Is Malfunctioning US Democracy Responsible For Climate Change? An Interview With Graciela Chichilnisky And Heikki Patomaki

Heikki Patomaki

As the climate change crisis continues unabated, it is becoming increasingly clear that the absence of global governance is a major factor in our failure to take necessary action for protecting the future of the planet. But an equally significant factor behind this failure is the dysfunctional state of the American political system as the global superpower's elected officials continue to deny the global warming phenomenon and to insist on a business as usual approach vis a vis the environment in general and climate change in particular — in spite of the fact that the majority of the American people have a different view on the matter.

To what extent is the absence of global governance and the malfunctioning US democracy responsible for climate change? What will it take to turn things around and rescue humanity from an unmitigated disaster of its own making? Can technology provide a way out? These issues are debated below in a joined interview with two leading scholars: *Graciela Chichilnisky*, a world renowned economist and mathematician, Professor of Economics and of Statistics at Columbia University and Visiting Professor of Economics at Stanford University), and a leading force in the climate change battle (architect and author of the Kyoto Protocol Carbon Market, CEO and cofounder of Global Thermostat), and *Heikki*

Patomaki, Professor of World Politics at the University of Helsinki, Finland, and a leading authority in the field of global governance.

J. Polychroniou and Marcus Rolle: Climate change has emerged in early 21st century as the most critical global problem, although there still continues to be plenty of denial and inexcusable political inertia across the globe. In this context, to what extent is the difficulty of addressing climate change a problem related to the absence of global governance?

Heikki Patomaki: Global governance in this field is not entirely absent, as witnessed by the Kyoto Protocol and Paris Agreement, but it is seriously lacking in many important ways. A key reason for why proper global governance – or government – is needed is that individual state-actions and world markets are often poor in preventing unnecessary, unneeded and unwanted worldwide developments from happening. World markets and separate states may generate economic crises and downturns or global warming or other unsustainable developments. Without legitimate and well-functioning common institutions it is also difficult to take action against underdevelopment, uneven industrialization or growth, or global accumulation of privileges and power – all of which may also be self-reinforcing processes in the absence of proper countervailing responses. Moreover, these processes can also trigger and strengthen conflicts among states, which may lead to securitization, even to arms-race and wars.

We can talk about reflexive self-regulation when knowledge about the way the social systems – including the world system as a whole – function is applied recursively in interventions that aim at avoiding unwanted or achieving desired outcomes. But what is unwanted or desirable is always an ethico-political question. Not only are different anticipations about the possible and likely futures involved in the politics of climate change, but so are assumptions concerning justice or the extent to which either actual or administratively created simulated markets can regulate themselves.

Graciela Chichilnisky

Graciela Chichilnisky: Globalization emerged after World War II fostered by the Bretton Woods Institutions that were created in 1945: The World Bank, the IMF, the WTO. They provided governance of the world economy for the first time in history. The United Nations and its various organizations emerged in that same period, and offered diplomatic and political governance. But by their own design, the Bretton Woods institutions shaped *the world economy,* and, also by design, they were dominated by the United States, which emerged as the sole economic power after the destruction caused by WWII. It is not surprising, therefore, that the main obstacle for the global governance of climate change originates in the USA — in particular in the US Congress, which seems to be out of step with the American people. Economics, indeed industrialization as fostered by the Bretton Woods institutions and the USA as the chief supporter, is deeply anchored at the source of climate change. The Bretton Woods organizations enforced an economic model based on industrialization with deep and extensive overuse of natural resources of all types and particularly of fossil fuels as a source of energy. The world's resources were extracted by developing nations and exported at low prices and overconsumed in the industrial nations. Climate change is a physical fact, but its origins are economic. There is nothing that can be done about climate unless we change our prevailing economic models and institutions including the overuse of global resources such as water, air, biodiversity, and fossil fuels. These are the economic factors at the source of the problem: the governance of the world economy we have is forcefully imposing a pattern of economic growth – and defining economic progress – in a way that may have been possible a hundred years ago but is no longer feasible now. Economic progress as defined by the

