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April 6, 2020

**Honourable Minister for Communications**

DR ISA ALI IBRAHIM PANTAMI, *FNCS FBCS FIIM*

**Ministry of Communications and Digital Economy Team of Directors**

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**RE: Environmental and Human Health Effects of 5G**

Dear Dr. Isa Ali Ibrahim Pantami & the Ministry of Communications and Digital Economy Team of Directors,

The Environmental Health Trust (EHT), a nonprofit research and policy organization dedicated to identifying and reducing environmental health hazards, wishes to express serious reservations about the proposed grounds for widespread rollout of 5G.

As past experiences with tobacco and asbestos demonstrate, the consequences are grave when governments fail to restrict and reduce environment pollutants that research proves cause harmful effects to populations.

Overwhelming evidence supports EHT's concerns that rollout of 5G will cause exposure to cancer-causing levels of radiation. In light of this evidence and consistent with public health concepts of preventing harm by reducing exposure to suspected and known carcinogens, EHT opposes placing wireless antennas on city utility poles, streetlights, and in close proximity to city workers, children, and families.

Governments are halting 5G until their health authorities have reviewed the state of science and impacts to environmental and human health. More than 150 cities in Italy, and a growing number of municipalities in Switzerland, Ireland and the United Kingdom have passed resolutions halting 5G until safety can be assured.<sup>1</sup>

Several cities in the United States have passed ordinances to restrict wireless antennas installation in residential neighborhoods<sup>2</sup>. For example San Diego County California has a 300 foot setback for schools and in Palo Alto

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<sup>1</sup> Environmental Health Trust, [INTERNATIONAL ACTIONS TO HALT & DELAY 5G](#)

<sup>2</sup> <https://ehtrust.org/usa-city-ordinances-to-limit-and-control-wireless-facilities-small-cells-in-rights-of-ways/>

California the installation of small cells on public utility easements in residential neighborhoods is prohibited, there is a 500 foot setback for small cells near multi-family residences in commercial districts and a 500 ft setback for schools<sup>3</sup>. The State of New Hampshire passed HB522<sup>4</sup> creating a Commission to investigate the environmental and human health risks of 5G<sup>5</sup> and Oregon passed SB 283<sup>6</sup> instructing the state health authority to investigate the independence science on the health impacts of radiofrequency radiation with a focus on children's school exposures.

Furthermore, EHT urges more testing on the impact of Millimeter Wave (MMW)-range radiation on humans, fauna, and flora *before* 5G becomes a commercially viable network.

## HOW 5G WORKS

Telecommunications operate using a waveform or modulation to encode a signal — for instance, voice or data — that travels over carrier frequencies to a receiver. The receiver then demodulates the signal, translating it back to its original form.

That's how broadcasts, messages, and downloads are encrypted and deciphered. In the early era of telecommunications, wires were used to send and receive these signals. In the current era of 3G and 4G wireless, these signals are sent wirelessly on low- and mid-band radio frequency spectrums.

As more and more people send and receive data, the current spectrum of radio frequencies used for transmissions has become overcrowded. Like traffic during rush hour, when everyone is driving at the same time, slowdowns and backups occur. This is what happens with data being sent across the spectrum now in use.

With the current highways becoming too crowded to accommodate the increasing population of the Internet of Things (IoT) — everything from wearable technology to driverless automobiles that operate over the spectrum — telecommunications companies seek to access high-band frequencies to relieve the impending traffic jam. MMW technology — these high bands in the spectrum — are wide-open, unused lanes that permit signals to travel very quickly.

But this much-hyped solution has a downside. Signals can only be sent via very short ranges in the 5G high-band spectrum, maybe as little as several hundred feet at a time. Establishing 5G base stations to ensure the signals can proceed is like setting up a “toll plaza” on the highway about every 800 yards. Even if the toll plaza doesn't require the driver to slow down to pass through it, for 5G to operate in this high-band spectrum, a multitude of toll plazas need to be built.

Unfortunately, these toll plazas, the 5G base stations, produce a massive amount of radiofrequency electromagnetic radiation (RF-EMF), which is designated as a possible human carcinogen. In other words, overexposure to MMW radiation can cause significant health damages.

