

THE NEW GLOBAL ECONOMY BETWEEN A WELL-PLANNED JOURNEY AND A CHAOTIC ONE. UNDER THE IMPACT OF BOTH CLIMATE CHANGE AND THE POST PANDEMIC, THE NGE: A MORE COMPLEX AND LESS PREDICTABLE SYSTEM

Petre ROMAN¹

¹Prof., PhD, Politehnica University of Bucharest, Romania
Corresponding author: Petre Roman; e-mail: proman@clubmadrid.org

Abstract

Mastering complexity is the next big challenge for science. Understanding and managing complexity is of critical importance if we are to find ways of solving environmental challenges such as global warming, and if we are to build societies that do not destroy themselves through conflict and war. Eliminating the carbon gas emissions inevitably implies higher energy costs and slower growth. There is no miraculous economic boom. Behind the shortages (energy, transport, semiconductors) there are deeper forces which can stay even for a long-term period. Green alternatives are not solving the problem of shortages. On the contrary. That shows, among many other things, the new complexity of the global economy. The New Global Economy is not about a bright future. It is about selecting a positive rule among many possible rules, a rule that indicates a positive behaviour of the global economy. *Green* should transform itself from truism into beating reality. The present available resources are, in general economic terms, more valuable than future resources. Having resources now means that we can or should expand our opportunities. This is simple economics, yet quite complex at the level of the global economy. The present command of resources is one of the most sensitive issues on the global stage. What stays unchanged when the economy is subjected to symmetrical transformation, i.e. transformations which do not alter the whole validity of the system? The obvious answer is: **cooperation, interconnectivity and trade**. We speak a lot about transitions in the global economy. Therefore, we are compelled to speak about some critical points and order parameters. Global economy should also be based on continuously expanding and charging towards the frontier of innovation. Governments and businesses working hand in hand make the economies more innovative. Global cooperation, if it is to become a reality, is about shared convictions. Indeed, we have no option but to act in the presence of uncertainty and often that means that a better situation could be simply an unattainable one. And we should, much more than now, resort to diplomacy as a global tool to cope with global uncertainties.

Keywords: *new global economy, real-time revolution, green energy, cooperation.*

Ervin Schrödinger, in *"What is Life?"*, states that: *"Life seems to be an orderly and lawful behaviour*

of matter, not based exclusively on its tendency to go over from order to disorder, but based partly on the existing order that is kept up."

The NGE, as any other economy, is about maximizing jobs and growth. The pandemic is becoming a catalyst for change. The essence of post-pandemic economic policies represents a real-time revolution, i.e., quality and timeliness of information emerging from using instant available data. Indeed, digital devices, monitoring all kinds of economic and commercial activities, machines and objects tracked with sensors, have become ubiquitous. Improved data and new ones developed in a perpetual feedback loop. In fact, we are dramatically increasing our ability to observe the economy accurately and, in doing so, improve it more quickly. And even more remarkably, battering the decision-making process in the public sector is of utmost importance. The gap between official data and what is happening in the real economy is often flagrant. And so often there is no time to wait for reports and official surveys. Bad and late data cause errors and jobs and lots of money is lost. There is a strong demand for economic research to understand the unpredictable and confusing situations.

A documented example is the financial crisis, when the Federal Reserve cut interest rates to near zero in December 2008, when America entered recession. Had the Federal Reserve cut them in December 2007 (one year earlier), the financial crisis would have been a lot less harmful. Now, real-time policies do not eliminate or reduce the work of statistical agencies. The NGE cannot be about moulding society as if we can see far into the future. Why? Because the global

economy is a complex, more often than not disordered system, because it is a dynamic system, which is a non-linear unpredictable one. The transformation we seek is towards a better, timelier and more rational decision-making. Real-time revolution is also, or should be, about alternative and augmentative communication.

Complex behaviour is all around us. The economy has many components, each with its own set of rules and all of them interacting in complicating ways. This year's (2021) Nobel Prize for Physics was awarded to Giorgio Parisi, a physicist who uncovered the hidden rules that govern complex disordered systems, i.e., the properties that emerge from the random, disordered movements of particles on the microscale, at the macroscale level. Such a mix of complexity and emergent behaviour is also the economy and the ecosystems under the impact of climate change, the biological phenomena or the financial systems. It's often much more difficult to predict the behaviour of a highly complex system like the global economy or a global financial one. And we are well aware that NGE should not denude the planet of its resources. That is the only way towards a sustainable future.

