

Environmental Concerns



The Environment and Sustainable Development

“Smart Meters do not necessarily bring environmental benefits. Like many new technologies, their rollout requires replacing an entire, fully functional, existing system. Their lifespan is expected to be short, at only 15 to 20 years (rather than over 30 years for traditional meters) and they use electricity to run – which requires extra generation to supply. The overreaching conclusion of the study is that the policies governing smart meters, are decisive in limiting or maximizing the positive impacts of this technology.”
VaasaETT Global Energy Think Tank (Stromback & Dromacque 2010).

Unintended consequences and sustainable development

The law of unintended consequences is amongst the most powerful in creation. It has yet to be adequately addressed with regard to the effects that Smart Meters, smart grids and related technologies may have on sustainable development.

“The law of unintended consequences provides the basis for many criticisms of government programs. As the critics see it, unintended consequences can add so much to the costs of some programs that they make the programs unwise even if they achieve their stated goals. The law of unintended consequences is at work always and everywhere,” Norton (2008).

The more that is known of the possible knock-on effects of Smart Meters and related technologies being rolled out across the world, and measures that can be taken to mitigate potential problems the smoother such rollouts are likely to be.

In-depth official Environmental Impact Assessments (EIA) that cover all of the areas discussed in this document have yet to be undertaken.

The Rio Declaration – as related to smart grids

There are many factors that need to be assessed for the development of the new electricity age to be commensurate to be in accord with the spirit of the 1992 United Nations Rio Declaration on Environment and Development (UNEP 1992). As examples:

Principle 1

“Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.”

As documented in the section on Human Rights, for some human beings at least, this principle may be compromised through the creation of inappropriate Smart Meter regimes that impact negatively on their health and potential productivity.

Principle 4

“In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.”

It appears that some, though not all, Smart Meter systems may *in their present form* damage have the potential to damage flora and fauna. This matter needs to be urgently addressed.

Additionally, environmental protection should extend to ensuring smart grids are adequately protected against natural and manmade EMP, as failure to do so could have huge negative repercussions.

Principle 7

“States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth’s ecosystem. ...”

Transparent, properly funded, *unbiased* research is urgently required on the possible effects of Smart Meters and related technologies on the health and integrity of the Earth’s ecosystem.

Principle 9

“States should cooperate to strengthen endogenous capacity-building for sustainable development by improving scientific understanding through exchanges of scientific and technological knowledge, and by enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies.”

If a true spirit of cooperation and global partnership can be achieved, *that takes onboard the advice of relevant specialists often excluded from such developments*, this goal can be commensurate with smart technologies to an even greater extent.

‘Open innovation’ approaches based on collaboration and co-creation may prove particularly worthwhile in creating environmentally cost effective solutions.

Principle 13

“States shall develop national law regarding liability and compensation for the victims of pollution and other environmental damage. States shall also cooperate in an expeditious and more determined manner to develop further international law regarding liability and compensation for adverse effects of environmental damage caused by activities within their jurisdiction or control to areas beyond their jurisdiction.”

Unless suitable mitigative and low-cost best practice measures are developed/undertaken related to Smart Meters and related technologies; there may be numerous liability and compensation claims lodged by victims related to ‘electromagnetic pollution’ and other environmental damage claims related to the rollouts.

Principle 15

“In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”

It appears that there may be a number of benefits in applying cost-effective precautionary measures in the design and operation of Smart Meters and related technology to reduce the likelihood of serious or irreversible environmental damage. Full EIAs which take into account the comments of those who could address such matters, appear warranted.

Low cost low risk alternatives and strategies should be applied wherever practical.

Principle 16

“National authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the

public interest and without distorting international trade and investment.”

This ‘polluter pays’ principle – which Marshall (2010) suggests *should be applied to electromagnetic pollution* – is very important as it may be one of the key deciding factors related to which formats of smart technologies are adopted and how existing smart systems should be modernized to address problems.