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<sup>3</sup>[https://www.losaltosca.gov/sites/default/files/fileattachments/city\\_council/page/48421/resolution\\_no.\\_2019-35.pdf](https://www.losaltosca.gov/sites/default/files/fileattachments/city_council/page/48421/resolution_no._2019-35.pdf)

<sup>4</sup>[https://trackbill.com/bill/new-hampshire-house-bill-522-establishing-a-commission-to-study-the-environmental-and-health-effects-of-evolving-5g-technology/1630657/?fbclid=IwAR28psMtRFU7mBGMmA8SKxoS0AIkf8LzcQR7e7vO\\_MiifUzs0N4GfUNeLC4](https://trackbill.com/bill/new-hampshire-house-bill-522-establishing-a-commission-to-study-the-environmental-and-health-effects-of-evolving-5g-technology/1630657/?fbclid=IwAR28psMtRFU7mBGMmA8SKxoS0AIkf8LzcQR7e7vO_MiifUzs0N4GfUNeLC4)

<sup>5</sup> <http://www.gencourt.state.nh.us/statstudcomm/committees/1474/documents.html>

<sup>6</sup> SB 283 <https://olis.leg.state.or.us/liz/2019R1/Downloads/MeasureDocument/SB283>

## WHY 5G IS HARMFUL

The World Health Organization and International Agency for Research on Cancer (WHO/IARC) classified RF-EMF as a Group 2B Possible Carcinogen in 2011<sup>7</sup>. Several experts who have worked with the WHO/IARC since then have concluded that the weight of current peer-reviewed evidence supports the conclusion that RF-EMF should be regarded as a human carcinogen.

Published peer-reviewed science already indicates that the wireless technologies of 2G, 3G, and 4G — in use today with our cell phones, computers, and wearable tech — create radiofrequency exposures that clearly pose a serious health risk to humans, animals, and the environment.

The human health effects associated with wireless exposures include impaired reproduction, increased incidence of brain cancer, DNA breaks, oxidative stress and immune dysfunction, altered brain development, sleep changes, hyperactivity, and memory and cognitive problems.

The following are a few of the studies on the impacts of radiofrequency radiation on humans, flora, and fauna. This is only a small sample of the body of research that has been published on this subject:

- Scientists at the University of Exeter found that mobile phone exposure was associated with reduced sperm motility and viability.<sup>8</sup>
- Doctors at Yale University's Department of Obstetrics, Gynecology and Reproductive Services found that mice exposed to cell phone radiofrequency exposure in-utero were hyperactive and had impaired memory, and that behavioral changes were due to altered neuronal developmental programming during gestation.<sup>9</sup>
- Scientists at Mizoram University in Aizawl, India, found that people living closer to cellular antennas had higher radiation levels in their homes as well as several significant changes in their blood predictive of cancer development.<sup>10</sup>
- Scientists looking at ecological effects of RF-EMF found that 70 percent of 113 studies it reviewed concluded that RF-EMF had a significant effect on birds, insects, other vertebrates, organisms, and plants. Development and reproduction in birds and insects were the most strongly affected.<sup>11</sup>
- The University of Lagos Department of Zoology looked at RF from antennas and found increased sperm abnormalities in mice exposed to RF from Global System for Mobile Communications (GSM) antennas.<sup>12</sup>

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<sup>7</sup> Bann, Robert, et al. [Carcinogenicity of Radiofrequency Electromagnetic Fields](#), *The Lancet*, VOLUME 12, ISSUE 7, pp. 624-626.

<sup>8</sup> Adams, Jessica A., et al. ["Effect of mobile telephones on sperm quality: a systematic review and meta-analysis."](#) *Environment International*, 70, 2014, pp. 106-112.

<sup>9</sup> Aldad, T.S., et al. ["Fetal Radiofrequency Radiation Exposure From 800-1900 MHz-Rated Cellular Telephones Affects Neurodevelopment and Behavior in Mice."](#) *Scientific Reports*, vol. 2, no. 312, 2012.

