

## Comments on the Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Regulations (EU) No 1316/2013 and (EU) No 283/2014 as regards the promotion of Internet connectivity in local communities

### ENVIRONMENTAL EFFECTS OF EMF EXPOSURES

There is a vast body of peer-reviewed scientific literature connecting radiofrequency radiation (that is used for the provision of Wi-Fi) with numerous potentially serious health effects. Tens of thousands of papers show evidence of harm ranging from molecular level effects such as oxidative stress through to systemic effects that have been shown to affect all systems.

### ADVERSE HEALTH CONDITIONS LINKED WITH EMR

An increasing number of studies indicate adverse health effects as a result of environmental exposure to electromagnetic pollution. There is substantial evidence indicating that even low intensity EMF exposures can cause ill health. Conditions linked with environmental EMF exposures include:

**Cancer** (Coureau et al. 2014, Moon et al. 2014, Hardell & Carlberg 2013); **Alzheimer's disease** (Davanipour & Sobel 2009, Huss et al. 2009); **Childhood & adult leukaemia** (Dolk et al. 1997, Hocking 1996); **Autism** (Herbert & Sage 2012, Kane 2004); **Immune system effects** (Boscolo et al. 2001, Novoselova et al. 1999); **Miscarriage** (Li et al. 2002); **Infertility** (Avendaño et al. 2010, Otitoloju et al. 2010, Aitken & De Luliis 2007); **DNA damage** (De Luliis et al. 2009, REFLEX 2004); **Oxidative stress** (Kumar et al. 2012, Agarwal et al. 2009, Ilhan et al. 2004).

We suggest the cost to the European economy of electromagnetic pollution runs into many billions of euros in terms of reduced health, wellbeing and productivity, and would be greatly exacerbated by the proposed wireless rollout.

**CANCER:** Radio frequency exposure at levels that can be experienced environmentally can cause DNA damage, which can be a precursor of cancer (De Luliis et al. 2009, Adlkofer 2004). Cancer rates for females living adjacent base stations 4.15 times greater than those at lower exposures ( $p < 0.0001$ ) (Wolf & Wolf 2004).

After 5 years, the risk of malignant tumours in individuals exposed to raised radio frequency exposures from base stations was 3 times higher than those with lower exposures (Eger et al. 2004). In 2009 cancer cost the EU €126 billion (Luengo-Fernandez et al. 2013).

**CHILDHOOD LEUKAEMIA:** Association noted between increased incidences of this and mortality at exposures of  $8 \mu\text{W}/\text{cm}^2$  (Hocking et al. 1996).

It is important to note that radio waves are already classified as 'Group 2B Possible Carcinogens' (WHO/IARC 2011) based on increased rates of the fatal brain tumour, glioma, linked with increased radiofrequency radiation exposure. Some experts are calling for an upgrade to Group 2A 'Probably carcinogenic to humans', or even to Group 1 'Carcinogenic to humans' (Hardell & Carlberg 2015, 2013). The partial report from the US National Toxicology Program (NTP 2016, 2016a) is already creating pressure for a classification upgrade. The full report, to be published next year, will further corroborate this concerning finding with evidence of DNA damage.

**SLEEP QUALITY:** The annual cost of chronic sleep deprivation in the UK alone has been estimated at £1.6 billion (Bupa 2010). Many studies indicate that individuals sleep better in environments with very low EMF levels compared to those with even slightly raised EMF

levels. As examples: Improved sleep has been noted in low-field environments with exposures of 0.05-0.22 V/m (0.0006-0.0128  $\mu\text{W}/\text{cm}^2$ ) compared to 0.25-1.29 V/m (0.0165-0.4400  $\mu\text{W}/\text{cm}^2$ ) (Oberfeld et al. 2004) and for 0.7 V/m exposures compared to 1.17 V/m exposures (Eger & Jahn 2010).

Additionally, a dose-response relationship has been shown between sleep-related fatigue and injuries (Swaen et al. 2003); and almost 20% of all serious car crash injuries are associated with driver sleepiness (Connor et al. 2002).

**DEPRESSION:** Suicide is the leading cause of death in England and Wales for men between 20-49 years old, and one of the main causes of death among 5-19 year olds (ONS Digital 2015). Depression is a gigantic public health burden that exceeds other common sources of morbidity and mortality. [In England in 2000, the annual cost of depression was estimated to be £9 billion (Thomas & Morris 2003)]. Individuals with depression are at heightened risk of: Alzheimer's disease; Cancer; Diabetes (type 2); Epilepsy; Obesity; and Stroke (BC's Physicians 2009).

Oberfeld et al. (2004) noted depressive tendency with 900/1800 MHz exposures of 0.25- 1.29 V/m (0.0165-0.4400  $\mu\text{W}/\text{cm}^2$ ) compared to 0.05-0.22 V/m (0.0006-0.0128  $\mu\text{W}/\text{cm}^2$ ) ( $p = 0.0016$ ). Others have made similar findings (Eger & Jahn 2010, Bortkiewicz et al. 2004, Santini et al. 2002). [Many wireless smart meters create RF EMF exposure levels above those associated with increased depressive tendency].

## EFFECTS OF EMR ON BIOIVERSITY

Unfortunately, Nature too can be adversely affected by electromagnetic pollution. As examples:

**Ants:** Ants perform many vital services including: pollination, predation and seed removal and dispersion. Exposures of 0.0795  $\mu\text{W}/\text{cm}^2$  significantly inhibited memories and association between food sites and visual and olfactory cues. The overall state in exposed colonies appeared similar to bee colony collapse disorder (CCD) (Cammaerts et al. 2012). [Effects of on pollinators, such as bees, have also been reported (Rahmani et al. 2011)].

**Birds:** "... *migratory birds are unable to use their magnetic compass in the presence of urban electromagnetic noise,*" Engels et al. (2014). The RF levels assessed [0.001  $\mu\text{T}$ , approximately equal to 0.3 V/m or 0.0236  $\mu\text{W}/\text{cm}^2$ ] are similar to the levels found in the 2 kHz to 5 MHz frequency range in urban environments as a result of electromagnetic pollution.

**Mice:** Mice and rats can act as pollinators and form an important part in Nature's food chain (Pattimore & Wilcove 2012). Exposure to 80-900 MHz radiation at 1.053  $\mu\text{W}/\text{cm}^2$  could cause irreversible infertility in mice after 3 generations, and levels of 0.168  $\mu\text{W}/\text{cm}^2$  caused total infertility after 5 generations (Magras & Zenos 1997). As mentioned earlier, research has additionally shown that EMFs can reduce human fertility (Avendaño et al. 2012, Falzone et al. 2011, Santini et al. 2002).