Bretton Woods institutions will in all likelihood lead to catastrophic climate change and even to the extinction of the human species, destroying globally the sources of clean air, drinkable water, biodiversity, and a stable climate that are our basic needs for survival. We need to change the global governance of the world economy for our species to survive. The United Nations governance is anchored on the concept of nation states –it uses a "one nation one vote" principle, while the Bretton Woods institutions use "one dollar one vote", governance is determined by the dollar amount that a nation controls. Nation states are a relatively new concept in human history, and there is nothing that a single nation can do by itself to avoid the worst outcomes of climate change which is a global phenomenon, since CO2 concentration is the same everywhere in the planet, whether it is measured in New York, in Beijing, in Madrid or in Buenos Aires it is always the same. Each continent has enough fossil fuels to cause climate change by itself, affecting the entire world, Africa could cause trillions of dollars in losses to the USA, for example, just by burning its own coal. The issue is global and cannot be resolved by any single nation: it is truly a global issue and our global governing institutions are not appropriate for the challenge. Lord Nicholas Stern said that Climate Change is "the biggest externality in the history of humankind" and yet our economic governing institutions are based on markets for private goods that completely disregard externalities. We need new global governing institutions and a new economic discipline focused on internalizing externalities in order to face the climate challenge. This is the global carbon market I designed and wrote into the Kyoto Protocol achieves for the atmosphere. Traditional economics with private goods and private markets, with governing institutions based on nation states and private market values do not make the cut.

J. Polychroniou and Marcus Rolle: The political economy of climate change is a newly emerging field, yet it's epistemological foundations seem to rely heavily on traditional approaches to addressing social and economic problems, which essentially means that it relies heavily on market-based solutions even when climate change represents the biggest market failure (as a negative externality) in the world. What's your view about market-based solutions to combatting climate change?

Heikki Patomaki: We live in a neoliberal era. Neoliberalism is a program of developing and resolving problems of human society by means of competitive markets. This ideology in turn is based on a discourse of modernity that

presupposes atomist egocentrism, incapacity to understand wholes, abstract universality, lack of reflexivity and a number of other problematical assumptions. This worldview is more part of the problem than a solution to it.

The system of emissions trading means privatization of an aspect of the atmosphere. In economic theory, the idea of privatization as a solution to environmental problems is associated with the Ronald Coase and the Chicago School. The legal creation of property rights is supposed to enable efficient markets and contract mechanisms to function. Neoliberal thinkers believe that this should gradually solve the problem of climate change, although it may of course be admitted that past emissions may have delayed effects, or that for each state, there is a temptation to free-ride by allowing their firms off the hook, in order to make them more competitive.

In the cap-and-trade system some countries and firms can reap unearned profits by selling excess greenhouse gas allowances, depending on how those allowances are organized. Thus the cap-and-trade system creates a perverse incentive to be as polluting as possible during the initial assessment measurement, and a follow-on incentive to lobby for maximum numbers of permits by claiming for contingencies etc. This may co-explain the surplus of certificates and tendency for the prices of emission permits to decline.

The cap-and-trade system includes also trade with various financial derivatives of the certificates. Like speculative finance more generally, this encourages the search for quick profits and reinforces short-term temporal horizons. In the secondary markets of pollution permits, ecological sustainability appears as a secondary concern. What matters is money-making. Given this orientation, it is no wonder that the profit-oriented carbon trading has been liable to outright corruption. Apart from cases of fraud and bribery, abuses of power, and other conventional forms of corruption, as a UNDP report explains, “corruption in this sector has also taken more original forms, such as the strategic exploitation of ‘bad science’ and scientific uncertainties for profit, the manipulation of GHG market prices, and anti-systemic speculation”.

Graciela Chichilnisky: Capitalism is an ever changing force, whether it is viewed as a God or as a monster. It is always changing. Using its own internal engine of change, it is possible to evolve capitalism by creating global markets for the use of the global commons: for example, the atmosphere. This is the UN Carbon

Market. Water markets and markets for biodiversity have the same objective and the same capabilities for water and biodiversity which are critically endangered global public goods on which our species depends for survival. These are new markets and will provide different market values for the global commons, for example giving enormous value to clean air, clean water and a thriving biodiversity. Therefore, once these new markets are created, optimizing GDP acquires a different value. GDP is the sum of the *market value* of all goods and services produced by the economy and acquires then a completely different definition, one where economic progress is consistent with human survival and the satisfaction of basic needs, a concept that I created in the mid-1970's in the Bariloche Model of Argentina. Basic Needs were voted and adopted by 150 nations at the 1992 Earth Summit of Rio de Janeiro as the cornerstone of Sustainable Development: satisfying the basic needs of the present without depriving the future from satisfying its basic needs. It is key to understand that markets for the global commons are first of all based on limiting the use of air, water and biodiversity globally, which is needed right now. Without mandatory limits, or property rights, markets do not work. Some people are against the carbon market for philosophical or ethical reasons, but this is a complete misunderstanding of what the carbon market means, what a market for water or biodiversity would mean. Markets cannot exist without mandatory limits on the use of air, of water and of biodiversity, nation by nation, and globally. Scientists agree that we need such limits. The critics of the carbon market do not argue with limiting the use of the atmosphere – which is needed before any market can operate. So what is the argument? The argument against the carbon market appears to be a misunderstanding. The argument is against the trading of rights to emit, which is the carbon market: but there is no argument from that side on the limits on emissions that are mandatory, nation by nation and global, and are sustained and implementing globally by the carbon market as is required by the scientists of the IPCC (UN Intergovernmental Panel on Climate Chance, the global scientific authority that was awarded the Nobel Peace Prize for its work on Climate Change). The more a nation goes above its limit, the more it has to pay per ton and in total for doing so, to the point that it cuts where it hurts: in the pocket or economics of the nation. This is not a simple economic transaction: it hurts to go above one's limit to the point that a nation could go bankrupt if it did. And it could lose its economic viability and therefore its political structure. In addition, the *carbon market is not a cap and trade system*. Yes: the carbon market is not the same as cap and trade. It is a market for user rights on a global public