NGE is a complex system and the questions around this new dynamic are, as before:

1. Is it robust? Which are the engines of growth?
2. Is it sustainable? Can we replicate the conditions of growth in the long-term?
3. Is it resilient? When the system is submitted to shocks, which are inevitable in a world full of uncertainties, does it withstand the shocks and bounce back to a normal state, perhaps even a better one?

The behaviour of the system is strongly sensitive to the initial conditions which are not, as a rule, under our control. It doesn't mean that we are compelled to navigate without a compass. We can select the elements which drive the evolution of the system towards a more predictable behaviour as well as knowing better the already present elements of it. While climate change is predominant in the global approach of the economy, we can't say that all comes down to this challenge and how to mitigate its consequences. As we stated before, the initial conditions are more diverse.

In his famous paper "*Complex Systems: a Physicist's Viewpoint*," Giorgio Parisi gave a definition of the complex system: "*A system is complex if its behaviour crucially depends on the details of the systems.*"

Threats to the future are not only natural (physical or biological), they are also political. The cultural propensities of people and communities don't disappear. When they evolve, there is only an alteration of the existing ones.

It is important to notice that acknowledging the threats to the future of a global zero-carbon economy it shouldn't be that we somehow become the moral slaves of that future. Under the threats we can still imagine and compute new routes and new solutions. A global environment under uncertainty should be considered within the reality derived from complexity.

Mastering complexity is the next big challenge for science. Understanding and managing complexity is of critical importance if we are to find ways of solving environmental challenges such as global warming, and if we are to build societies that do not destroy themselves through conflict and war. Stephen Hawking said that "*the present century will be the century of complexity.*" Heinz Pagels was more specific: "*I am convinced that the nations and people who master the new sciences of complexity will become the economic, cultural and political superpowers of our century.*"

In physics we reach a critical point when a series of conditions – with decisive impact on the system – have the same intensity. They are temperature, pressure and density. In economy there are four fundamental things:

1. Capital (investments);
2. Energy;
3. Trade and commerce;
4. Labour force.

So, what would be the most reasonable policy expectation about the NGE? Eliminating the carbon gas emissions inevitably implies higher energy costs and slower growth. There is no miraculous economic boom. Behind the shortages (energy, transport, semiconductors) there are deeper forces which can stay even for a long-term period. Green alternatives are not solving the problem of shortages. On the contrary. That

shows, among many other things, the new complexity of global economy. The NGE is not about a bright future. It is about selecting a positive rule among many possible rules, a rule that indicates a positive behaviour of the global economy. *Green* should transform itself from truism into beating reality.

Let's take the hydrogen-fuel issue. The cost of producing massive amounts of hydrogen from renewables is nowadays five times greater than from natural gas. Everything meaningful should be a combination imposed by complexity. For example, kilowatt-hour produced is not equal, either in terms of negative consequences, or of costs.

1. From what source of energy is hydrogen produced?
2. When is it very useful to produce hydrogen, with zero or minimal negative consequences and low cost on the market?
3. What kind of storage of electricity is beneficial to the investments in hydrogen production?
4. Can hydrogen replace the classical sources of combustion in steel production and other industrial activities? (Hydrogen can be pressurized to be consumed in transportation but it can be liquefied only at -253 degrees Celsius)
5. How large would the necessary stimulus to supply hydrogen be and how unprepared would the markets for such a move be?

Incumbent technologies (not the black ones, but the grey ones) and the financial constraints of governments could represent a major obstacle.

An NGE is already coming but being a complex system means going even a little off balance and if risk having it tear apart. A clear example today is the price surge of the global shipping of goods.

Under the WTO rules, the average global tariff fell between 1990 - 2017 by 4,2%, but for developing countries it fell even more: India 51%; China 28%. The system supported an explosion of global trade as a share of global gross output from 30% in the early 1970s to 60% in the early 2010s.

The international commerce received a great boost from the radical reduction of transport costs and also stability, meaning predictability. Reduction in uncertainty was so important. Today *free trade* is not a mantra anymore. One

reason is the pandemic associated restrictions, but another one is political, related to national protection of inefficient firms. The question appears once more: protecting national firms makes the country as a whole more resilient to shocks?