Low EMF initiatives that promote the use of the most biologically friendly types of technology, and create more biologically friendly exposures than standard wireless systems, are urgently required to help protect the environment and create more viable and sustainable Internet provision.

## HIGH CAPACITY NETWORKS - MILLIMETRE WAVE WI-FI

### Millimetre waves and biological effects

It has been known for well over a hundred years that millimetre waves can be biologically active (Bose 1906). Though beneficial effects can result from short-term millimetre wave treatments (MMWT) (Table 1), side effects can also arise. The effects of long-term chronic exposures have yet to be assessed.

<b>Table 1: Biological effects reported from mm wave exposures</b>				
<b>Power Density [<math>\mu\text{W}/\text{cm}^2</math>]</b>	<b>Frequency range</b>	<b>Exposure type</b>	<b>Effects noted</b>	<b>Author</b>
0.000,000,000,1 to 0.0001	30-60 GHz	<b>5-15 minutes</b> exposure	<b>Stimulated growth of pine seed microflora.</b>	Ratushnyak et al. (2008)
0.000,000,01	54-76 GHz	<b>5 minutes per day</b> for 5 days on mice previously exposed to ionizing radiation	<b>Normalizing effect on growth of damaged cells.</b>	Bundyuk et al. (1994)
0.07	53.37-78.33 GHz	<b>1-hour exposure</b> every 2 days. 5 treatments given to <b>human breast cancer cells</b> in culture.	<b>Cell number approximately 60% less</b> in irradiated group of cells than in sham-exposed control.	Beneduci et al. (2005)
0.1	41.303 GHz	<b>10-minute irradiation.</b>	<b>Maximum effect on <i>E. coli</i> cells' genome conformational state.</b>	Alipov et al. (1993)
$\geq 0.3$	60 GHz	<b>1-minute exposure</b> [3 current cycles - 5 second exposures every 20 seconds].	<b>Changes in firing rate of neurons.</b>	Siegel & Pikov (2010)
1 – 3	54-78 GHz	4-6 treatment sessions, each of <b>10-20 minutes duration.</b>	<b>Complete relief of headaches</b> in 122 out of 177 patients with pre-stroke forms of cerebrovascular pathology <sup>1</sup>	Kuz'menko (1998)
10	42.2GHz	Mice received <b>30-minute whole body exposure</b> daily for 15 days.	<b>Tumor growth inhibited by 33.5% compared to controls.</b>	Kalantaryan et al. (2016)

## Side effects from short-term MMWT exposure

Mild side effects have been reported as a result of short-term mm wave exposures.

### Paresthesias

In a number of patients minor short-term paresthesias [a sensation of burning, numbness, prickling or tingling that most often occurs in the body's extremities] has been reported as a result of exposure, as have feelings of fatigue and sleepiness (Usichenko et al. 2006, Radzievsky et al. 1999).

It is suggested by the author that such side effects may be likely to arise in members of the general population as a result of chronic long-term environmental exposures.

<sup>1</sup> 65% of patients receiving this treatment remained in remission for around 1 year, versus 20% in control group receiving standard medication.

### **Altered neuronal activity**

Tests have indicated that neuronal activity in the brain can be affected by very low intensity short-term exposures to mm waves (Siegel & Pikov 2010).

### **Cancer**

In research by Bellossi et al. (2000), DBA/2 mice were irradiated with 60 GHz waves for 30 minutes a day, for 5 consecutive days a week at 500  $\mu\text{W}/\text{cm}^2$ . While mice with lymphocytic leukemia cells showed increased survival (for 2 series out of 4), mice with Lewis tumor cells exhibited accelerated tumor growth. The exposure level was half that permitted by both ICNIRP (1998) and the FCC (1996) in basic restrictions for members of the general public.

Radio waves are already classified as 'Group 2B Possible Carcinogens' (WHO/IARC 2011), with some experts now calling for them to be upgraded to Group 2A 'Probably carcinogenic to humans', or even to Group 1 'Carcinogenic to humans' (Hardell & Carlberg 2015, 2013). The recent NTP (2016) findings could be particularly instrumental in causing such an upgrade.

## **EUROPE IS OBLIGED TO RESPECT BASIC HUMAN RIGHTS WHEN SEEKING TO PROMOTE INTERNET CONNECTIVITY**

### **European Convention on Human Rights: Convention for the Protection of Human Rights and Fundamental Freedoms**

It is estimated that between 3% to 5% of Europeans (around 22.3 million to 37.1 million individuals) may presently be affected by EHS. This number is growing (Jamieson 2014, Mallery-Blythe 2014a).

The proposed widespread proliferation of wireless Internet throughout Europe that the European Commission is proposing would cause profound harm to many individuals and the environment.

#### **ARTICLE 1: Obligation to respect Human Rights**

***"The High Contracting Parties shall secure to everyone within their jurisdiction the rights and freedoms defined in Section I of this Convention."***

It should be additionally noted that in Article 1 of the Charter of Fundamental Rights of the European Union (The European Parliament, the Council and the Commission 2010) it is declared that "*Human dignity is inviolable. It must be respected and protected.*"

Similar is stated in the Universal Declaration of Human Rights "*The Declaration is based on the "inherent dignity" of all people and affirms the equal rights of all men and women, in addition to their right to freedom. The Declaration gives human rights precedence over the power of the state. While states are permitted to regulate rights, they are prohibited from violating them,*" UNAC (2012, 2012a).

## **SECTION I: RIGHTS AND FREEDOMS**

## **ARTICLE 2: Right to life**

**1. "Everyone's right to life shall be protected by law. No one shall be deprived of his life intentionally save in the execution of a sentence of a court following his conviction of a crime for which this penalty is provided by law."**

**Expectant and New Mothers:** It is recognised in The International Covenant on Economic, Social and Cultural Rights (OHCHR 1976) that "*Special protection should be accorded to mothers during a reasonable period before and after childbirth.*"

Exposures of mothers to be and new mothers to EMFs "*has raised public health concerns because of the possible effects (cancer, neurological effects, developmental disability effects, etc) from the long-term exposure to low-intensity, environmental level fields in daily life,*" (Bellieni & Pinto 2012).

**Protection of Embryos/Foetuses:** All EU States agree that the human embryo/foetus belongs to the human race (Hoffman & Rowe 2010). The potential of that being obliges it to be protected in the name of human dignity, even when it is not legally ruled as a person with right to life (Mowbray 2012). It can still have interests capable of protection under law (Deazley & Smith 2013).

