Trailer –

I am a geoscientist by training and a science manager by practice. In recent years, as I watched global change rise, I became increasingly interested in the ethical implications of geosciences. We call it geoethics.

What does it mean to steward Earth systems? How do we, as individuals and societies, can even assume stewardship on systems apparently so much larger, and definitely so much older than ourselves? In the extreme, how is our ongoing practice of de-facto geo-engineering ethical? In which circumstances, and why?

This year, like everyone else, I stayed at home and watched the rising tide of the COVID-19 pandemic. And it occurred to me that pandemics, too, call on us to put together an ethical frame of reference at a much larger scale than that of the individual. With infectious diseases, my health is not just my own: it becomes a factor in yours, too. This gave me new, interesting questions: what does geoethics have to say about ethical behavior in a pandemic? Vice versa, how do actual decisions made (ethically) during the actual COVD-19 pandemic reflect on the work of geoethicists?

With these questions in mind, I have started working on a new subject, drafting my thoughts and discussing with friends, peers and strangers.

What follows below sketches some elements of my thinking so far. ***If you have feedback or ideas to contribute, I will be duly grateful.***

Geoscientists and the Pandemocene

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Pandemics are more than outbreaks of diseases. As a little semantics tells; the ancient Greek origin of the word *pandemic* means 'all' (pan) and 'people' (demos). Hence, a pandemic is something familiar to all humans. To face it, our modern way of life is a bunch of pandemics. Pandemic applied as a medical term may serve as an example. How the "coronavirus" emerged (markets), how the illness COVID-19 did spread through societies (travel), or what works to confine the outbreaks (social distancing) - any of these courses is about a way of life.

Humans, now more than seven Billion, are needing a decent life on Earth. For that end, they require a globalised society for the provision of food, goods, and security. There is little alternative to it, although it is a profound question of how. How the production of food and goods, the use of commodities and natural resources was done in the recent past led to anthropogenic global change. Climate change is only the single best-known example. It is a pandemic.

Turning to the geoscientists, recognising that the Holocene has ended (Waters et al. 2016) is acknowledging that the pandemics reached the geological record (Zalasiewicz et al. 2019). Hence, as debated for two decades, renaming the current times' Anthropocene' seems valid. Nevertheless, mutatis mutandis, although the notion 'Anthropocene' emerged as a shorthand for our times, 'Pandemocene' might be an alternative, unthought so far.

1 A Past, Present and Future of Pandemics

1.1 Societal Contexts of Geoscientists

Geosciences or Earth sciences are an amalgam of fundamental and applied research fields mainly within but also beyond natural sciences, as well as specific engineering disciplines and commercial undertakings on various scales, ranging from individual chartered experts to state-owned or multinational private corporations. Together, these geosciences disciplines nourish a corpus of stewardship knowledge about natural processes that can inform how people could act within the Earth system (Lenton and Latour 2018; Ogden et al. 2013; Redman and Miller 2015; Steffen et al. 2011). Therefore, contemporary geoscience knowledge is of high operational value for the functioning of modern societies.

Geoscience knowledge alone, however, does not guide how people ought to act. Like many other natural science communities, the geosciences communities have strengthened their ethical frameworks [*]. Intra-disciplinary frames, like the Cape Town Statement on Geoethics, are advantageous (Peppoloni, Bilham, and Di Capua 2019). They provide a solid foundation to go beyond a mainly intra-disciplinary setting of geoethics.

1.2 Past and Present

During prehistoric and historical periods, humankind modified natural environments to appropriate resources for a living (Ellis 2015; Fuentes 2016; Ruddiman 2018). Contemporary societies apply geosciences extensively for their economic, societal and cultural activities (Gill and Bullough 2017; Rosol, Nelson, and Renn 2017). These activities bind, through global supply chains, the entire globe into one social-ecological system (Reyers et al. 2018) that intersects with the physical and biological systems of the Earth. Crafts-persons, technicians, architects, and engineers apply geoscience knowledge when altering natural environments or creating artefacts, e.g. extraction of minerals, the laying the foundations for buildings, or managing floodplains. Artists, poets or philosophers of any time or culture refer to the Earth for co-shaping human identity. The earliest (known) reference is the Gilgamesh Epos of the third millennium BC (George 2000). Contemporary geoscience knowledge seeps into modern thinking and dealings (Moores 1996; Peppoloni and Di Capua 2012). Rarely it is put forward as a metaphor; as an exception, the title of a book by the geochemists Langmuir and Broecker (2012), 'How to build a habitable planet'.

