5G and the Precautionary Principle

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***Weak formulation*:**

Rio Declaration (1992) *"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."*

***Strong formulation*:**

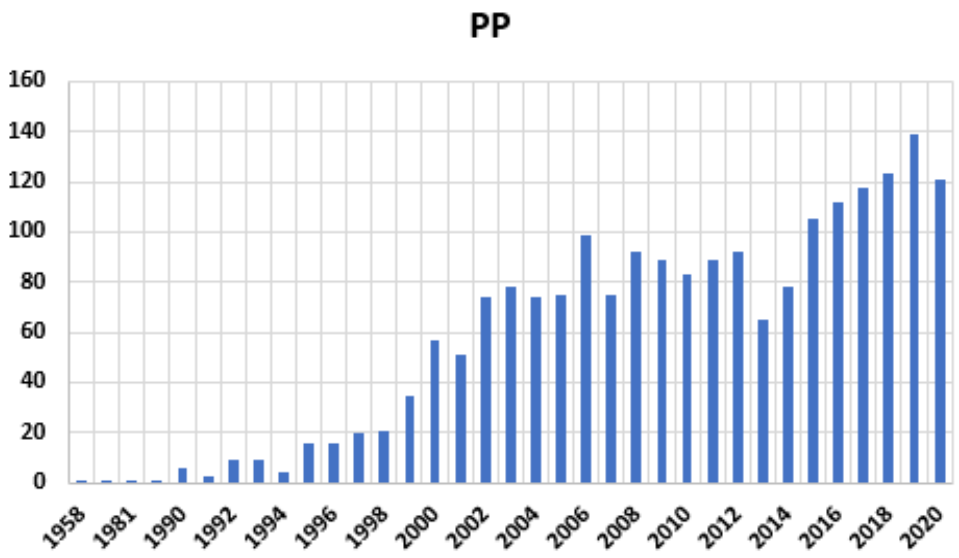
World Charter for Nature (1982): *"Where potential adverse effects are not fully understood, the activities should not proceed"*

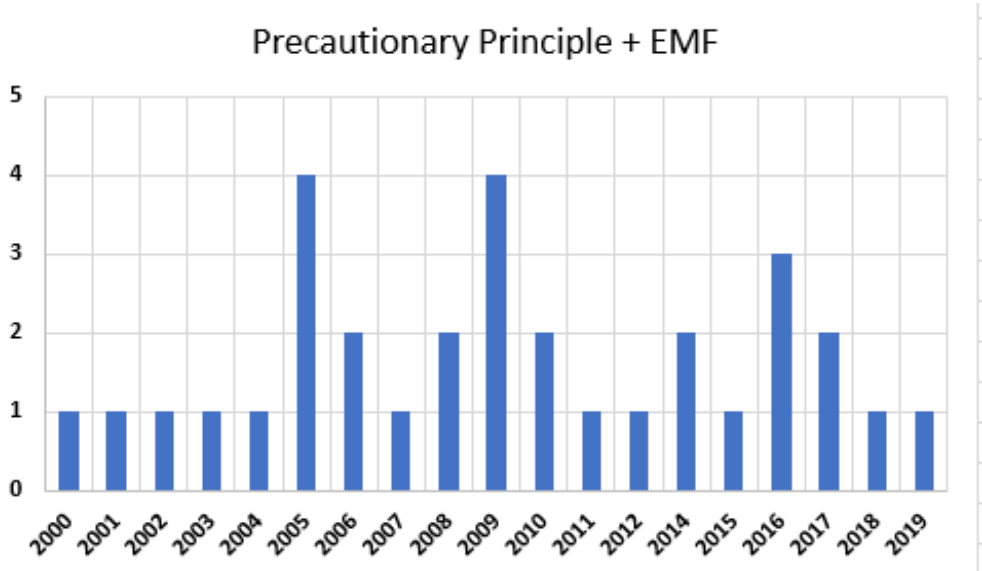
PP in European Regulatory Law

- EU bans on import of hormone-fed beef from U.S. (1989)
- French ban on British beef (1996)
- Bans in EU on GMOs (multiple countries (ongoing issue)
- EU bans on phthalates in toys (1999)
- Reduced exposure limits for RF fields (Italy, Switzerland , Slovenia and other countries)
- Bans on vitamin-enriched corn flakes by Denmark (2004)

Also…

- Zambian rejection of US food due to concerns about GMO in corn (2002)