**Protection for Children:** The need for special protection being accorded to children is recognised in human rights legislation. As examples, it is mentioned in The UN Convention on the Rights of the Child (United Nations 1989) and the Declaration of the Rights of the Child (UN1990) that "*the child, by reason of his physical and mental immaturity, needs special safeguards and care, including appropriate legal protection, before as well as after birth.*" Refer also to Mallery-Blythe (2014) for a detailed discussion on risks to children of EMF exposure [ <https://www.youtube.com/watch?v=sNFdZVeXw7M> ]

As noted by Hoffman & Rowe (2010), when authorities are aware (or should be aware) of real risk to life they are under obligation to take appropriate mitigative action to protect those at risk.

The present proposals by the European Commission (2016) completely ignore warnings and best practice advice related to electromagnetic fields given by the Parliamentary Assembly of the Council of Europe (PACE) documenting 'The potential dangers of electromagnetic fields and their effect on the environment' (Parliamentary Assembly 2011), the European Parliament (2008) and the European Environmental Agency (EEA 2007).

## **ARTICLE 3: Prohibition of torture**

**"No one shall be subjected to torture or to inhuman or degrading treatment or punishment."**

The term 'Degrading treatment' can be defined as "*... such as to arouse ... feelings of fear, anguish and inferiority, capable of humiliating and debasing... and possibly breaking... physical or moral resistance,*" (Conseil de l'Europe / Council of Europe 1978).

The above appears very similar to descriptions provided by some electromagnetically hypersensitive (EHS) individuals (EMFSN 2016), describing how their condition makes them feel when exposed to EMFs.

Article 3 embodies a fundamental human right. "*... the right to freedom from bodily harm is second only to the right to life, and is equally based on the right which all people have a level of basic respect and dignity as human beings,*" (Hoffman & Rowe 2010). The physical symptoms experienced by some of those with EHS, and some non-EHS individuals adversely affected by EMFs, are a form of torture.

## **ARTICLE 5: Right to liberty and security**

**1. "Everyone has the right to liberty and security of person. ... "**

**Right to Liberty:** The liberty of EHS to go where they wish is compromised by electromagnetic pollution. The rights of such individuals may be violated if emissions prevent them from being able to go where they wish (even within their own homes and gardens) unhindered by exposures to electromagnetic field regimes perceived as detrimental to their wellbeing.

*"EHS has been described by patients as a 'loner's disease'. Due to the prevalence of ubiquitous EMR in the contemporary urban environment, EHS causes patients to experience extreme social isolation. The serious symptoms confine them to their home. Venturing out to shopping malls, libraries, theatres, hospitals, and doctors' offices is often precarious because of the prevalence of wireless routers, cell phones, antennas, and other sources of EMR. Furthermore many ... are often no longer able to spend time in the homes of family members due to EMR issues. As a result, huge stresses are placed on marriages and families ..."*  
(Genius & Lipp 2012).

Please note that many of the areas mentioned in the above quote are areas that the current European Commission (2016) proposal recklessly seeks to install wireless Internet into. It appears highly likely that individuals who consider that they are deprived of their liberty to go where they wish, when they wish, may eventually seek legal recourse. Prohibiting individuals from enjoying proper liberty within society is dangerous, demeaning, degrading and a gross breach of human rights.

**Right to Security:** 'Security of person' can be legally defined as "*The legal and uninterrupted enjoyment by a man of his life, his body, his health and his reputation.*"

Claims may be brought by some that their enjoyment of life, body, health and reputation may be seriously affected as a result of the increased electromagnetic radiation exposure they would receive.

Claims might additionally be brought that some individuals may have their reputations damaged as a result of how they are forced to behave as a result of exposures, or potential exposures. Claims could also be brought that they find that having to behave in this way is degrading and damaging to their security of person.

Security of health impacts both wellbeing and productivity. The health of a growing number of individuals is being adversely affected by electromagnetic pollution.

## **ARTICLE 8: Right to respect for private and family life**

**1. "Everyone has the right to respect for his private and family life, his home and his correspondence."**

*"Respect for home and home life means more than just providing some form of dwelling or shelter: it extends to maintaining the situation to which a person has become accustomed, and the very permanence of which gives comfort,"* Hoffman & Rowe (2010).

The quality of home life and enjoyment of inhabiting a dwelling may be "*spoilt by various forms of interference, such as noise, light, smells, fumes or other forms of pollution [including the present author suggests electromagnetic pollution], and anyone who has experienced this might well refer to it as an invasion of their privacy,*" Hoffman & Rowe (2010).

In *Guerra and others v. Italy* (Conseil de l'Europe/Council of Europe 1998), it was ruled that environmental pollution can cause a violation of human rights. In that instance, the European Court found the state guilty of failing to take 'positive steps' to provide vital information and that the quality of life of individuals, and that of their home and private lives had suffered as a result of their human rights being breached on this issue.

In the case of *López Ostra v Spain* (Conseil de l'Europe/Council of Europe 1994), the European Court declared: “*environmental pollution may affect individuals' well-being and prevent them from enjoying their homes in such a way as to affect their private and family life adversely, without ... seriously endangering their health.*”

The right for people to be able to enjoy their property in the manner to which they have become accustomed can become severely compromised by electromagnetic pollution. It is already indicated that EMF emissions can prevent some individuals using parts of their homes and gardens, and can even cause them to move home in order to avoid/reduce adverse health effects (EMFSN 2016, Gregory 2011, Havas 2011). There is a need for low EMF environments to be retained whenever possible.

### **ARTICLE 12: Right to marry**

*“Men and women of marriageable age have the right to marry **and to found a family** [emphasis by current author], according to the national laws governing the exercise of this right.”* [Refer back to section covering the effects of electromagnetic radiation on fertility].

As scientific research indicates environmental exposures to EMFs can reduce human fertility and increase risk of miscarriage (Bellieni & Pinto 2012), there is a risk that those promoting the proliferation of wireless devices may be found negligent if the resultant increase in electromagnetic pollution compromises the ability of individuals to found families.

### **ARTICLE 14: Prohibition of discrimination**

*“The enjoyment of the rights and freedoms set forth in this Convention shall be secured without discrimination on any ground ...”*

Individuals with EHS are discriminated against with regards to jobs, place of residence and public access to most areas of life. They are not just restricted from access to desirable things, such as leisure and entertainment, but also essentials such as groceries, health care and even petrol.

The present proposal by the European Commission (2016) to “... offer free local wireless connectivity in the centres of local public life ...” appears inadvertently discriminatory. All the areas that it suggests should have Internet access should also provide low EMF zones / White Zones as standard.

Claims might be brought that those who ignore the special needs of individuals who are, or believe they are, vulnerable to EMF radiation may be guilty of discrimination and wilful blindness. Claims might also be brought that those who deliberately ignore and dismiss relevant scientific evidence of potential risks, whether through wilful blindness or recklessness, may be guilty of inciting others to unwittingly discriminate against such individuals (Jamieson 2014a).