good – the planet's atmosphere – and therefore the initial distribution of endowments must favor lower income nations to reach an efficient market solution. This is new and different – certainly it is not even contemplated by "cap and trade" systems like the Chicago SO2 market. In practice, within the Kyoto Protocol this became the "Clean Development Mechanism" that has transferred over $120Bn to developing nations for clean technology projects since 2005, when the carbon market was ratified and became international law. So the creation of new markets for the global commons (for the atmosphere, the hydrosphere and the biosphere) embodies a profound economic change, a change in the way we relate to nature and in the the value we give to humans and their survival. Is it possible that capitalism based on new property rights on the use of the global commons, as explained here, will change capitalism from within? Yes, this is possible. We already created the global carbon market and it is international law since 2005, the market I designed and wrote into the Kyoto Protocol, and this carbon market has been trading $175Bn/year as of 2012. And it is based on carbon emission limits, nation by nation and globally. According to the World Bank, the carbon market nations have reduced since their emissions by about 30%, while the others increased their emissions since the carbon market became international law in 2005. We could do the same with water and biodiversity. Wait: I don't mean "we could," I mean "we must". If we don't value water, air and biodiversity, which are goods needed for our survival, our species will not survive.

J. Polychroniou and Marcus Rolle: The Kyoto Protocol was the first major effort on the part of the world community to tackle the problem of climate change. Does it remain a viable climate change policy for the 21st century?

Heikki Patomaki: The Kyoto Protocol is far from a satisfactory solution to the 21st century problems. The 1997 Kyoto Protocol sets carbon dioxide emission quotas for countries. Quotas and caps can be seen as fixed, as they often are, but the Kyoto Protocol includes an emissions trading scheme that allows actors to trade their commitments. In other words, this system creates a market for carbon dioxide emissions, for a type of pollution. This has manifold moral and political implications. For instance, emission trading undermines the sense of shared sacrifice necessary to future global cooperation on the environment, while also encouraging an instrumental attitude towards nature.

The second Kyoto Protocol commitment period applies to emissions from

2013-2020. This system is far from being all-inclusive. The countries with binding targets in the second commitment period comprise only the members of the EU and a few other European states, such as Australia and Kazakhstan. Many of these countries are committed to reducing, by 2020, their emissions to 80% of their 1990 emissions. A problem of the second commitment period is that between 2005 and 2012, a number of countries saw their emissions cut by more than they had promised, so they now have a surplus of emissions permits. This was mostly because of the fall of industrial output due to the global recession of 2008-. If these emission permits were carried over into the second commitment period, it could render the whole exercise virtually pointless, as the extra permits would allow countries to continue emitting. Under the amendment "3.7ter", however, many of these permits will be cancelled by 2015. The second period can thus imply some new reductions in emissions, but encompasses only the EU and a few other countries.

By summer 2016, 66 states had accepted the Doha Amendment, while entry into force requires the acceptances of 144 states. Of the 37 countries with binding commitments, 7 have ratified.

