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Sustainability or Resilience? The Story Sketch of a Problem that Waits on the Sidelines

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Abstract: Humans are not the only ones critically disrupting the complex ecosystem of planet Earth. It's not about methane production by cattle herds: humans are responsible for that too. However, even during the Anthropocene, processes independent of humans are taking place that can affect the earth's ecosystem with intensity and magnitude unmatched by the externalities of human existence. Resilience to these processes and events renders an essential condition for a perspective of the Earth's ecosystem that we call sustainable.

Key words: sustainability, resilience, seismicity, climate change

1. Introduction

In April 1815, during a volcanic eruption, the Tambora volcano on the island of Sumbawa in Southeast Asia blew itself up. The volcanic gases in the high troposphere then disrupted the alternation of the sea-sons of global climates and the sun's rays ceased not only to reach the Earth's surface but also to pass through the atmosphere. What the aerosols produced by the eruption could not do in the stratosphere, the ash produced by the eruption completed in less than half a year, spreading across all longitudes and latitudes. The most destructive period of sustained extreme weather in human history had begun. Anywhere on earth where records exist or data can be derived by other means, the average temperature during the decade 1810 to 1820 was at least 1.5°C lower than in the previous decade: it was the coldest period in at least 500 years, in which years of extreme rainfall were interspersed with years of extreme drought. In New England, 1816 earned the nickname "the year without the sun" or "eighteen-hundred-and-freeze-to-death"; in the German lands, 1817 became "the year of the beggars". To be alive during the three years after the eruption almost anywhere on the globe was to be hungry: crops froze before there was anything to harvest, or were washed away by downpours and floods. People ate rodents, nettles, or clay; in Europe, desperate crowds clogged the roads in a vain attempt to find something to eat. In Switzerland and Germany, cases of cannibalism and killing of one's children as a more humane alternative to starvation have been recorded. Sailing on the sea and on lakes was extremely risky due to the sudden, destructive storms that alternated between periods of no wind.

2. The Problem

Catastrophic events, of which the eruption of the Tambora volcano in 1812 is an example, can repeat today and in the near and distant future. The 8.9 magnitude earthquake with its epicenter in the sea to the east of the Japanese island of Honshu is not two hundred years old "pre-history". Most of us watched almost live the counting of the victims of the tsunami that the earthquake triggered and the struggle to deal with the Chernobyl-sized nuclear accident at the

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Fukushima power plant in 2011. Japan considered itself well prepared for a tsunami strike, based, among other things, on the catastrophic tsunami of 1896, when the wave reached a height of 38.2 meters: but on the Omoe Peninsula in 2011 it was 38.9 meters; the record tsunami height after the eruption of the Krakatoa volcano in 1883 remains unsurpassed — for now. The total number of deaths in Japan as a result of the 2011 earthquake and (mainly) tsunami reached 15,889, 2,601 people remain missing, and the economy suffered US$300 billion in damage. At the Fukushima plant, flooding caused an explosion of accumulated hydrogen when emergency cooling failed. A day later, the first and second reactors were already critically overheated, over 200 000 people were evacuated from the vicinity of the plant, and nearly 6 million households were left without electricity — in winter, for days or weeks. The tsunami and earthquake also caused complications at the Onagawa plant. Tsunamis hit other coastlines, too, causing damage and killing people: on virtually all the Pacific coasts, even on the 17,000 kilometers of the Chilean coast, the losses in Japan were several orders of magnitude higher; still, with a little cynicism, “nothing Japan can’t cope with”.

Lesser-known realities of the 2011 earthquake and tsunami are the 2.4-meter shift of northeastern Japan toward North America; the four-hundred-kilometer swath of Japanese land closest to the epicenter of the quake dropped 0.6 meters; the Pacific plate of the Earth’s crust shifted westward by as much as 20 meters; the Earth’s axis shifted by 10 centimeters — resulting in a 1.8 microsecond shortening of the day.