The use of the Precautionary Principle, as advocated by Professor Jacqueline McGlade, when Executive Director of the European Environment Agency, helps address this serious issue (EEA 2007).

### **ARTICLE 17: Prohibition of abuse of rights**

*“Nothing in this Convention may be interpreted as implying for any State, group or person any right to engage in any activity or perform any act aimed at the destruction of any of the rights and freedoms set forth herein or at their limitation to a greater extent than is provided for in the Convention.”*

The rights and freedoms of EHS, and others adversely affected by EMFs, must be actively protected when seeking to enhance Internet connectivity within communities. Doing so will help protect, health, wellbeing and the economic prosperity of Europe.

## Protocol

to the Convention for the Protection of Human Rights and Fundamental Freedoms

### ARTICLE 1: Protection of property

*“Every natural or legal person is entitled to the peaceful enjoyment of his possessions. No one shall be deprived of his possessions except in the public interest and subject to the conditions provided for by law and by the general principles of international law,”* HRA (1998).

Many EHS individuals are forced to move home as a result of adverse health effects from electromagnetic pollution experienced in their property. The term ‘property’ can be legally defined as including real estate, land, growing plants and animals.

Evidence indicates that, in addition to potentially harming humans, EMFs at levels considerably below those permitted in ICNIRP guidelines, which can be created by wireless systems, appear capable of causing damage to plants and animals.

### ARTICLE 2: Right to education

As the right to education of children who are EHS can be potentially compromised by electromagnetic pollution in schools, it is suggested that wired, instead of wireless, connections be used as a matter of best practice to enable connectivity.

## Protocol No. 4

to the Convention for the Protection of Human Rights and Fundamental Freedoms securing certain rights and freedoms other than those already included in the Convention and in the First Protocol thereto

### ARTICLE 2: Freedom of movement

**1. “Everyone lawfully within the territory of a State shall, within that territory, have the right to liberty of movement and freedom to choose his residence.” ...**

This freedom is already being compromised for those who are EHS as a result of electromagnetic pollution.

The Commission's strategic aim to have “... sites at which public services are provided, such as public administrations, libraries and hospitals to be equipped with Gigabit internet connections ... [and connect] these and other centres of community life, including outdoor spaces accessible to the general public ...” would breach Article 2 if standard wireless technologies were used.

The provision of hard-wired alternatives helps address this challenge. LiFi may also provide a suitable solution if it is properly developed.

There is a need for low EMF / White Zones in such areas as discussed above to help protect such individuals and allow them freedom of movement and access to general services and amenities. The same holds true for the workplace.

Increased saturation of the environment with electromagnetic pollution would further restrict the freedom of movement of EHS individuals. Refer also to earlier comments related to ‘Article 14: Prohibition of discrimination’.

## Protocol No. 12

to the Convention for the Protection of Human Rights and Fundamental Freedoms

## **ARTICLE 1: General prohibition of discrimination**

1. *"The enjoyment of any right set forth by law shall be secured without discrimination on any ground ..."*
2. *"No one shall be discriminated against by any public authority on any ground such as those mentioned in paragraph 1."*

Social inclusion is one of the major goals of sustainable development. It is also one of the main declared objectives of the European Union (Atkinson 2009).

**The best way to ensure Human Rights are adhered to and that those with EHS are not discriminated against is to adopt more protective EMF guidelines, specify safer technologies for Internet connection, and encourage the creation of Low EMF / White Zones in rural and urban areas by encouraging, for example, the use of hard-wired cabling.**

## **RISK AND QUESTIONABLE RETURNS FOR INVESTORS**

The 'Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Regulations (EU) No 1316/2013 and (EU) No 283/2014 as regards the promotion of Internet connectivity in local communities' document states that: **"... many public authorities and private respondents supported the deployment of Wi-Fi networks in public premises, while seeking an appropriate regulatory environment for issues like access provider liability and exposure to electromagnetic fields (EMF)."** (European Commission 2016).

The EC (2016) 'Full synopsis report of the public consultation on the evaluation and review of the regulatory framework for electronic communications' briefly touched on this issue as well noting that **"... many public authorities and private respondents supported the deployment of commercial/municipal Wi-Fi networks in public premises, while seeking appropriate regulatory safeguards for a.o. liability or exposure to EMF."**

## **Many individuals do not wish blanket wireless coverage**

Ofcom's Communications Market Report 2016 indicates that approximately a third of adult UK Internet users (around 15 million individuals) have undertaken a 'digital detox' *"in a bid to strike a healthier balance between technology and life beyond the screen."* It also suggests approximately 1 in 10 adults (11%) may undertake such a 'digital detox' every week. Of all those taking such measures, 25% spent  $\leq 1$  day without the Internet; 20% avoided it for  $\leq 1$  week; and 5% went web-free for  $\leq 1$  a month. It is likely that similar figures will be found elsewhere in Europe.

The report mentions that 30% of respondents had undertaken a holiday 'digital detox'. 16% had deliberately gone on vacation to a place without Internet access; 13% deliberately went on holiday minus their mobile phone; and 9% who had chosen an area where there was neither mobile phone nor Internet access (Ofcom 2016).

Such findings add yet further weight to the already substantial benefits of creating low EMF zones / White Zones within buildings and external environments.

The creation of such spaces will also help address the needs of the growing percentage of the population who are becoming electromagnetically hypersensitive (Jamieson 2016a) and reduce the risks of potential claims from those exposed to electromagnetic pollution.

## Many insurers are excluding risks associated with electromagnetic radiation

As examples:

*"... insurers over the past 10 years increasingly have been excluding coverage under both general liability and umbrella policies. Others are neither excluding nor making affirmative statements about the risk"* (White Geisel 2007).

*"Risk is so fundamental ... that there are some risks that we simply will not insure against. These include ... electromagnetic fields and electromagnetic radiation ..."* (AVIVA 2012).

*"We will not pay anything under this policy, ... in respect of ... Electromagnetic fields any liability of whatsoever nature directly or indirectly caused by, in connection with or contributed to by or arising from electromagnetic fields (EMF) ..."* (Zurich Insurance Group 2014).

## THE TELECOMMUNICATIONS INDUSTRY IS ALSO AWARE OF RISKS

As examples:

*"The influence of electrosmog on the human body is a known problem. ... The risk of damage to health through electrosmog has also become better understood as a result of more recent and improved studies. When for example, human blood cells are irradiated with electromagnetic fields, clear damage to hereditary material has been demonstrated and there have been indications of an increased cancer risk. ..."* Swisscom AG - major Swiss telecommunications provider (Swisscom AG 2003).

*"Unfavorable litigation or governmental investigation results could require us to pay significant amounts or lead to onerous operating procedures,"* (AT&T 2014).

*"... any perceived risk of adverse health effects of wireless communication devices could materially adversely affect the Company..."* (BlackBerry Limited 2014).