Large Academic Literature on PP

Use of PP within EU is constrained by

- **EC policy**
  - Communication From the Commission on the Precautionary Principle, 2.2.2000
- **Case law**
  - European Court of Justice
  - Court of First Instance
  - (EFTA Court)
- **(for EMF) other official documents**
  - Implementation report on the Council Recommendation limiting the public exposure to electromagnetic fields (0 Hz to 300 GHz) (European Union Council,1999)

Problems With Use of PP

- **Definitional ambiguity (nobody agrees what it is)**
- **One-sided emphasis on avoiding risks (as opposed to evaluation of potential risks and benefits of a proposed policy)**
- **Inconsistent application: tends to be applied to politically controversial issues.**
- **May be used to address nonrisk concerns (e.g. trade protection)**

Treaty on European Union (1992)

Community policy shall be based on the precautionary principle*

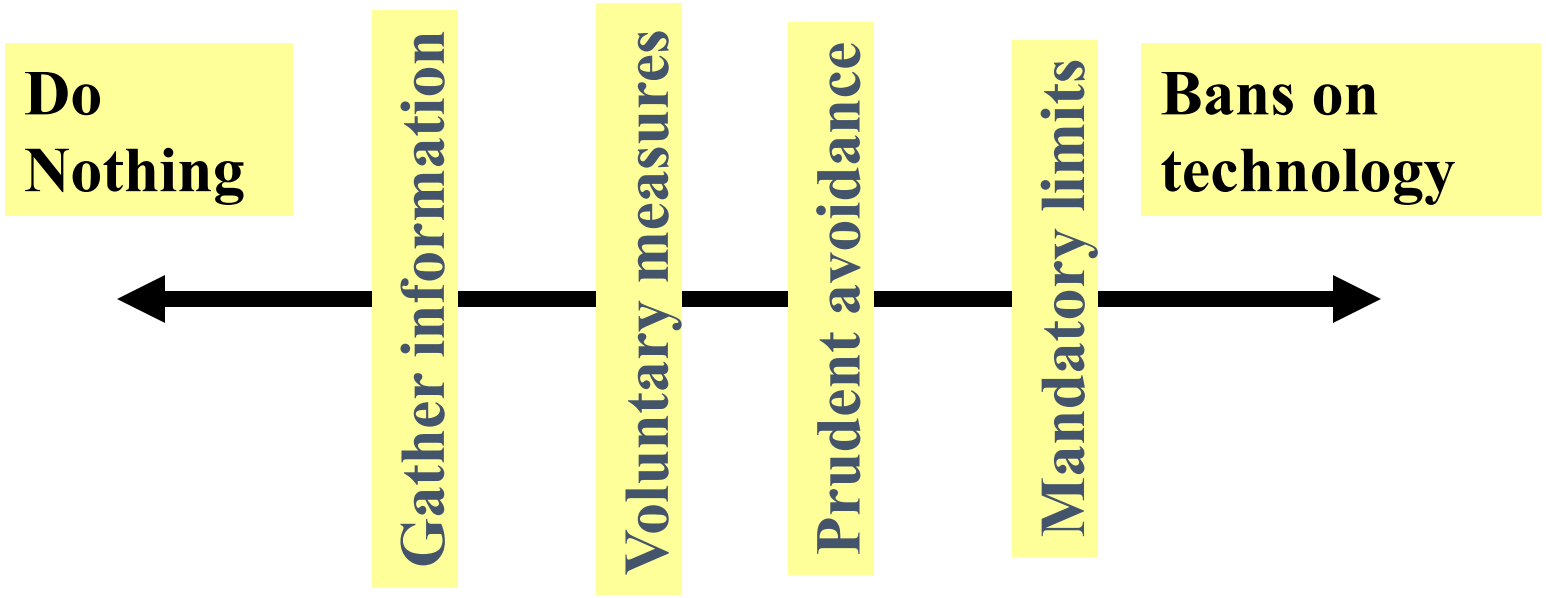
*… but does not define the PP

Commentary by EC (February 2000)

Precautionary measures:

- must be applied to address identified risks
- must be based on “as best as possible” a review of the scientific evidence
- Are intended as interim measures pending the availability of sufficient data to establish science-based regulations

Valid Applications of PP



Precautionary Approaches to EMF in EU and USA

- **Gather Information/Sponsor Research but Take No Regulatory Action**
- **Prudent Avoidance**
- **ALARA (As Low As Reasonably Achievable)**
- **Low-Cost “Precautionary” Measures (e.g. publish SAR values for handsets)**
- **Reduction in RF Exposure Limits on Precautionary Grounds**
- **Advisories to Refrain from Use of Mobile Phones or to Use “Hands-Free” Kits to Reduce Exposure**

