Chapter 13
Foundations of Sustainability in Nature and Society

The problems of sustainability, of sustainable development, that frequently discussed term of the turn of the present century, we have touched on in previous chapters. But now the time has come for us to discuss it in more detail.

What is it? Is it the true guiding star for escaping the global crisis that has overtaken the world? Or is it only the next in a string of media campaigns, not unlike the pronouncements made from high rostra in the early 1960s USSR of how "The current generation of Soviet people will live under communism?" And does anybody really know what sustainable development is? After all, until quite recently, humanity somehow got along fine without it, governed by age-old experience and practice often based, in any case, on the self-interest of one or another political, national or social group as well as on a system of checks and balances. Meanwhile, relations between states, as a rule, were built on temporary treaties and alliances which, however, could easily be violated in the event of a changing balance of power on the political chessboard. It was, in essence, the path of spontaneous development, and it accompanied global ecological sustainability, determined for the time being by a relatively low population on Earth and its weak technological armament.

With the start of the twentieth century, however, the situation fundamentally changed. Man took hold of hitherto unknown sources of energy and made himself capable of influencing his surrounding world on a scale previously unseen. And while before social cataclysms, revolutions and wars had imposed misfortunes primarily of a local nature, though at times sweeping off whole peoples and states, with the appearance of modern weapons of mass destruction, any full-scale nuclear conflict is capable of annihilating all life on Earth, as shown by Russian geophysicist Georgy Golitsyn, American astronomer Carl Sagan and their colleagues. This Golitsyn-Sagan Hypothesis, more famously known as Nuclear Winter, was checked simultaneously on computer models in the Computing Center at the Soviet Academy of Sciences (Moiseyev et al. 1985) and a team of scientists in America. In both

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cases, computer calculations confirmed the accuracy of the hypothesis[1]. And what had seemed to be innocent technological novelties, such as the refrigerant Freon, patented in 1928 and widely used in refrigerator parts, in half a century began threatening "ozone holes" over the planet's polar areas.

Along with this, the most important achievement in public thought over the past decades has been the understanding that ecological sustainability cannot be viewed independently of its social and economic aspects. After all, against this backdrop of modern humanity's technological armament, even typical corporate selfishness can lead to dangerous and unpredictable consequences. This nearly happened in the Soviet Union in the 1980s, when projects to divert northern rivers, being shoved through with unflagging obstinacy, were closely connected with the Ministry of Water Resources.

In this way, life itself has put humanity in search of a development path that would not destabilize the environment and, what's more, aid the harmonization of social relations endowed with a sense of responsibility for the fate of our common home, Planet Earth. This idea of universal stability in the natural and social environment, a relation to life as a fragile gift that must be held safe to be passed along as our inheritance to the next generation, pressed in human consciousness in the second half of the twentieth century against the drive to reform and reconstitute the world, which at that time had gripped millions on either side of the Iron Curtain. That was when words of sustainable development as an alternative to the previous, nature-destroying course of civilization sounded from the rostrum at the 1992 Earth Summit in Rio de Janeiro.

Characteristically, the economically successful countries put forward the idea of Sustainable Development first, and for good reason. Having long since destroyed the greater part of their own ecosystems, they recognized sooner than most the ecological consequences the rest of the world would incur in an attempt to follow the same path. Therefore, warnings of the exhaustibility of natural resources amidst civilization's continued expansion, as were heard at Rio de Janeiro, bore witness that this problem had become a fact of public knowledge.

As it often happens, the term Sustainable Development, however, had its own backstory. In the mid-twentieth century, a group of scientists and managers studying issues of fishing regulation in Canada used the phrase *sustainable yield*, meaning a system for exploiting fisheries while not exhausting them. To do this, the yearly catch of fish would correspond to the population's ability to reproduce itself. Nearly a century earlier, the same idea, using different terminology and referring to different resources, was put forward by German foresters. Here it also had in mind an analogous system for exploiting forests in such a way that logging did not exceed natural growth and that the wood harvest occurred without loss to nature. Now such a system is called sustainable forestry. Such resource exploitation may continue indefinitely under constant conditions of climate and other factors that do not depend on human activity.

[1] Granted, not all modern climatologists, including supporters of the Golytsin-Sagan Hypothesis, find these calculations convincing. This is because the model turned out to be too sensitive to changes in input data, so even small variations lead to materially different results.

But only at the end of the 1980s did this term receive a new hearing. And, thanks to its use in the Brundtland Commission report, *sustainable development* gained a broad and steady scientific coinage. It would be an exaggeration, however, to think that a quarter century on the global community has a clear, crystallized view of the substance of Sustainable Development or is of one mind concerning the path to its practical realization.