## LEGAL RULINGS RELATED TO EMF EXPOSURE

**2011:** The Labour Court in Madrid declared that hypersensitivity, caused in part by microwave exposure, can cause permanent disability. Its ruling set a precedent for future conditions related to EHS. [The verdict awarded the college professor, who has been permanently incapacitated, a permanent disability pension at 100% of his base salary rate (WEEP News 2011)].

**2012:** The Italian Supreme Court affirmed a casual link between a businessman's heavy mobile phone use & his brain tumour (Alleyne 2012, Microwave News 2012).

**2013:** The Australian government ordered to pay claims for damaging the health of an employee with EMF sensitivity (Administrative Appeals Tribunal of Australia 2013, GSMA 2013).

**2013:** An Israeli cell phone company compensates a customer who contracted cancer (Leibovich 2013, Raz & ZivIsraeli 2013).

## CONCLUSION

It is proposed that great caution is warranted with regard to the proposed widespread rollout of wireless technologies within Europe to meet perceived Internet connectivity requirements and that more environmentally friendly, biologically tested, alternatives are required.

*"There are many examples of the failure to use the precautionary principle ..., which have resulted in serious and often irreversible damage to health and environments. Appropriate, ... actions taken now to avoid plausible and potentially serious threats to health from EMF are likely to be seen as prudent and wise ...," Professor Jacqueline McGlade, Executive Director of the European Environment Agency (2003-2013) (EEA 2007).*

It is already known that electromagnetic fields can be biologically active. Proper assessment of the potential health and environmental consequences of their widespread use is urgently required. An unchecked proliferation of wireless technologies could create catastrophic results, and is highly unwise particularly given that safer alternatives are already available to provide such services. A far more sophisticated approach than that presently proposed in the European Commission's current proposal is required to create real lasting benefit for Europe in the 'Bioelectromagnetic Age'.

Widespread proliferation of wireless technologies as proposed by the European Commission (2016) could lead to unprecedented public health and environmental disasters. A major rethink is necessary.

## References

[Some sections within this commentary are from previous work by the present authors].

- Adlkofer, F. (2004), Mobile-phone radiation damages lab DNA,  
<http://www.nature.com/news/2004/041220/full/news041220-6.html>
- Administrative Appeals Tribunal of Australia (2013), McDonald and Comcare [2013] AATA 105 (28 February 2013), <http://www.austlii.edu.au/au/cases/cth/aat/2013/105.html>
- Agarwal, A. et al. (2009), Effects of radiofrequency electromagnetic waves (RF-EMW) from cellular phones on human ejaculated semen: an in vitro pilot study. *Fertility and Sterility*, 92(4) 1318-1325.
- Aitken, R.J. & De Iulius, G.N. (2007), Origins and consequences of DNA damage in male germ cells. *Reproductive Biomedicine Online*, 14(6), 727-33.
- Alleyne, R. (2012), Mobile phones can cause brain tumours, court rules. *The Telegraph*,  
<http://www.telegraph.co.uk/health/9619514/Mobile-phones-can-cause-brain-tumours-court-rules..html>
- Alipov, Y.D., Belyaev, I.Y., Kravchenko, V.G., Polunin, V.A. & Shcheglov, V.S. (1993), Experimental Basis for Commonality of Resonant Reaction of Prokaryotic and Eukaryotic Cells to Millimeter Waves of Low Intensity. *Physics of the Alive*, 1(1),72-79. In Russian. Cited by Kositsky et al. (2001).
- AT&T (2014), AT & T Annual Report 2014 - AT&T,  
[http://www.att.com/Investor/ATT\\_Annual/2014/downloads/att\\_ar2014\\_annualreport.pdf](http://www.att.com/Investor/ATT_Annual/2014/downloads/att_ar2014_annualreport.pdf)
- Atkinson, A.B. (2009), *The EU and social inclusion: facing the challenges*. 2nd Edition, Policy Press. 303 pp.
- Avendaño, C. et al. (2012), Use of laptop computers connected to Internet through Wi-Fi decreases human sperm motility and increases sperm DNA fragmentation. *Fertility and Sterility*, 97(1), 39-45.
- AVIVA (2012), Corporate responsibility report 2012, <http://www.aviva.com/reports/2012cr/download/>
- BC's Physicians (2009), *Stepping out of the Shadows: Collaborating to Improve Services for Patients with Depression*. A Policy Paper by BC's Physicians August 2009. British Columbia Medical association, 40pp.
- Belliemi, C.V. & Pinto, I (2012), Section 19: Fetal and Neonatal Effects of EMF. *BioInitiative Working Group*, Cindy Sage and David O. Carpenter, Editors. *BioInitiative Report: A Rationale for Biologically-based Public Exposure Standards for Electromagnetic Radiation* at [www.bioinitiative.org](http://www.bioinitiative.org)
- Bellossi, A., Dubost, G., Moulinoux, J., Ruelloux, M., Himdi, M. & Rocher, C. (2000), Biological effects of millimeter-wave irradiation on mice - preliminary results. *IEEE Transactions on Microwave Theory and Techniques*, 48(11), 2104-2110.
- Beneduci, A., Chidichimo, G., Tripi, S. & Perrotta, E. (2005a), Transmission electron microscopy study of the effects produced by wide-band low-power millimeter waves on MCF7 human breast cancer cells in culture. *Anticancer Research*, 25(2A),1009-1013.