Graciela Chichilnisky: Yes, it does. It's structure is working fine, but the limits on emissions that it harbors in its Appendix, nation by nation, must be extended to all nations and in time. Otherwise the carbon market cannot work. The carbon market trades rights to emits, and without limits there is nothing to trade. This is why the Paris Agreement has been called a "fraud" by James Hansen, the father of climate change science. The Paris Agreement has no mandatory limits. Can this be done? Can emission limits be successfully imposed? Definitely. Kyoto did it in 1997. As we saw October 14th 2016 at the UN climate meeting in Kigaly, Rwanda 170 nations are willing to cooperate and made HFC emission limits mandatory (they extended the Montreal Protocol to encompass HFCs, which did not require US Congress approval) and HFCs are greenhouse gases. So the carbon market can thrive and produce the global change in values that is absolutely needed right now. The main and almost the single obstacle is the US Congress and this is explained above. However most Americans disagree with their Congress representatives on the issue, but polls show that fossil fuel lobbying shifts the US Congress' vote away from the American voter. The situation may change due to new technologies that are carbon negative and make carbon reduction possible while increasing profits and economic gains today. These could and eventually

will turn US Congress around: the only question is how long this process will take. We are clearly running out of time with the North and the South Poles melting and the overwhelming damages caused by amplified draughts, floods and hurricanes caused by climate chance, which lead to millions of people migrating and costs of hundreds of billions of dollars worldwide. It can be done: the question is when.

J. Polychroniou and Marcus Rolle: One of you (Heikki Patomaki) has been arguing in favor of a global Keynesian approach to climate change and the environment in general. What distinguishes the Keynesian approach to climate change and environment related problems from mainstream environmental economics?

Heikki Patomaki: Differences between tax and cap-and-trade systems concern distributional implications; simplicity and related administrative and transaction costs; effective scope; and dynamic effects. A tax can generate substantial public revenue that can be used for purposes of common good and global redistribution, as defined through a democratic process, also to compensate for the effects of global warming. A carbon tax is also relatively simple and can thus be easily specified in a fairly short legal text, whereas cap-and-trade proposals are much more complicated. Setting up caps and emission certificates and their trading system – an administratively created synthetic market – involves many intricate technical issues (e.g. the proposal needs to determine how allowances will be created and distributed), entailing high administrative costs. Moreover, a system of tradable permits entails also significant transaction costs to the actors themselves, because they have to search for traders, engage in negotiations, seek approval for deals and take insurance.

What is more, cap-and-trade systems can only be implemented among private firms or countries. In contrast, taxes have broader effects. For instance, a carbon tax extends to all carbon-based fuel consumption, including gasoline, home heating oil and aviation fuels. The scope of greenhouse gas taxes is thus wider and covers comprehensively different sources of emissions. A further advantage of the tax is that it offers a permanent incentive to reduce emissions, whereas caps fix the preferred amount of decrease in emission, typically a result of compromise and lobbying.

At a deeper philosophical level, the idea of a global tax is part of a global-Keynesian approach that is more compatible with environmental concerns than

conventional economics. According to the holistic perspective of Keynesian economic theory, economic developments, and especially the formation of effective aggregate demand, are seen from the standpoint of all actors and countries at once. The conditions in which actions are taken form a whole in which the various parts are dependent on each other. Thus understood, Keynesian theory is consistent with a cosmopolitan moral perspective, as morality in general requires sufficient universalizability across different contexts, concerns and interests. The aim of various versions of the universalization principle is to help in locating norms that can be accepted by different parties irrespective of race, gender, age, nationality, world-view, or even present conditions. Valid norms may, and sometimes also must, take into account future generations. When connections across temporal (and spatial) distance are robust and when the effects of activities on nature or society will be enduring, as in the case of global warming, the effects must be considered from an ethical point of view.

Graciela Chichilnisky: Generally speaking, the Keynesian approach views the aggregate demand of an economy as a public good, which makes it therefore part and parcel of economic policy. This is generally correct, although sloppy implementation can lead to very bad consequences. To br sure, Keynesianism's good will and positive hopes do not suffice. But think of it this way: a financial policy that offers high income individuals shares in new technology companies that deploy and scale up carbon negative technologies can reverse climate change and is both Keynesian and conservative at the same time. It can be done. The critical thing now, as stated in the 5th Assessment Report of the IPCC and the Paris Agreement, is to remove the excess carbon that is already in the atmosphere which will remain otherwise for hundreds of years and will inexorably lead to irreversible climate change disaster. And no, adopting clean energy and recycling positively and emphatically do not suffice — there is not enough time for that, nor for the great policy of planting more trees that is critical for biodiversity. These policies are great, but, as demonstrated by UN studies, it will take decades and beyond this century to have an impact on climate change. Moreover, CO_2 already emitted stays in the atmosphere for hundreds of years and, if not removed right now, it will add up to additional layers of carbon dioxide which at this stage will overflow the glass. This means irreversible climate change. But carbon negative technologies that can clean the atmosphere today effectively and reverse climate change do exist, as reported by KPMG and Forbes Magazine in articles and videos two weeks ago, and they can use the carbon dioxide removed or