<sup>10</sup> Zothansiam, et. al. [Impact of radiofrequency radiation on DNA damage and antioxidants in peripheral blood lymphocytes of humans residing in the vicinity of mobile phone base station](#), *Electromagnetic Biology and Medicine*, 36(1):1-11 · August 2017

<sup>11</sup> Cucurachi, S, et al. [A review of the ecological effects of RF-EMF](#), *Environment International*, 51, 2013, Pages 116-140.

<sup>12</sup> Otitolaju, A.A., Obe, I.A., Adewale, O.A. et al. *Bull Environ Contam Toxicol* (2010) 84: 51. <https://doi.org/10.1007/s00128-009-9894-2>

- Studies on bees have found behavioral effects,<sup>1314</sup> disrupted navigation,<sup>151617</sup> decreasing egg laying rate,<sup>18</sup> and reduced colony strength.<sup>1920</sup>
- A review published in the International Journal of Environmental Health<sup>21</sup> cites research that shows that higher frequencies can alter gene expression, promote cellular proliferation and synthesis of proteins linked with oxidative stress, inflammatory and metabolic processes, could generate ocular damages, affect neuro-muscular dynamics.
- A review of studies published in Environmental Research<sup>22</sup> documents a range of adverse effects reported in the published literature from cancer to bacteria growth changes to DNA damage.
- Research has found a high level of damage to trees from antenna radiation. For example, a nine-year field monitoring study<sup>23</sup> of exposures to 2G, 3G and 4G involving over 100 trees found trees sustained more damage on the side of the tree facing the antenna.

## CORPORATE ACKNOWLEDGEMENT OF THE DANGERS

Insurers, investment firms, and telecom companies themselves are aware of the potential risks caused by 5G, and have warned their shareholders of the potential financial costs they may incur if — really, when — additional studies confirm the relationship of mobile networks to health damages due to RF.

For instance, investment trust company Crown Castle's 2019 10-K Annual Report<sup>24</sup> states:

*"If radio frequency emissions from wireless handsets or equipment on our communications infrastructure are demonstrated to cause negative health effects, potential future claims could adversely affect our operations, costs or revenues.*

*The potential connection between radio frequency emissions and certain negative health effects, including some forms of cancer, has been the subject of substantial study by the scientific community in recent years. We cannot guarantee that claims relating to radio frequency emissions will not arise in the future or that the results of such studies will not be adverse to us. ... If a connection between radio frequency emissions and possible negative health effects were established, our operations, costs, or revenues may be materially*

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<sup>13</sup> Kumar, N. R., Sangwan, S., & Badotra, P. (2011). Exposure to cell phone radiations produces biochemical changes in worker honey bees. *Toxicology international*, 18(1), 70–72. [doi:10.4103/0971-6580.75869](https://doi.org/10.4103/0971-6580.75869)

<sup>14</sup> Favre, D. (2011). Mobile phone-induced honeybee worker piping. *Apidologie*, 42(3), 270–279. <https://doi.org/10.1007/s13592-011-0016-x>

<sup>15</sup> Andrew Goldsworthy BSc PhD, Letter - [The Birds, the Bees and Electromagnetic Pollution](#), May 2009

<sup>16</sup> Sainudeen Sahib, S., [Electromagnetic Radiation \(EMR\) Clashes with Honey Bees](#), INTERNATIONAL JOURNAL OF ENVIRONMENTAL SCIENCES Volume 1, No 5, 2011, Research article ISSN 0976 – 4402

<sup>17</sup> Kimmel et al., [Electromagnetic Radiation: Influences on Honeybees \(Apis mellifera\)](#), 2007

<sup>18</sup> Sharma, vp, & Kumar, N. R. (2010). [Changes in honey bee behaviour and biology under the influence of cell phone radiations](#). *Current Science*, 98, 1376–1378.

<sup>19</sup> IBID

<sup>20</sup> Harst et al., [Can Electromagnetic Exposure Cause a Change in Behaviour? Studying Possible Non-Thermal Influences on Honey Bees – An Approach within the Framework of Educational Informatics](#), 2006.