- BlackBerry Limited (2014), United States Securities and Exchange Commission Washington, D.C. 20549, Form 40-F, [http://us.blackberry.com/content/dam/bbCompany/Desktop/Global/PDF/Investors/Governance/Annual\\_Information\\_Form\\_Fiscal\\_2014.pdf](http://us.blackberry.com/content/dam/bbCompany/Desktop/Global/PDF/Investors/Governance/Annual_Information_Form_Fiscal_2014.pdf)
- Bortkiewicz et al. (2004), Subjective symptoms reported by people living in the vicinity of cellular phone base stations: review. *Med Pr.*, 55(4), pp. 345-351 – In Polish.
- Boscolo, P. et al. (2001), Effects of electromagnetic fields produced by radiotelevision broadcasting stations on the immune system of women. *The Science of the Total Environment*, 273(1-3), 1-10.
- Bose, J.C. (1906), *Plant Response*. Longmans, Green & Co. New York, pp. 618-619. CH-40-Index-JCB-PR-PT-06-P-546-781.pdf
- Bundyuk, L.S., Kuz'menko, A.P., Ryabchenko, N.N. & Litvinov, G.S. (1994), Corrective action of millimeter waves on systems of various levels of hierarchy. *Physics of the Alive*, 2(1), 12-25. Cited by Kositsky et al. (2001).
- Bupa (2010), Bupa 'How Are You Britain?' report.
- Cammaerts, M.C. et al. (2012), GSM 900 MHz radiation inhibits ants' association between food sites and encountered cues. *Electromagnetic Biology and Medicine*, 31(2), 151-165.
- College of Physicians and Surgeons of British Columbia (2015), Chronic exposure to opioids may cause hypersensitivity to pain. *College of Physicians and Surgeons of British Columbia*, 3(5), 11. <https://www.cpsbc.ca/for-physicians/college-connector/2015-V03-05/11>
- Connor, J. et al. (2002), Driver sleepiness and risk of serious injury to car occupants: population based case control study. *BMJ*, 11:324(7346), 1125.
- Conseil de l'Europe/Council of Europe (1998), Case of Guerra and others v. Italy, (116/1996/735/932), Judgement, Cour Européenne des Droits de l'Homme - European Court of Human Rights, Strasbourg, February 19th, 1998, 31 pp.
- Conseil de l'Europe/Council of Europe (1994), Case of López Ostra v Spain, (Application no. 16798/90), Judgement, Cour Européenne des Droits de l'Homme - European Court of Human Rights, Strasbourg, December 9th, 1994. 20pp.
- Conseil de l'Europe / Council of Europe (1978), Court (Plenary), Case of Ireland v the United Kingdom (1978), (Application no. 5310/71),  
Cour Européenne des Droits de l'Homme Judgement U European Court of Human Rights, Strasbourg, January 18th 1978, 129 pp.
- Coreau, G. et al. (2014), Mobile phone use and brain tumours in the CERENAT case-control study. *Occupational & Environmental Medicine*, 71(7), 514-522.
- Davanipour, Z. & Sobel, E. (2009), Long-term exposure to magnetic fields and the risks of Alzheimer's disease and breast cancer: Further biological research. *Pathophysiology*, 16(2-3), 149-156.
- Deazley, R. & Smith, S. (2013), *The Legal, Medical and Cultural Regulation of the Body: Transformation and Transgression*. Ashgate Publishing, Ltd. 256 pp.
- De Iuliis, G.N. et al. (2009), Mobile Phone Radiation Induces Reactive Oxygen Species Production and DNA Damage in Human Spermatozoa In Vitro. *PLOS One*, DOI: 10.1371/journal.pone.0006446
- Dolk, H. et al. (1997), Cancer incidence near radio television and transmitters in Great Britain, Part II. All high-power transmitters. *American Journal of Epidemiology*, 145, 10-17.
- EC (2016), Full synopsis report of the public consultation on the evaluation and review of the regulatory framework for electronic communications. Digital Single Market. Digital Economy & Society, <https://ec.europa.eu/digital-single-market/en/news/full-synopsis-report-public-consultation-evaluation-and-review-regulatory-framework-electronic>
- EEA (2007), Comment by Professor Jacqueline McGlade, Executive Director of the European Environment Agency in 'Radiation risk from everyday devices assessed.' European Environment Agency, <http://www.eea.europa.eu/highlights/radiation-risk-from-everyday-devices-assessed>
- Eger, H. & Jahn, M. (2010), Specific Health Symptoms and Cell Phone Radiation in Selbitz (Bavaria, Germany) - Evidence of a Dose-Response Relationship, <http://www.next-up.org/pdf/>
- Eger, H. et al. (2004), The Influence of Being Physically Near to a Cell Phone Transmission Mast on the Incidence of Cancer, *Umwelt-Medizin-Gesellschaft*, 17.4.2004.
- EMFSN (2016), Smart Meter Health Complaints, EMF Safety Network, [http://emfsafetynetwork.org/?page\\_id=2292](http://emfsafetynetwork.org/?page_id=2292)
- Engels, S. et al., (2014), Anthropogenic electromagnetic noise disrupts magnetic compass orientation in a migratory bird. *Nature*, doi:10.1038/nature13290, <http://www.nature.com/nature/journal/vaop/ncurrent/full/nature13290.html> , 9pp.
- European Commission (2016), Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Regulations (EU) No 1316/2013 and (EU) No 283/2014 as regards the promotion of Internet connectivity in local communities. Brussels, 14.9.2016. COM(2016) 589 final. 2016/0287 (COD) (Text with EEA relevance).
- European Parliament (2008), Excerpts from the Resolution of September 2008 on the mid-term review of the European (P6\_TA(2008)0410). Environment and Health Action Plan 2004-2010 (2007/2252(INI)). [http://www.apdr.info/electrocontaminacion/Documentos/Instituciones\\_Europeas/European.Parliament.resolution.2008.pdf](http://www.apdr.info/electrocontaminacion/Documentos/Instituciones_Europeas/European.Parliament.resolution.2008.pdf)