As developed and militarily powerful states promote, sometimes aggressively, their national big companies (especially industrial), what can the less developed countries do in order to keep up with the general nationalistic trend? *The Economist*, October 2021, stated: "In the global economy, power increasingly trumps rules".

NGE is revealing perhaps, among other energy related solutions, an era of electricity becoming a *tradeable commodity* thanks to connecting power grids. Matching supply and demand by transferring electricity across distance. Undersea cable-lying is nowadays easily feasible, with advanced technologies, even at depths below 1200 meters. There is an estimation showing that until 2030, 72.000 km of cables will be laid under seas. Another project is also very promising. Before 2030 energy islands (the first one is in the North Sea), with lots of different technologies in one space: wind, battery, hydrogen, connected by cable with one or two or more countries. And size is a crucial factor when returns tend to grow exponentially in time. Remember, we are in the *Exponential Age*. Be exponential or bust.

By mid-century the world will need to completely remake its energy system and still to face the same crucial issue: to grow again as the demand for improving living standards will continue to manifest itself as it is today.

Redesigning energy markets is possible and very much needed. Bigger safety of the nuclear plants, big reserves not only in gas but also in battery storage and hydrogen are all very near or sufficiently near to technological completion. Climate summit outcome in Glasgow these days shows that the world is already falling behind on pledges (to reach carbon -zero emissions) that were never enough to begin with. Nuclear power needs to be reconsidered as a lot greener than gas. Nuclear energy is crucial as a complement to renewables. Indeed, nuclear provides always available power when renewables are naturally restricted by the lack

of wind or sun. It is an ambivalent connection. There is also an important advantage: it has a small footprint. Less than 1% of the solar or wind needed. Jean Monnet wrote more than fifty years ago: *"approaching our atomic future separately would have been insane."* The present available resources are, in general economic terms, more valuable than future resources. Having resources now means that we can or should expand our opportunities. This is simple economics, yet quite complex at the level of the global economy. The present command of resources is one of the most sensitive issues on the global stage. What stays unchanged when the economy is subjected to symmetrical transformation, i.e. transformations which do not alter the whole validity of the system? (in physics, validity is expressed in the fact that the appearance of the object is not changed). The obvious answer is: **cooperation, interconnectivity and trade**. We speak a lot about transitions in the global economy. Therefore, we are compelled to speak about some critical points and order parameters. Global economy should also be based on continuously expanding and charging towards the frontier of innovation. Governments and businesses working hand in hand make the economies more innovative.

In a disordered phase of transition, the parameter of order is zero. But, while asymmetries are inevitable, global disorder is not. Even if abnormal behaviours occur, signalled by critical thresholds, patterns do emerge in the long-term.

Examples teach us to organize the multitude of objects in classes. But how many examples do we need in order to extract a rule of certain architecture of the set (system)? It is clear that it all depends on the architecture.

Now, what would be the architecture of the NGE as a system? Intuition, the talent to accidentally discover something true and powerful have their important place. Umberto Eco, in his essay *"Serendipities,"* expressed this firmly: *"We should rely on a criterion of truth. But if I were to choose it too dogmatically, I would risk ending my argument at the very moment I begin it."* And he quotes Dante (*"Paradise,"* XXVI): *"For no product of human reason, from the human taste for always having something new... is ever stable."*

While the science of climate change is today firmly established on powerful truths, the final outcome is not necessarily a simple extension of present-day trends. We are compelled to produce more with less. How? By learning from nature and miming nature.

We are more and more, in some respects again, living in a world where cooperation is challenged by the power relationship or the standing forces. But, let's remember that the functioning of the economy, along with the functioning of the government and the social institutions, depends eventually on our mutual ability to secure cooperation. Without working procedures to induce cooperation, we cannot enjoy the benefits of civilization and of the formidable technological progress. All discussions on global cooperation should be rooted in and growing out of convictions, i.e. out of what we believe to be true, important and useful. Global cooperation, if it is to become a reality, is about shared convictions. Indeed, we have no option but to act in the presence of uncertainty and often that means that a better situation could be simply an unattainable one. And we should, much more than now, resort to diplomacy as a global tool to cope with global uncertainties.

For bibliographical references please address the author.