In particular, even its very first definition, given in the Brundtland Report, *Our Common Future* (1987), provided ample ground for disagreement. So, for example, in the Report's second chapter it says "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (Our Common Future 1987: p. 41). But how do we understand the needs of future generations? Shall we equate them to the current requirements of those who live in developed countries or of those who only aspire to reach that level but cannot be counted among the number of impoverished? And how do we understand the words on development that does not threaten, "the natural systems that support life on Earth: the atmosphere, the waters, the soils, and the living beings" (Our Common Future 1987: p. 42). if we do not clarify the nature and specifics of the threat? That mankind, to one extent or another, has exerted and clearly will continue to exert a negative influence upon the biosphere does not leave the question of a doubt. Not without cause did Friedrich Nietzshe call it a "disease of the Earth." The whole question is how to stop this disruptive influence from surpassing the biota's capacity to compensate.

In short, much in these formulations appears insufficiently developed and lacks an adequate theoretical base. This methodological shortcoming, perhaps inevitable at the stage of acknowledging the problem, has given rise to a multitude of contradictory and quite arbitrary renderings of this understanding, so crucial to modernity. We observe the greatest inconsistency where discussion touches on the fundamental compatibility of sustainability and growth with the characteristic mix-up or even jumbling of these two conceptual categories.

Thus, some authors assert that sustainability and development contradict one another, and so we ought to reject any pairing of the two (Valyansky and Kalyuzhny 2002). Here you could recall that from a philosophical point of view development is a particular instance of a movement, just as a movement is a particular instance of development: a movement toward civil society, a movement toward social equality, etc. And the sustainability of movement (motion) is one of the fundamental concepts of mathematics, going back to Joseph-Louis Lagrange and Simeon Poisson, then further developed by Henri Poincare and Alexandr Lyapunov. As they thought of it, it meant motion which, having started at a point of some predetermined tunnel, never exits beyond the bounds of that tunnel. The motion here is the product of a change, and the sustainability—of invariability, the consistency of some relation or property of the object, maintaining itself despite any change from among a set of the concrete, fixed class of potentially possible changes (Danilov-Danil'yan 2003).

In such a case, the development of civilization, a social group or economic system can be considered sustainable if it maintains a certain invariant, particularly with concern to the system properties on which its survival depends. For civilization

as a whole, this invariant is the limit of environmental pressure, beyond which the adaptive capabilities of the biosphere are exhausted and its irreversible degradation begins (more on that in Chap. 14). With concern to another pair of concepts, growth and development, here disagreement partly owes itself to the polysemy of the English verb *to develop*, meaning at once to develop, to improve, to grow and to expand. This seemingly gives credence to the authors who link sustainable development with growth, even if slowed, limited to available resources and not exceeding the limits of natural ecosystems' assimilated capabilities (Jocelyn et al. 1994).

But, one way or another, the great majority of researchers allow for some form of economic growth as part of sustainable development. Growth has long figured as a panacea in the public consciousness. As the book *Limits to Growth the 30-Year Update* says, "Individuals support growth-oriented policies, because they believe growth will give them an ever increasing welfare. Governments seek growth as a remedy for just about every problem. In the rich world, growth is believed to be necessary for employment, upward mobility, and technical advance. In the poor world, growth seems to be the only way out of poverty. Many believe that growth is required to provide the resources necessary for protecting and improving the environment… For these reasons growth has come to be viewed as a cause for celebration" (Meadows et al. 2006: p. 6).

And yet, for all the intertwining of these understandings, there exists between growth and development a sufficiently deep distinction in meaning, including that fixed in linguistic usage.

So, according to the single-language *Merriam-Webster Dictionary, to grow* means to spring up, to increase in size, to have an increasing influence, and, as a transitive verb, to cause to grow or to promote the development of. And here comes the semantic model of *to develop*, first as a transitive verb: to promote the growth of, to expand by a process of growth. The intransitive verb means to go through a process of natural growth or evolution by successive changes, to come into being gradually, to become manifest.

Thus we can see an important mark of distinction, allowing us, to a certain extent, to develop the concepts of growth and development. While growth is a change quantitative in substance, development is structural and qualitative. And, therefore, each of these processes obeys its particular rules and yields dissimilar results, at times radically different. So, for example, the permanently increasing pressure of civilization upon the biosphere, already having reached the limits of its adaptive capabilities and in places even going beyond these limits, is an obvious example of unbridled quantitative growth, disregarding any regulation or limit and, therefore, incurring the most dangerous consequences. But if humanity, as some think, is doomed to incessant growth in one or another modification, then, in that sense, it stands in sharp contrast with the development of the biota.

Indeed, the process of establishing and evolving ecosystems, from which the very concept of sustainability is borrowed, constructs itself upon a very different foundation than the world built by man, and we can characterize this behavior as a phenomenon of development without growth. Take any tropical forest or tundra community—all of these ecological systems arising through evolution have long

developed only qualitatively and, under stable climate conditions, never grow in physical size whether by territory or volume. Note that Vladimir Vernadsky calculated the mass of living material by order of magnitude independent of time. Limits to such qualitative development, in all likelihood, do not exist, for which we have in evidence the colossal complexity of the biota. The stimulus for this arises from the biota's constant "dialogue" with the environment, including the search for the most efficient mechanisms of its own regulation and stabilization, and, in case of disruption, a way to restore the environment to the margin of stability.