It is in everyone’s interest that the most environmentally friendly cost-effective smart technologies and infrastructures are chosen.

Principle 17

“Environmental impact assessment [EIA], as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority.”

It appears that some Smart Meter and smart grid EMF regimes may in their present forms risk causing serious or irreversible damage to the environment. It is suggested that comprehensive EIA on Smart Meters and related technology (covering the matters raised in this present document) should be carried out by States at the earliest possible opportunity to address these issues.

Terrific inroads are being made with regard to the development of intelligent grids – *there is much still to be achieved*. Smart Meters do not benefit the environment without proper regulation (Stromback & Dromacque 2010).

References

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The European Commission

The European Commission Communication on the Precautionary Principle (EC 2000) states:

“The precautionary principle applies where scientific evidence is insufficient, inconclusive or uncertain and preliminary scientific evaluation indicates that there are reasonable grounds for concern that the potentially dangerous effects on the environment, human, animal or plant health may be inconsistent with the high level of protection chosen by the EU.”

For Europe there is also ‘The Consolidated Version of The Treaty on the Functioning of the European Union’ (CVTFEU 2010), which states in Article 191 (ex Article 174 TEC) that:

“Union policy on the environment shall aim at a high level of protection ... It shall be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay.”

It has already been indicated that some RF/microwave regimes may cause environmental damage. Refer to section on ‘Possible environmental effects’.

Risk assessment

Proper risk assessment plays a key contributor to the precautionary principle. The Council of Europe / Conseil de L’Europe (2011) suggest:

“Risk assessment [should be] more prevention oriented.

- improve risk-assessment standards and quality by ... making the indication of the risk level mandatory, commissioning several risk hypotheses and considering compatibility with real life conditions;
- pay heed to and protect “early warning” scientists; formulate a human rights oriented definition of the precautionary and ALARA principles; increase public funding of independent research, *inter alia* through grants from industry and taxation of products which are the subject of public research studies to evaluate health risks; ...”

“... the issue of independence and credibility of scientific expertise is crucial to accomplish a transparent and balanced assessment of potential negative impacts on the environment and human health.”
CE (2011).

Ensuring that Smart Meters, and other types of electronic technology, are 'environmentally sound' can create direct beneficial financial impact whilst also helping to future proof such systems. Such 'best practice' measures can be directly recouped by the UK through savings on overall healthcare expenditure and increased workforce productivity.

The responsibility for environmental impact lies with the provider – providing impetus for proper development and the creation of World-class clean-technology products and services.

Responsibly undertaking risk assessment and investment may greatly benefit corporations and countries, and could lead to numerous innovative solutions and technological breakthroughs that may benefit the worldwide Smart Meter rollout and the next generations of electronic technology.

References

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Many countries are committed to enhancing their 'green infrastructure'. One such way of doing so is ensuring Smart Meters and related technologies are biologically and 'environmentally friendly' and that their development and operation adhere to the 'precautionary principle'.

Possible environmental effects

Vegetation



OTLB (2011) <http://stopsmartmeters.org/2011/04/08/shrubs-dont-lie/>

In the photos above, taken 20 days apart in the USA, severe die off of the bush is noted after the installation of wireless Smart Meters. It was reported that none of the other plants or trees in the area (further away from the units) were affected.

Similar was found in Canada after installation of a wireless Smart Meter. The meter was in place less than two months at the time the photo was taken. Prior to installation, leaves in the area where it was to be housed were green and healthy indicating that radiation from Smart Meters may cause adverse effects on vegetation.



Image sources: http://www.youtube.com/watch?v=lsuP_WBBr2c, Weatherall(2011).

The possible validity of such conjecture is indicated in research by Roux et al. (2007), Sandu et al. (2005), Balmori (2004), Selga & Selga (1996), Magone (1996), Balodis et al (1996), Brauer (1950) – and that discussed by Firth (2010) – some of which indicates that RF/microwave radiation may damage vegetation, even at levels below those typically emitted by wireless Smart Meters.