<sup>21</sup> Di Ciaula, A. [Towards 5G communication systems: Are there health implications?](#) *Int J Hyg Environ Health*. 2018 Apr;221(3):367-375.

<sup>22</sup> Russell, Cindy L. [5G wireless telecommunications expansion: Public health and environmental implications](#), *Environmental Research* (165) 2018, pp 484-495

<sup>23</sup> Waldmann-Selsam, C., Balmori-de la Puente, A., Breunig, H., & Balmori, A. (2016). [Radiofrequency radiation injures trees around mobile phone base stations](#). *Science of The Total Environment*, 572, 554–569.

<sup>24</sup> Crown Castle, [10-K Annual Report 2019](#)

*and adversely affected. We currently do not maintain any significant insurance with respect to these matters."*

Wireless companies from AT&T<sup>25</sup> to Nokia to T-Mobile to Verizon Wireless have issued similar warnings<sup>26</sup> to their own shareholders. These disclosures show that the manufacturers of the 5G network cannot assure safety.

### **Insurers Rank 5G, Wireless and Electromagnetic Radiation as "High Risk"**

A 2019 Report by Swiss Re Institute<sup>27</sup> considers the risks so great to the insurance industry that it advises against writing any policies to cover damages that might arise. It classifies 5G mobile networks as an "off-the-leash" risk, meaning a high-impact emerging risk that will affect property and casualty claims in more than three years' time.

The report states:

- ***"Existing concerns regarding potential negative health effects from electromagnetic fields (EMF) are only likely to increase. An uptick in liability claims could be a potential long-term consequence."***
- ***"As the biological effects of EMF in general and 5G in particular are still being debated, potential claims for health impairments may come with a long latency."***

A Business Insurance analysis<sup>28</sup> also examined mass tort exposures that may have the potential to cause major difficulties for commercial policyholders and their insurers. It includes workers' overexposure to radio frequency waves from rooftop wireless transmitters as a potential future claim and states that research "has shown biological effects from lower-level 'nonthermal' exposure, and people exposed at lower levels have reported headache, dizziness, nausea, mood disorders, mental slowing, and memory loss."

Most insurance plans do not cover electromagnetic fields (EMF) and have very clear "electromagnetic field exclusions." According to CFC Underwriting LTD<sup>29</sup> in London, the UK agent for Lloyd's:

*"The Electromagnetic Fields Exclusion (Exclusion 32) is a General Insurance Exclusion and is applied across the market as standard. The purpose of the exclusion is to exclude cover for illnesses caused by continuous long-term non-ionizing radiation exposure i.e. through mobile phone usage."*

Even AT&T Mobile Insurance<sup>30</sup> excludes loss from pollutants. Their policy states, "Pollutants" means: Any solid, liquid, gaseous, or thermal irritant or contaminant including smoke, vapor, soot, fumes, acid, alkalis, chemicals, artificially produced electric fields, magnetic field, ***electromagnetic field, sound waves, microwaves, and all artificially produced ionizing or non- ionizing radiation and waste.***"

In order for insurance companies to cover EMFs, policyholders often have to purchase additional "Pollution Liability"<sup>31</sup> or "Policy Enhancement" coverage.

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<sup>25</sup> [AT&T 2016 Annual Report](#)

<sup>26</sup> EHTrust.org, [Corporate Company Investor Warnings In Annual Reports 10k Filings Cell Phone Radiation Risks](#)

<sup>27</sup> Swiss Re Institute, [New Emerging Risk Insights](#), 2019

<sup>28</sup> BusinessInsurance.com, ["The Next Asbestos: Five emerging risks that could shift the liability landscape,"](#) May 13, 2011.

<sup>29</sup> CFC Underwriting, LTD, [Electromagnetic Field Insurance Policy Exclusion](#)

<sup>30</sup> [AT & T Mobile Insurance Policy](#), 2014, p. 4

<sup>31</sup> Beacon Hill Associates, [The GL Form and Pollution Exclusions](#), May 2016

**If insurance companies will not insure EMFs and telecommunications firms consider EMFs a "pollutant" bad enough to warn its shareholders of the potential financial costs, how can governments allow such an environmental impact without also warning their citizens?**

## **HOW SCIENCE CAN INFORM PUBLIC POLICY**

The scientific evidence currently available indicates humans should drastically reduce, not increase, their daily wireless exposures.