3. Implications and Discussion

Immediately after the Fukushima accident, Germany decided to shut down all its nuclear power plants, not to mention build new ones, and it did not retract this decision even when emotions had subsided. Such a decision was undoubtedly taken as an act of support for the use of renewable energy sources — in Germany’s case, wind in particular — but were other, preferably all, contexts considered responsibly and rationally?

After the eruption of Tambora and the subsequent three-year global “solar eclipse”, a catastrophic famine struck the entire planet. What would be the consequences of a geophysical event of similar magnitude today? In areas and populations dependent on agricultural production, probably the same as two hundred years ago. And where would economically advanced countries import food from? Would they remain economically advanced at all if consumers and governments lost interest in any products that did not very directly address the basic needs of life? What about energy supplies? Solar power would cease to exist; wind power would be available more rarely — in the brief interludes between hurricanes and no wind. Anyone would take credit for good old fossil and nuclear fuels — as long as the transmission grids, sorely tested by extreme winds, worked, of course. Nor would shipping be relied upon, and the resilience of oil and gas pipeline structures to the flooding and landslides that would undoubtedly result would be demonstrated.

In addition to this, let us not forget to consider how much more spoiled, less hardy, less resilient — physically and mentally — each of us and our society - European society in particular — are compared to our ancestors ten generations back. The saying that civilization is three hot meals away from chaos and disruption may be a sad truth. The current SARS-CoV-2 pandemic shows how risk-averse rulers and leaders almost everywhere in the world are: and what if the risk becomes a reality, the threat becomes a disaster? Are we even capable of acting rationally in such a situation?

Impacts of a natural disaster such as the eruption of the Tambora volcano in 1815 would probably be uneven today, specific to the nature of the economies of individual countries and regions and their food and energy resources. They would be least in most countries in the middle of the global economic

development ladder: their advantage would be (still) fossil fuel-based energy; European energy would be most affected by the failure of photovoltaic and wind resources: quite possibly fatally. The divider of the nuclear-free energy systems of Germany and Austria would be hydroelectricity: but national energy grids are robustly interconnected in Europe — could Austria or Switzerland maintain their partial advantage? A relative advantage would be given to countries that already carry out part of their agricultural production off-farm — in greenhouses with electric lighting, better still in vertical farms: in Europe, for example, the Netherlands. But would this segment of food production saturate at least a basic supply of essential calories to all the inhabitants of a country or region? Fishing could remain relatively unaffected — perhaps only temporarily — as long as fishing boats can sail, catch and return to ports between extreme storms, and as long as extreme storms do not put out of action equipment for which ports cannot provide sufficient protection.

All of these are just unprofessional deductions and inductions, indeed: but they are so grave that we cannot be content with a possibly dismissive and flatly dismissive response from experts. Even the author of this essay would like the experts to rule out the catastrophic scenarios outlined as impossible — based on robust facts and constructs, interconnected in a complex, holistic structure, confirmed by qualified opposition in which the individual claims and their structure as a whole stand up. But nothing of the sort is happening: until it does, the enthusiasm for the results achieved at the Glasgow COP26 — if there are any — should be tempered. Beyond doubt, the best plan to achieve the climate goal of “plus one and a half degrees Celsius” will collapse like a house of cards if in a single year, a massive geophysical event “meets the climate goal” — causing the average temperature of the (near-surface) troposphere to drop by 1.5°C. The statement that in the Anthropocene human activities are globally affecting the Earth's ecosystem deserves reconsideration. Yes, they do, but it is not only this influence that is (yet) not under control. First, other factors that influence this ecosystem — geophysical processes for example — are out of human control. And the impacts of these processes can be — are likely to be — even more massive than any deliberate human activity.

4. Conclusion

Until both the illustrated and the as yet unsuspected threats beyond human control are competently excluded, let us replace the magic word of our time — sustainability — with the concept of resilience. The reasoning is as apparent as it has so far been in many ways overlooked: without structural resilience, no system is truly sustainable. And it is not just catastrophic volcanic eruptions. Even at the scale of individual components of a settlement system, processes are taking place in the non-living part of their ecosystems that we have so far overlooked and cannot reliably predict in the long term, let alone be able to regulate.