- Falzone, N. et al. (2011), The effect of pulsed 900 MHz GSM mobile phone radiation on the acrosome reaction, head morphometry and zona binding of human spermatozoa. *International Journal of Andrology*, 34(1), 20-26.
- FCC (1996), Guidelines for evaluating the environmental effects of radiofrequency radiation, Federal Communications Commission, Washington D.C., August 1996.
- Genius, S.J. & Lipp, C.T. (2012), Electromagnetic hypersensitivity: Fact or fiction?, *Science of the Total Environment*, 414, 103-112.
- Gregory, S. (2011), Letter to CPUC judge overseeing 'Smart' Meter proceedings, [http://emfsafetynetwork.org/?page\\_id=2292](http://emfsafetynetwork.org/?page_id=2292)
- GSMA (2013), Australian government ordered to compensate worker with electromagnetic hypersensitivity, <http://www.gsma.com/publicpolicy/australian-government-ordered-to-compensate-worker-with-electromagnetic-hypersensitivity>
- Hardell, L. & Carlberg, M. (2015), Mobile phone and cordless phone use and the risk for glioma – Analysis of pooled case-control studies in Sweden, 1997–2003 and 2007–2009. *Pathophysiology*, 22, 1-13. <http://www.pathophysiologyjournal.com/article/S0928-4680%2814%2900064-9/pdf>
- Hardell, L. & Carlberg, M. (2013), Using the Hill viewpoints from 1965 for evaluating strengths of evidence of the risk for brain tumors associated with use of mobile and cordless phones. *Reviews on Environmental Health*, 28(2-3), 97-106. <http://www.ncbi.nlm.nih.gov/pubmed/24192496>
- Havas, M. (2011), Havas Submission to CCST "Report on Smart Meters", <http://www.magdahavas.com/2011/01/18/havas-report-on-smart-meters-for-ccst/>
- Herbert, M. & Sage, C. (2012), Findings in Autism (ASD) Consistent with Electromagnetic Fields (EMF) and Radiofrequency Radiation (RFR). Section 20 of the BioInitiative Report 2012.
- Hocking, B. et al. (1996), Cancer incidence and mortality and proximity to TV towers. *The Medical Journal of Australia*, 165(11-12), 601-605.
- Hoffman, D. & Rowe, J. (2010), *Human Rights in the UK (Third Edition)*, Pearson, London, 466 pp.
- HRA (1998), Human Rights Act 1998, [legislation.gov.uk](http://www.legislation.gov.uk), <http://www.legislation.gov.uk/ukpga/1998/42/contents>
- Huss, A. et al. (2009), Residence near power lines and mortality from neurodegenerative diseases: longitudinal study of the Swiss population. *American Journal of Epidemiology*, 169(2), 167-175.
- ICNIRP (1998), ICNIRP Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields up to 300 GHz. International Commission on Non-Ionizing Radiation Protection. *Health Physics*, 74(4), 494-522. <http://www.icnirp.de/documents/emfgdl.pdf>
- Ilhan, A et al. (2004), Ginkgo biloba prevents mobile phone-induced oxidative stress in rat brain. *Clinica Chimica Acta* 340, 153-162.
- Jamieson, I.A. (2016a), Digital Detox. CIBSE Intelligent Buildings Group eNewsletter November 2016, [http://www.cibse.org/getmedia/422fa5ee-79ad-4041-b514-8fc3772a53e3/CIBSE-IBG\\_Nov\\_2016b.pdf.aspx](http://www.cibse.org/getmedia/422fa5ee-79ad-4041-b514-8fc3772a53e3/CIBSE-IBG_Nov_2016b.pdf.aspx)
- Jamieson, I.A. (2016), Comments by Dr. Isaac Jamieson, September 30, 2016. Submission to the FCC.
- Jamieson, I.A. & Mallery-Blythe, E. (2015), Submission made to House of Lords Select Committee on National Policy for the Built Environment: Call for Written Evidence 2015.
- Jamieson, I.A. (2014), Changing perspectives – improving lives. Presentation given at the European Economic and Social Committee's Electromagnetic hypersensitivity Public Hearing on 4th November 2014, Rue Belliard 99, 1040 Brussels.
- Jamieson, I.A. (2014a), Electromagnetic Hypersensitivity & Human Rights: Commentary To The European Economic And Social Committee., <https://ecfsapi.fcc.gov/file/10910251701394/Electromagnetic%20Hypersensitivity%20and%20Human%20Rights.pdf>
- Jamieson, I.A. (2013), Comments on Health, Human Rights, Environmental and Security Concerns With regard to the FortisBC Inc. Application for a Certificate of Public Convenience and Necessity for the Advanced Metering Infrastructure Project, Project No.3698682
- Kalantaryan, V., Martirosyan, R., Babayan, Y., Nersesyan, L., Stepanyan, H. Vardapetyan, R. (2016), Action of Non-Ionizing Radiation on Tumor and Healthy DNA. *Armenian Journal of Physics*, 9(1), 100-105.
- Kane, R. (2004), A Possible Association Between Fetal/Neonatal Exposure to Radiofrequency Electromagnetic Radiation and the Increased Incidence of Autism Spectrum Disorder. *Medical Hypothesis*, 62(2), 195-197.
- Kositsky, N.N., Nizhelska, A.I. & Ponezha, G.V. (2001), Influence of High-frequency Electromagnetic Radiation at Non-thermal Intensities on the Human Body (A review of work by Russian and Ukrainian researchers). No Place To Hide - Newsletter of the Cellular Phone Taskforce Inc. Volume 3, Number 1 – Supplement February 2001. Translation by Patricia Ormsby (2001). [http://www.salzburg.gv.at/2001\\_kositsky\\_et\\_al.\\_-ussr\\_review-2.pdf](http://www.salzburg.gv.at/2001_kositsky_et_al._-ussr_review-2.pdf)
- Kumar, S. et al. (2012), Impact of Microwave at X-Band in the aetiology of male infertility. *Electromagnetic Biology and Medicine*, 31(3), 223–232.
- Kuz'menko, V.M. (1998), The role of microwave resonance therapy in the combined treatment of patients with cerebral atherosclerosis. *Likars'ka Sprava*, 7, 146-148. In Ukrainian. Cited by Usichenko et al. (2006).