The Environmental Research review<sup>32</sup> concludes that *"a moratorium on the deployment of 5G is warranted" and "the addition of this added high frequency 5G radiation to an already complex mix of lower frequencies, will contribute to a negative public health outcome both from both physical and mental health perspectives."*

In September 2017, more than 180 experts sent a declaration<sup>33</sup> to the European Union calling for a moratorium on 5G expansion citing potential neurological impacts, infertility, and cancer. The Declaration states,

*"We, the undersigned, more than 180 scientists and doctors from 35 nations, recommend a moratorium on the roll-out of the fifth generation, 5G, for telecommunication until potential hazards for human health and the environment have been fully investigated by scientists independent from industry."*

This appeal has now been signed onto by over 269 scientists and medical doctors.

In 2019, the European Parliament issued a report<sup>34</sup> which states that increased exposure to radiation frequencies *"may result not only from the use of much higher frequencies in 5G but also from the potential for the aggregation of different signals, their dynamic nature, and the complex interference effects that may result, especially in dense urban areas."*

The report notes that it "is not possible to accurately simulate or measure 5G emissions in the real world" and adds "5G radio emission fields are quite different to those of previous generations because of their complex beamformed transmissions in both directions – from base station to handset and for the return. Although fields are highly focused by beams, they vary rapidly with time and movement and so are unpredictable, as the signal levels and patterns interact as a closed loop system. This has yet to be mapped reliably for real situations, outside the laboratory."

Why roll out 5G if the potentially devastating effects have not been mapped out with any reliability? Is the benefit of 5G worth the consequences?

EHT's answer is no. In light of studies showing ample evidence of the biological impact of RF, it is imperative that a new infrastructure and 5G not be introduced widely into commerce at this time.

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<sup>32</sup> Russell, Cindy L. [5G wireless telecommunications expansion: Public health and environmental implications](#), Environmental Research (165) 2018, pp 484-495

<sup>33</sup> EHTrust.org, [Scientists And Doctors Demand Moratorium On 5G Warning Of Health Effects](#), Sept. 13, 2017

<sup>34</sup> [5G Deployment: State of Play in Europe, USA, and Asia](#)

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Policy that fast tracks the ability to deploy 5G technology will ensure the widespread exposure of millions to an agent that growing numbers of scientists and nations consider a serious health threat.

Nations need to consider critically the impact of unprecedented increased wireless exposures to the population. *EHT is gratified by efforts to slow the rollout of 5G that are already in place in nations, including France, Israel, and Switzerland.*

## CONCLUSION

For a new 5G network to fulfill its promise of creating ultra-fast speeds and massive capacities for millions of people, ***thousands of new and often large cellular antennas will need to be sited in neighborhoods within meters of homes and bedrooms to connect the Internet of Things with 5G technology.***

***This means close proximity of humans to high-level RF-EMF, which can cause significant and widespread health damages.***

Before introducing and additional and new untested wireless technology into the environment, it is necessary to:

- model exposures to infants, children and pregnant women;
- conduct experimental tests on exposures' impacts on wildlife; and
- evaluate impacts on human systems through in vitro and in vivo toxicology

The assumption that all wireless technology is safe has been shown to be incorrect. EHT strongly opposes the widespread installation of new wireless antennas and 5G infrastructure until more testing has been done and joins hundreds of scientific experts from around the world to urge nations to support safer technology instead of wireless 5th generation.

Sincerely,

A handwritten signature in black ink that reads "Devra Davis".

Devra Davis, PhD, MPH  
Fellow, American College of Epidemiology  
Visiting Prof. Hebrew Univ. Hadassah Medical Center & Ondokuz Mayıs Univ. Medical School  
Associate Editor, Frontiers in Radiation and Health  
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