Around the turn of the millennium, many Central European cities were hit by floods that none of their contemporaries remembered (we thought they did not exist), even though historical sources provide reliable evidence of events of the same magnitude. Particular measures — mobile and fixed dams and other stream modifications — responded spontaneously to keep future floods within acceptable limits. For sure, in the climate change debate, we also include devastating floods (in part) among the externalities of industrialization and humanity’s industrial existence: as such we want to get rid of them (in part) by meeting climate goals. But the approach “let’s take a lesson, let’s learn how to live with them” prevails. Why then is this alternative completely absent from the discourse on the main consequences of warming? In relation to geophysical and acute climate events, the search for resilience, the preventive building of measures that allow humanity and individual people “to live with

them" as far as possible without material, social and cultural constraints, is and will be for a long time to come — it seems — the only sustainable option.

In prehistory, the man had no reason or room to believe that he was anything other than one part of the universe — a peer among peers. The human brain (exceptionally perfect originally, perhaps, to master to process well the impulses coming from a rather clumsily constructed eye) gave man the capacity for continuous "project activity". As soon as humans greatly improved their own nutrition and climate resilience (yes, resilience — not sustainability in the first place) by this ability, they began to use its sometimes spare capacities for activities seemingly, in the short term, superfluous. For the creation and appropriation of goods — objects, power over other people, for the formation of relationships with them, for the physical and mental appropriation of the world — for philosophy, art, technology, the sciences. Man and humanity gradually emancipated themselves from their environment — or so they thought: the res cogitans reserved themselves against the rerum extensae.

In the face of the consequences of his tendency towards easy solutions to his needs and his disdainful attitude towards the "rest of the world", since Romanticism man has begun to return to the framework of "nature". At the turn of the second and third millennium of the Christian era, he declares himself a humble part of the earthly ecosystem (again). But he forgets that he is no longer willing to endure some of the vicissitudes of life in this ecosystem, regardless of his declared humility and considerateness. Yes, man is able to deny himself meat, but he does not want to endure famines or epidemics, droughts, floods, or earthquakes — even though these are unquestionably inherent parts of the past and future history of the earth's ecosystem. And this unwillingness, growing into incapacity, is growing logarithmically. It is being demonstrated today, for the second year running, by SARS-CoV-2. Humanity has experienced hundreds of more devastating epidemics, but this is the first one in history, for which the governments of virtually all countries — usually the more advanced they are — are plunging their own economies into recession, chaos, and debt, the consequences of which they can barely predict, let alone counter.

But it is far from being only, and perhaps not primarily, about economics and prosperity. Dystopias as the result of forces we cannot predict, let alone control, have their place in cinema, literature, and other arts, but not in our view of the future. For climate, pollution, and limited resources, we have found — have we really found? — the solution: reducing our consumption, abandoning our current economic, cultural, and social practices, and finding and imple-menting better, "smarter" alternatives. We link all these self-limitations and "smart solutions" with the adjective "sustainable". The goal is clear — really? Just achieve "plus 1.5°C" and we are "out of the woods"? How satisfied will we be with the sustainability of terrestrial life when the next self-defeating catastrophic volcanic eruption hides the Sun behind clouds of volcanic ash for a few years?

Regardless of what has and has not been agreed in Glasgow in autumn 2021, humanity as a whole is not passive in relation to the goal of stabilizing the rise in the temperature of the Earth's troposphere at plus 1.5°C compared to pre-industrial times. Should we not also urgently begin to do something to ensure that not all our efforts and plans are wasted if a catastrophic geophysical event blocks our path to this goal? Should we not begin to address our resilience in relation to such an — unknown — event? Cities and villages, the individual components of the global settlement system, are some way ahead in this respect than humanity and the planet as a whole. Following the principle of "near is my skirt but nearer is my skin", they do not hesitate to address flood protection and sea-level rise measures as appropriate before climate change — if they have the knowledge and resources. New challenges and new

urgent actions will emerge once we realize, with all the implications, that resilience precedes sustainability, that structural resilience is an indispensable condition, the sustainable method of sustainability.

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