Precautionary Principle and 5G

"5G" is…

- A set of engineering standards for operating mobile wireless networks
  - Greater data transfer rates (bandwidth)
  - Much shorter delays at base station (latency)
  - Designed to connect with many more devices (Internet of Things)
- Incorporates technical innovations
  - MIMO - base station antennas transmit multiple beams steered towards users
  - Extensive use of "small cells"
- Is *not* frequency-specific. In U.S.:
  - Low band (< 1 GHz)
  - Mid band (2.5-3.8 GHz) { Similar to existing cell bands
  - High band (>26 GHz, more bands coming)

"5G" is *not* a distinctive physical agent

Are “5G” signals safe?

- Installations must comply with RF safety limits
- Health agencies have not established any health hazards from RF exposures below safety limits but recommend more research
- Many bioeffects studies at mm waves but few standardized risk studies.

Public Concerns About "5G" and Health:

5G Specific Concerns:

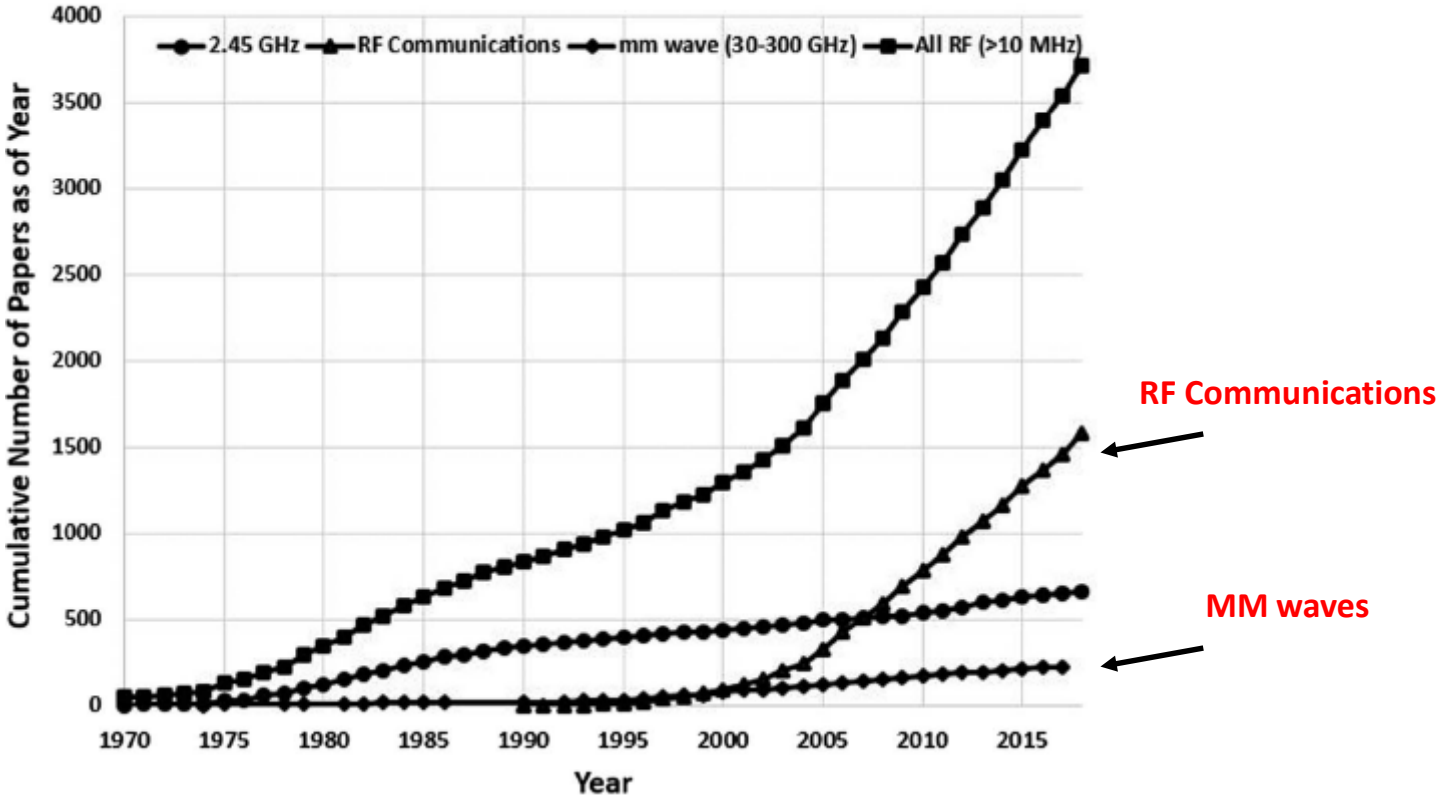
Safety of mm-wave exposure

(But most 5G installations in US operate in "low" or "mid" band, i.e. close to present cell phone bands)