After a particularly strong and prolonged disruption, though, such as glaciation, this restoration takes the path of evolutionary speciation, i.e. a radical reconstruction of the biota's internal structure that requires hundreds of thousands or even millions of years, and the conditions thus changed set the benchmark for the next stage of evolution. We should not look upon this benchmark, however, as something pre-ordained, since the evolving biota, including the localized communities, "shifts" it in a direction it "finds convenient." Two factors play a part in this. First, such shifts are determined by the potential of the biota and its communities, and, correspondingly, have limits to their potential. Second, reaching a benchmark at each concrete stage of evolution can be thought of as piece work. As each developing species resolves an evolutionary task, a task of a more general character is simultaneously resolved. That includes increasing the overall adaptive potential of the biota, aiding its survival in case of possible catastrophic changes to the abiotic environment.

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It would seem that evolution and human progress are both founded on the principle of selection, mutual adaptation and the competition of peoples, cultures and civilizations. And, nonetheless, humanity, unlike nature, embodies the sentiment of incessant and ever-accelerating growth, whether demographic, economic or material, the last of which we often equate with progress. But while competitive relations in the biota are one of the means of providing long-term stability, the case of humanity, as a rule, demonstrates just the opposite inclination. Here competitive relations of civilizational subsystems frequently make themselves the greatest source of global unsustainability.

But, is this, humanity's Achilles' heel, linked to some fundamental particularity of our lifestyle? One should think so. And here, first of all, we'd like to call attention to the very way that humans interact with their environment which sharply distinguishes them from all other living things on Earth. Because while all other species conceive and adapt their life activity to the environment, man, alone among the crowd, took a fundamentally different turn, adapting this world to his own needs and wants. "Man is the only creature who refuses to be what he is," Albert Camus wrote in his 1951 book, *The Rebel*, granted, not in the ecological but in the social aspect of our lives. "The problem is to know whether this refusal can only lead to the destruction of himself and others" (Camus 1991, Introduction).

To explain this, we must make the important distinction between the heritable mechanism of sustainability, the basis of which is genetic memory in the biota, and the supra-biological structure of human civilization, where culture rather than genome supplies the memory. It is also worth distinguishing the base section of a

culture—its world view and spiritual or moral values—from the complex of practical knowledge and skills, including the technology that humans use.

While the basal composition of a structure changes very slowly, forming the sustainable core of the society, knowledge and practical experience expand ever more determinedly, involuntarily bringing the surrounding world into the process. This in particular holds the key to the incessant, accelerating growth of civilization, incomparable in speed to the evolution of the biota. It is that incompatibility which gave rise to the ecological challenge of our day. After all, in growing its technological power, its physical and financial capital, humanity could not correspondingly increase the productivity of nature's capital, determined by entirely different processes of its own—solar energy coming to Earth, the plant biota's capacity to use it, the speed of biochemical reactions, and so on.

Thus, the warnings sounded at Rio de Janeiro in 1992, until then understood only by a small clique of specialists. They warned that the global ecosystem was truly exhaustible, that the economy must account for the ecological factor and that technological progress far from always provides social progress. This proved an unquestionable intellectual breakthrough, calling attention to the problem from the widest circles of global society. That same year, a group of about 1700 scientists from 70 countries including 102 Nobel Laureates, members of the Union of Concerned Scientists, came forward with the troubling petition, "World Scientist's Warning to Humanity." "Human beings and the natural world are on a collision course…The earth is finite. Its ability to absorb wastes and destructive effluent is finite. Its ability to provide food and energy is finite. Its ability to provide for growing numbers of people is finite. And we are fast approaching many of the earth's limits.…No more than one or a few decades remain before the chance to avert the threats we now confront will be lost and the prospects for humanity immeasurably diminished" (World Scientists'… 1992).

It looks as though the idea of sustainable development came forward just when it became a necessity. It is the first serious attempt to find a way out of the civilizational dead end linked to the very foundations of human existence in which material growth has become an end in itself. The fetishization of growth in recent times has come to worry economists more and more. "The economics of growth and its relationship with development, in particular, require radical rethinking. A vast theoretical and empirical literature almost uniformly equates economic growth with development," It says in the UN Human Development Report for 2010. "Its models typically assume that people care only about consumption; its empirical applications concentrate almost exclusively on the effect of policies and institutions on economic growth" (Human Development Report 2010).

But this psychology has set its roots too deep, pulling into its orbit not only the residents of developed countries, but wider sections of third-world populations, including such giants as China, India and Brazil. At its core, this represents a choice of values, before which, perhaps unknowingly, stands twenty-first century humanity. On this choice, ultimately, the success or failure of transition to sustainable development will depend.

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