- Leibovich, A. (2013), Israeli cell phone company to compensate customer who contracted cancer. EMFacts Consultancy, <http://www.emfacts.com/2013/03/israeli-cell-phone-company-to-compensate-customer-who-contracted-cancer/>
- Li, D.-K. et al. (2002), A population-based prospective cohort study of personal exposure to magnetic fields during pregnancy and the risk of miscarriage. *Epidemiology*, 13(1), 9-20.
- Luengo-Fernandez, R. et al. (2013), Economic burden of cancer across the European Union: a population-based cost analysis. *The Lancet Oncology*, 14(12), 1165-1174.
- Magras, I.N. & Xenos, T.D. (1997), RF radiation-induced changes in the prenatal development of mice. *Bioelectromagnetics*, 18(6), 455-461.
- Mallery-Blythe, E. (2014), Electromagnetic Radiation, Health and Children 2014, <https://www.youtube.com/watch?v=sNFdZVeXw7M>
- Mallery-Blythe, E. (2014a), Electromagnetic Hypersensitivity A Summary by Dr Erica Mallery-Blythe, <http://www.iemfa.org/wp-content/pdf/Mallery-Blythe-v1-EESC.pdf>
- Microwave News (2012), Italian Supreme Court Affirms Tumor Risk from Long-Term Use of a Cell Phone, <http://microwavenews.com/news-center/italian-supreme-court-affirms-tumor-risk>
- Moon, I.S. et al. (2014), Association between vestibular schwannomas and mobile phone use. *Tumour Biology*, 35(1), 581-587.
- Mowbray, A. (2012), Cases, Materials, and Commentary on the European Convention on Human Rights. Oxford University Press, 895 pp.
- Novoselova, E.G. et al. (1999), Microwaves and cellular immunity. II. Immunostimulating effects of microwaves and naturally occurring antioxidant nutrients. *Bioelectrochemistry Bioenergetics*, 49(1), 37-41.
- NTP (2016), Cell Phones. National Toxicology Program, US Department of Health and Human Services, <http://ntp.niehs.nih.gov/results/areas/cellphones/index.html>
- NTP (2016a), Report of Partial Findings from the National Toxicology Program Carcinogenesis Studies of Cell Phone Radiofrequency Radiation in Hsd: Sprague Dawley® SD rats (Whole Body Exposures). Draft 6-23-2016, <http://biorxiv.org/content/biorxiv/early/2016/06/23/055699.full.pdf>
- Oberfeld, G. et al. (2004), The Microwave Syndrome – Further Aspects of a Spanish Study. EBEA Congress, Kos, Greece, 2004.
- Ofcom (2016), The Communications Market 2016, <http://stakeholders.ofcom.org.uk/market-data-research/market-data/communications-market-reports/cmr16/>
- OHCHR (1976) The International Covenant on Economic, Social and Cultural Rights. Office of the United Nations High Commissioner for Human Rights, <http://www.ohchr.org/Documents/ProfessionalInterest/cescr.pdf>
- Otitoloju, A.A., et al. (2010), Preliminary study on the induction of sperm head abnormalities in mice, *Mus musculus*, exposed to radiofrequency radiations from global system for mobile communication base stations. *Bulletin of Environmental Contamination and Toxicology*, 84(1), 51-54.
- Pattemore, D.E. & Wilcove, D.S. (2012), Invasive rats and recent colonist birds partially compensate for the loss of endemic New Zealand pollinators. *Proc Biol Sci*. 279(1733),1597-605.
- Parliamentary Assembly (2011), The potential dangers of electromagnetic fields and their effect on the environment. Resolution 1815 (2011) Final version, <http://assembly.coe.int/nw/xml/XRef/Xref-XML2HTML-en.asp?fileid=17994&>
- Radzievsky, A.A., Gordienko, O.V., Alekseev, S., Szabo, I., Cowan, A. & Ziskin, M.C. (2008), Electromagnetic millimeter wave induced hypoalgesia: frequency dependence and involvement of endogenous opioids. *Bioelectromagnetics*, 29(4), 284-295.
- Radzievsky, A.A., Rojavin, M.A., Cowan, A. & Ziskin, M.C. (1999), Suppression of Pain Sensation Caused by Millimeter Waves: A Double-Blinded, Cross-Over, Prospective Human Volunteer Study. *Anesthesia & Analgesia*, 88(4), 836-840. <http://www.cemmedic.hu/uploads/dokument/2-akademia%20kutasok/Moszkva%20-%20seb%20kezelese%20kiserleti%20allatokon/rojavin1.pdf>
- Rahmani, A. et al. (2011), Report of possible impacts of communication towers on wildlife including birds and bees. Ministry of Environment and Forest, Government of India. 88pp.
- Ratushnyak, A.A., Andreeva, M.G., Morozova, G.A. & Trushin, M.V. (2008), Effect of extremely high frequency electromagnetic fields on microbiological community in rhizosphere of plants. *International Agrophysics*, 22, 71-74.
- Raz, H. & ZivIsraeli, A. (2013), Cell phone company to compensate customer who contracted cancer. *Haaretz*, <http://www.haaretz.com/business/israeli-cell-phone-company-to-compensate-customer-who-contracted-cancer.premium-1.506877>
- REFLEX (2004), REFLEX: Risk Evaluation of Potential Environmental Hazards from Low Energy Electromagnetic Field Exposure Using Sensitive in vitro Methods.
- Santini, R., et al. (2002), Investigation on the health of people living near mobile telephone relay stations: Incidence according to distance and sex. *Pathologie-biologie*, 50(6), 369-373. - In French. (Abstract in English).
- Siegel, P.H. & Pikov, V. (2010), Impact of low intensity millimetre waves on cell functions. *Electronics Letters*, 46, S70–S72. [http://thz.caltech.edu/siegelpapers/IET\\_Dec2010.pdf](http://thz.caltech.edu/siegelpapers/IET_Dec2010.pdf)
- Swaen, G.M. et al. (2003), Fatigue as a risk factor for being injured in an occupational accident: Results from the Maastricht Cohort Study. *Occupational and Environmental Medicine*, 60 (Suppl 1), 88–92.

- Swisscom AG (2003). "Reduction of Electrosmog in Wireless Local Networks." WIPO: Patentscope. International Patent Application No. PCT/CH2003/000138, <https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2004075583>
- The European Parliament, the Council and the Commission (2010), Charter of Fundamental Rights of the European Union (2010/C 83/02), Official Journal of the European Union, C83/389-403.
- Thomas, C. & Morris S. (2003), Cost of depression among adults in England in 2000. *British Journal of Psychiatry*. 183, 514-519.
- UN (1990), Declaration of the Rights of the Child, <https://www.unicef.org/malaysia/1959-Declaration-of-the-Rights-of-the-Child.pdf>
- UNAC (2012), The Universal Declaration of Human Rights. United Nations Association in Canada/Association canadienne pour les Nations Unies, <http://www.unac.org/rights/declaration.html> Accessed 21/12/12.
- UNAC (2012a), Questions and answers about the Universal Declaration of Human Rights. United Nations Association in Canada/Association canadienne pour les Nations Unies, <http://www.unac.org/rights/question.html> Accessed 21/12/12.
- United Nations (1989), Convention on the Rights of the Child, <http://www.un.org/documents/ga/res/44/a44r025.htm>
- Usichenko, T.I., Edinger, H., Gizhko, V.V., Lehmann, C., Wendt, M. & Feyerherd, F. (2006), Low-Intensity Electromagnetic Millimeter Waves for Pain Therapy. *Evidence-Based Complementary and Alternative Medicine*, 3(2), 201-207. doi:10.1093/ecam/nel012.
- WEEP News (2011), Hypersensitivity to the waves produced by mobile phones becomes a new cause of permanent disability, <http://weepnews.blogspot.co.uk/2011/09/news.html>
- White Geisel, R. (2007), Insurers exclude risks associated with electromagnetic radiation. *Business Insurance*, <http://www.businessinsurance.com/article/20070603/ISSUE03/100022051/insurers-exclude-risks-associated-with-electromagnetic-radiation>
- WHO/IARC (2011), IARC classifies radiofrequency electromagnetic fields as possibly carcinogenic to humans, Press Release No. 208, World Health Organization, May 31, 2011, [http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208\\_E.pdf](http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf)
- Wolf, R. & Wolf, D. (2004), Increased Incidence of Cancer Near a Cell- Phone Transmitter Station. *International Journal of Cancer Prevention*, 1(2), 123-128.
- Zurich Insurance Group (2014), Zurich Community Care Liability Insurance: Group Policy Wording, <https://bettercaring.com.au/wp-content/uploads/E-ZU22378-Community-Care-Liability-Group-Policy-Wording.pdf>

Disclaimer: The contents of this report are intended to help advance knowledge in the areas discussed and provide background information based on existing knowledge and related factors that may influence health, productivity and sustainability. They are not intended as a final statement on these topics, and as more information becomes available the opinions given may develop, be adapted or change. Whilst all reasonable precautions have been taken to ensure the validity of the information presented, no warranty is given towards its accuracy. No liability is accepted by the authors for damages arising from its use and/or interpretation by others.