1.3 Scriptum Futurum

About three years ago, in 2017, the participants of the Salzburg Global Seminar-593 [#] were asked: What will it mean to be human in 2050 or 2100? Drawing on my contribution [**], my *scriptum futurum* runs as follows:

1. People overcame the multiple social-ecological pandemics of the 2020/2030-ties; then life-expectancy had stalled globally. During this crisis, the use of arms of mass destruction got hindered although some 'conventional warfare' occurred.
2. By 2050, collaborative Earth System Governance has emerged, and the life-expectancy (number of healthy years) of people started to increase again. The deterioration of the most vital global ecosystems has halted.
3. In 2100, the global human population has stabilised. Open societies have led to about equal levels of development in all urbanised regions.
4. Joint efforts are ongoing to relocate people from the ocean shorelines (and some other now uninhabitable zones); 'managed human retreat' because of sea-level rise and 'rebuilding of (coastal) urban areas' is a global policy.
5. Since 2050, emotions emerged spontaneously in complex information systems, and since then, they consolidated into stable societal features. Since then, such 'feeling systems' and the various (collective and individual) 'people-tool systems' got a dedicated legal status in most countries.

In turmoil caused by the COVID-19 pandemic, I keep my metaphorical description about the state-of-play and the exit-strategy:

(1) For many of our fellow citizens, 'The Future,' with capital "F," is the march towards "About-the-Same." It is the aeon-old view, "Nihil sub sole novum" (nothing new under the sun) that for many provide a (false) frame of security. Astonishingly, However, what to do when this reference frame seems to change, to wobble and, hence gets uncertain. 'The Unknown' frames the stages of our plays. 'The Counter-Intuitive' seems to consolidate out of our plays. They block the way back. The horsemen of the modern apocalypse, 'The New,' 'The Unknown,' and 'The Counter-Intuitive' threat with insecurity, loss of competences, altered divisions of societies, and lost sense!

(2) Some people relish the 'The New,' 'The Unknown,' and 'The Counter-Intuitive'. Artists, Explorers, Scientists feel a deep sensual pleasure when confronting them, as a person and as citizens. The artist's psyche, the explorer's spirits, the innovator's minds, the researcher's souls are resources vibrating with imagination and passion. Hence, nurtured by them, the citizenries may confront Quantum-Technology, Earth System Sciences, Artificial Intelligences, and Synthetic Biology. Then the citizenries will draft the new 'guides to these galaxies.' They will tell, whether '42' is still the right answer, why your towel might be a reliable resource, and who moved the restaurant(s) at the end of the universe(s)? [##]

*(3) However, only as citizens, artists, cultural practitioners, inventors, and scientists can push the boundaries of the human imagination. As citizens, jointly they may move beyond the familiar and transcend the borders towards the future. Nevertheless, are they ready to assume this task? Do they invest collaboratively in path-changing discoveries, different fates of our planet, and charting pathways to liveable futures? Only then, 'The New', 'The Unknown', and 'The Counter-Intuitive' will face the broad, vigorous smile of 'The Imaginator'- **Surrender**!*

2 Conclusion: Planetary Human Agency and Geosciences

How societies alter natural environments depends on their technological means, cultural views on how to deploy them, the scientific insights that underpin these technological means and cultural views, and the economic conditions, cultural constraints, and available resources. Together these features determine which 'endeavours' of anthropogenic change are possible or desirable to undertake. The principal human endeavour in contemporary times is to operate a 'technosphere' at the planetary scale (Haff 2014b, 2014a; Herrmann-Pillath 2018; Leach et al. 2018), which is the essence of the Pandemocene.

Within society's corpus of technological means, cultural views and scientific insights, geoscience knowledge has the potential to fundamentally shape the direction, effectiveness, and efficiency of anthropogenic change of Earth system dynamics (Bohle and Marone 2019). To that end, geosciences are instrumental in making anthropogenic global change happen, that making it a Pandemic. Therefore, geoscientists are its co-architects who should assume the responsibility that comes with their role as agents of technology-driven change (Bohle and Bilham 2019). In this context, how geoscientists use their expertise is not an impartial matter. They are called to duty to offer cures in the Pandemocene; that is the essence of geoethics. Strengthening geoethics may be a choice in the Holocene, although it is a must in the Pandemocene because citizens' actions should *'be judged… where they fall on a scale of care and neglect" because "[w]hen humans formed an independent relation with the Earth, we were left to choose between a path of care and a path of neglect.'* (Hamilton 2017; p. 150, emphasise in the original).

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Possible Quandary and A Work-Around" with N. Bilham, https://www.mdpi.com/2571-550X/2/2/19) and a blog post prepared 2017 for the Salzburg Global Seminar #593.

[*] http://www.geoethics.org/definition; [**] http://ukkoelhob.blogspot.com/2018/02/the-smile-of-imaginator.html; [#] Salzburg Global Seminar #593 "The Shock of the New: Arts, Technology and Making Sense of the Future" (Salzburg, 20-25 February 2018); [##] See plots in "The Hitchhiker's Guide to the Galaxy" by Douglas Adams;

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