UK (ICNIRP)  

Increase in antenna height to comply with Italian limits

Italy (ICNIRP/~40)

Compliance increases cost & can make antennas more visible

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## Compliance limits lower than ICNIRP - Application of criteria

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<th>Analysis</th>
<th>Met?</th>
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<tbody>
<tr>
<td>Effective in reducing potential health risk?</td>
<td>No plausible benefit. Does not reduce exposure. Non-optimum site location may increase handset average power increasing exposure.</td>
<td>No</td>
</tr>
<tr>
<td>Reduces general public anxiety?</td>
<td>Larger zones feeds non-scientifically-supported fear of base stations. Moving from science-based limits reduces trust in the validity of those limits and public authority’s management of risk.</td>
<td>No</td>
</tr>
<tr>
<td>Low environmental impact?</td>
<td>Antennas more visible</td>
<td>No</td>
</tr>
<tr>
<td>Low financial cost?</td>
<td>Significant costs to redeploy/redesign sites / unable to offer service</td>
<td>No</td>
</tr>
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</table>

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Planning exclusion zone policies – Case study Melbourne (Australia) - 1

Current policy is ICNIRP limits and no planning-based siting restrictions

“What if” case study

- What % area would become unavailable for base station deployment if prohibited within 500m of pre-schools, schools and hospitals?
- Publicly available mapping data for community facilities and base station locations
If 500m zone applied:
- across whole urban area would affect >50% of antennas
- Rises to ~90% in dense urban area

Service impacts not directly assessed

GSMA report available

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# Planning exclusion zone policies – Application of criteria

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<td>Effective in reducing potential health risk?</td>
<td>No plausible benefit. Non-optimum site location may increase handset average power increasing exposure where service can be provided</td>
<td>No</td>
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<tr>
<td>Reduces general public anxiety?</td>
<td>Potentially feeds non-scientifically-supported fear of base stations</td>
<td>No</td>
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<tr>
<td>Low environmental impact?</td>
<td>More than 50% sites to be re-deployed – where?</td>
<td>No</td>
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<tr>
<td>Low financial cost?</td>
<td>Costs to redeploy sites / unable to offer service</td>
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Impact of policies on public concern – Appropriate policy can manage concern

The proportion of respondents mentioning handsets/masts as a concern is gradually decreasing

Percentage mentioning handsets/masts as a concern

UK Strategy
- International limits
- National mast policy
- Code of practice
- Sample audits
- Information
- Research support

MOA, 2012
Impact of policies on public concern – Eurobarometer findings

Stricter legal safety standards (limits, exclusion zones)

Strong precautionary advice by governments

ICNIRP ✔
Compliance ✔
Communications ✔

Question: QC3. How concerned are you about the potential health risks of electromagnetic fields?
Answers: Very concerned + Fairly concerned

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Data-source: Special Eurobarometer 347, 2010, p. 66; presentation by GSMA Europe
Conclusions

ITU should recommend:

- Applying evidence based EMF exposure limits as advised by the WHO
- Cooperation with the WHO to clarify scientific uncertainty
- Having consistent mast policy
- Be cautious with precautionary measures and avoid policies that are ineffective especially if they create alarm and/or are costly
- Communicating using trusted health agencies
Thank You

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<td>2, 9</td>
<td>WHO</td>
<td>Base stations and wireless networks - Fact Sheet N°304 (May 2006) [<a href="http://www.who.int/emf">www.who.int/emf</a>] [accessed 17/4/13]</td>
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<td>12</td>
<td>Joseph et al., 2012.</td>
<td>Assessment of RF Exposures from Emerging Wireless Communication Technologies in Different Environments, Joseph et al., Health Physics, 102(2):161-172, February 2012.</td>
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<tr>
<td>24</td>
<td>IEC 62232</td>
<td>IEC 62232 Edition 1.0 2011-05, Determination of RF field strength and SAR in the vicinity of radiocommunication base stations for the purpose of evaluating human exposure</td>
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<td>25</td>
<td>Wiedemann, 2011</td>
<td>How to deal with uncertain risks? The EMF case and beyond, Academy of Disaster Reduction and Emergency Management, Ministry of Civil Affairs &amp; Ministry of Education, The People's Republic of China, Beijing Normal University, 16th of March 2011, Prof. Dr. Peter Wiedemann</td>
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Compliance limits lower than ICNIRP - Some technical background

- Field strength falls quickly as you move away from the antenna
- Lowering the compliance limit affects access-control zones near antenna
- Compliance to lower limits may require site design changes without improving network performance or reducing public exposure

For typical base station antennas the field falls away more slowly close to the antenna than at larger distances

<table>
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<th>Technical Corner</th>
<th>Close to antenna* (Cylindrical decay)</th>
<th>Far from antenna* (Spherical decay)</th>
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<tr>
<td>Exposure (power flux density)</td>
<td>$s \propto 1/d$</td>
<td>$s \propto 1/d^2$</td>
</tr>
<tr>
<td>Compliance distance at exposure limit</td>
<td>$d_L \propto \frac{1}{S_L}$</td>
<td>$d_L \propto \frac{1}{S_L^2}$</td>
</tr>
<tr>
<td>Increase in compliance distance relative to ICNIRP for reduced limit</td>
<td>$d_L = \frac{S_{icnirp}}{S_L} \times d_{icnirp}$</td>
<td>$d_L = \frac{S_{icnirp}}{S_L} \times d_{icnirp}$</td>
</tr>
<tr>
<td>For “precautionary limit” 1/10 ICNIRP</td>
<td>$d_L \equiv 10 \times d_{icnirp}$</td>
<td>$d_L \equiv 3.16 \times d_{icnirp}$</td>
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*See IEC 62232 for description of where cylindrical/spherical estimation applies – typically 12 to 50m from antenna

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Precautionary Measures = Increased Concern

Study conducted in Australia, Brazil, India, Japan, Germany, The Netherlands, South Africa, UK and USA.

ICNIRP recommends limits, however, in some countries debate continues.

Base station information
Precautionary limits
Protect sensitive areas
Minimise exposure

All precautionary measures increased concern.

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Wiedemann, 2011