Proliferation of small cells

(but effect on population exposure is unclear and may reduce exposure)

RF Bioeffects Studies



Bushberg, J. T., Chou, C. K., Foster, K. R., Kavet, R., Maxson, D. P., Tell, R. A., & Ziskin, M. C. (2020). IEEE Committee on Man and Radiation—COMAR Technical Information Statement: Health and Safety Issues Concerning Exposure of the General Public to Electromagnetic Energy from 5G Wireless Communications Networks. *Health Physics*, *119*(2), 236.

Simkó and Mattsson (2019)

- “pragmatic” review (comprehensive, assessed study quality)
- 94 relevant publications performing *in vivo* or *in vitro* investigations
- More than half of these studies reported some kind of effect of exposure but there was “no consistent relationship” between exposure and effect
- Many or most of the studies had high risk of bias (e.g. lack of sham control, lack of blinding)
- “for future studies to be useful for safety assessment, design and implementation need to be significantly improved.”

Int. J. Environ. Res. Public Health 2019, 16, 3406; doi:10.3390/ijerph16183406

Systematic vs. Narrative Review

Narrative Review	Systematic Review
• No stated inclusion criteria (prone to cherry picking) • No formal assessment protocol • Ranges from careful and comprehensive to "quick and dirty"	• Pre-established inclusion criteria • Formal evaluation criteria (analyze all studies the same regardless of their conclusions) • Mechanism to record dissenting conclusions • Includes meta-analysis where appropriate Very time consuming to do well

"Picking Cherries in Science: The Bio-Initiative Report" by Kenneth R. Foster & Lorne Trottier, February 15, 2013 in *Science-Based Medicine*
https://www.sciencebasedmedicine.org/picking-cherries-in-science-the-bio-initiative-report/

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Head of Cabinet

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Letter from A. Vinčiūnas concerning petition for moratorium on 5G

"The recourse to the EU's Precautionary Principle to stop the distribution of 5G products appears too drastic a measure. We first need to see how this new technology will be applied and how the scientific evidence will evolve. ."

(Arūnas Vinčiūnas, European Commission, in response to petition for moratorium on 5G, 11/29/17)

Does “5G” trigger the PP?

requires identification of a potentially hazardous effect

Health agencies have not concluded that a hazard of RF energy (all frequencies) exists at levels below current exposure limits

"all effort" must be made to "evaluate the available scientific information”

Many officially sponsored systematic reviews have been done, e.g. SCENIHR (2015), U.S. FDA (2019), WHO (expected 2021) on RF at all frequency ranges.

Conclusions agree: no hazard established at exposure levels below current limits.

"Strong" precautionary policies raise problems

- **Low-band and mid-band 5G use similar frequency ranges as existing cellular services**
- **mm-wave devices have long been in use (e.g. airport security scanners, data links, auto anticollision radar) although levels of public exposures have been low.**
- **No off-ramp – politically difficult to reverse, and lack of clarity about evidence that would be needed to justify removal of precautionary policies.**
- **Unanticipated consequences of ad-hoc changes in exposure limits.**

Unanticipated Consequences

Vatican radio transmission facility located about 20 km north of Rome which was a longstanding source of controversy including claims of health effects

Nevertheless, some “weak” precautionary policies may be warranted

- **Recommend that health agencies closely follow the health effects literature**
- **Systematic reviews with risk of bias analysis of studies**
- **Governments should support (quality) health effects research at 5G frequencies**

- **Not needed:**
- **More poorly done studies (unblinded, no sham controls, poor dosimetry)**
- **Poor quality reviews**

References

- Science and the precautionary principle. K. R. Foster, P. Vecchia, M. H. Repacholi. Science 288: 979-980 (2000).
- K. R. Foster, Radiofrequency Fields and the Precautionary Principle, in Non-ionizing Radiation Protection: Summary of Research and Policy Options pp. 405-429 AW Wood and Karipidis, Eds. Wiley, April 2017.