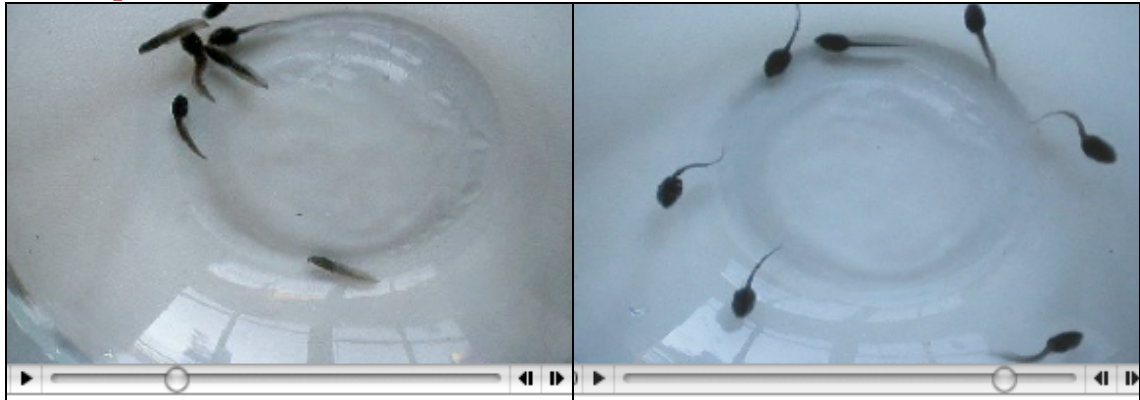
The earliest research proving that microwaves could affect plant growth appears to have been undertaken in 1905 (Bose 1919).

The use of wired Smart Meters, or retention of existing meters until such problems as appear to exist are solved, would appear prudent. *Smart Meters need not be wireless and can be safe and smart.*

References

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Amphibians



Videos of tadpoles exposed to antenna radiation (left) & shielded controls (right).
<http://bemri.org/component/content/article/43-heseuk/100-amphibians-eggs-and-tadpoles-of-common-frog.html> (© Balmori, A. 2008).

There is presently a drastic decline in wild amphibian populations, and an increase in the number of deformed amphibians being found (Blaustein & Johnson 2003). Balmori (2006) suggested electromagnetic pollution may have a role to play in this.

Balmori (2010) investigated whether RF/microwave emissions, at levels that could be found in the everyday environment, could affect frogs' biological development. In this study he exposed frogs' eggs and tadpoles to radiation from several mobile phone base stations at a distance of 140 m over a 2-month period.

The group exposed to environmental RF/microwave fields of 1.8-3.5 V/m (n = 70) had poor coordination of movements, exhibited asynchronous growth (resulting in big and small tadpoles) and had high mortality (90%).

In comparison, the control group (n = 70) under the same conditions (with the exception of being protected from those fields by a Faraday cage), exhibited normal coordination of movements, synchronous development and only 4.2% mortality.

Refer also to the video link.

These results indicate that RF/microwave radiation levels, even within current safety guidelines, may be harmful to wildlife, and that measures should be taken to reduce such emissions.

There is also the possibility (as yet apparently uninvestigated) that the drastic decline may in part be due to RF/microwave regimes suppressing immune system functioning, thereby allowing viruses to multiply more readily inside the body.

References

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Research indicates that both natural and artificial electromagnetic phenomena can cause positive and negative effects on the environment. One of the key challenges in Smart Meter development will be to ensure that they are biologically friendly.

Birds



Image source: Arvind Balaraman, http://www.freedigitalphotos.net/images/view_photog.php?photogid=1058

Everaert & Bauwens (2007) recorded fewer male House Sparrows in areas with relatively high electric field strengths caused by RF/microwave field emitters (mobile phone base stations) than in lower field areas. Spatial variation was negatively and highly significantly related to the field strengths from such units ($p < 0.001$).

Similar findings were made by Balmori & Hallberg (2007) with regard to House Sparrows exposed to fields in the 1 MHz – 3 GHz range (that UK wireless Smart Meters and appliances will operate within).

They noted reduced bird density in areas of increased field strength ($p = 0.0001$).

Balmori (2005) had previously indicated that increased exposure to microwave radiation (as indicated by electric field intensity) may hinder the reproduction and productivity of white stork. Increased aggression was also noted under the higher field regimes.

Whilst the need for caution is apparent, further research, particularly as related to the increased field levels that the presence of wireless Smart Meters, or power line communications (PLC), might cause (unless systems are upgraded) would appear warranted.

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Insects



A growing body of scientific literature indicates that inappropriate electromagnetic field (EMF) regimes may adversely affect insects, including bees and other insect pollinators.

Greatly reduced numbers of insects would adversely affect Nature's food chain, and may partially explain reduced numbers of some bat and bird species.

Common fruit fly (*Drosophila melanogaster*)

Panagopoulos et al. (2004) found exposing common fruit fly to modulated nearfield 900 MHz GSM radiation for 6 minutes daily for the first 2-5 days of their adult lives decreased their reproductive capacity by 50%-60%.

Similar exposures with unmodulated waves were shown to cause a 15%-20% reduction. The effects of long-term exposures were not investigated. Panagopoulos et al. (2010) further noted that bioactivity was greatest for intensities down to less than $10 \mu\text{W}/\text{cm}^2$ and was still evident until $1 \mu\text{W}/\text{cm}^2$.

Honey bees (*Apis mellifera*)

These and other insect pollinators are vital for many agricultural crops. Gallia et al. (2009), estimated that the total economic value of insect pollination worldwide is €153 billion (£135 billion).

It has been recognised for several decades that electromagnetic fields can influence bees' behaviour (Korall et al. 1988, Warnke 1976, Lindauer & Martin 1968). How such fields may be made more biologically friendly has been alluded to.

Korall et al. (1988) noted that bursts of magnetic fields could induce jumps of misdirection in bees - they also noted ways that such problems might be avoided. Whether the pulsed emissions from

Smart Meters may induce jumps of misdirection, or adverse health effects in bees (and if so how these may be remedied), have yet to be assessed.

Sharma & Kumar (2010) compared the performance of honey bee colonies either exposed or unexposed to RF/microwave radiation from mobile phones. Exposures were for 15 minutes twice a day, twice a week from February to April. They found a significant ($p < 0.05$) decline in colony strength and queen's egg-laying rate in those exposed. Forager bees were negatively influenced by exposure, and neither honey nor pollen was found in the exposed colony at the end of the experiment. According to the authors, the average power density experienced $8.5 \mu\text{W}/\text{cm}^2$.

Neelima et al. (2011), investigating the effect of short-term mobile phone radiation on adult worker honey bees found that exposure to RF/microwave radiation for up to 40 minutes altered worker bees' behaviour and physiology. Favre (2011), additionally found RF/microwave radiation from active mobile phone handsets had a dramatic effect on worker bee behaviour, principally by inducing a piping signal that announces either that a colony is disturbed or that it is going to swarm. Negative control runs using a radio did not induce changes in behaviour.

RF/microwave radiation, alongside other contenders such as immunodeficiencies, mites and pesticides may be contributing to the dramatic decline of insect pollinators worldwide. Until such time as this might be disproved it would appear prudent to limit such emissions.

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“Systematic assessment of the health impact of a rapidly changing environment - particularly in areas of technology, work, energy production and urbanization - is essential.” WHO (1986). Refer also to Appendix 3 ‘Health Promotion’.

SmartReach, the UK consortium created to address the UK Government mandate on Smart Meter installation is *“committed to helping protect the environment and to making a meaningful contribution to the development of a thriving low-carbon economy.”* It is comprised of three companies: BT, Arqiva and Detica. <http://smartreach.com/>