“farmed” from the air to generate billions of dollars from the sale of CO2 for the production of beverages, food, greenhouses, plastic and other building materials, carbon fibers that replace metals, synthetic gasoline, and water desalination. I am now reciting the business model of Global Thermostat www.globalthermostat.com whose proven technology is inexpensive and flexible, modular, and farms CO2 directly from the atmosphere while transforming it into dollar bills from the sale of the materials and goods just described. Of course this can be done. We need 15-20 years at $200Bn/year which the carbon market of the UN has already traded in 2012, in just one year. The process is low-cost and profitable, so the money is only project finance. We need, for example, to build 30,000 Global Thermostat plants removing 1MM tons of CO2 per year each, which is about 150 per nation. That is all. And while Global Thermostat is a visionary leader, other technologies and firms will emerge to imitate its business model and the economy – and all of us – will be better off for that. Let’s do it.

J. Polychroniou and Marcus Rolle: The Industrial Revolution, which eventually gave rise to a global industrial civilization, was based on a fossil-fuel economy. However, the very source of energy that created a new dawn for human civilization is now responsible for the global warming phenomenon which, if it continues unabated, could begin very soon to have an immensely catastrophic impact on global industrial civilization itself by creating new sources of conflict and instability and even leading eventually to the destruction of civil society as we know it in the western world. Do you agree with this assessment and, if so, what do you consider to be the most practical and realistic clean energy systems that can be adopted in a world under complex interdependence?

Heikki Patomaki: I believe industrialization is a universal condition for humanity – it could have happened in China earlier, or it could have been postponed and happened somewhere else than Europe, but it was bound to happen at some point somewhere. We can also talk about universal political economy stages can be defined in terms of the available forces of production and sources of energy. The development of humanity so far has proceeded through three different stages:
(1) The stage of hunter-gatherers, who can handle fi re and simple tools but have no other sources of energy than their own muscles and the heat of fire;
(2) The stage of agricultural civilization, where the main source of energy is human and animal muscle, although increasingly also wind, water flows and chemical explosives are being exploited;

(3) The stage of industrial civilization, based on the work of machines operated with external sources of energy, such as fossil fuels, wind or water flows which are transformed into electricity, and nuclear power. The problem with the stage (3) is precisely is that the use of fossil fuels or uranium is neither sustainable nor renewable.

Now we – the humanity – are facing an acute crisis and must move quickly to a new stage. The main source of all energy is the sun, although also Earth's internal heat can be a source of energy. The energy of the sun can be captured directly, but it also generates flows of air and water, which can be utilized too. In addition, hydrogen is a zero-emission fuel; and heat pumps can be used to save energy. And in principle we can also imitate the fusion processes of the sun on the Earth. These are all, at least in principle, either renewable energy sources or ways of saving energy, but no human system of harnessing of saving energy is ecologically, ethically or politically neutral.

Especially under the current politico-economic circumstances, I tend to favor decentralized solutions, such as household or factory based solar panels and heat pumps, although we need to invest in any possibilities that look at least potentially promising. Consider for instance using tidal energy for separating hydrogen from water. One of my favorite ideas is, however, really large-scale solar panels in space, the building of which might require also the use of a space elevator. A major problem with these kinds of solutions is, of course, that they could also be used as weapons. A global security community is a precondition for the feasibility of large-scale and centralized solutions – and even then it is not reasonable to put all one's eggs in one basket.

Graciela Chichilnisky: We need to build a large number of carbon negative power plants, which are already operating today: there is a Global Thermostat plant at SRI in Silicon Valley that is cleaning SRI's natural gas power plant — and with the residual heat it cleans inexpensively the atmosphere from additional CO2. This is possible, and the residual heat required can come from a solar plant, so GT can produce carbon negative power plants based on solar plants, thus accelerating the new and clean forms of energy. We need to build 30,000 such carbon negative plants, each producing electricity, while removing 1MM tons of CO2 per year, which amounts to about 150 plants per nation. This is completely manageable and can be implemented in a few years, as described above, starting right now.

J. Polychroniou and Marcus Rolle: It is becoming increasingly obvious that the reduction of emissions is not enough to combat the climate change threat as there is too much carbon dioxide already accumulated in the atmosphere, thereby ensuring that temperatures will continue rising even with noticeable reduction in future emissions and other greenhouse gases. In your view, why is there little interest so far in using gigaton-scale carbon dioxide removal technologies?

Heikki Patomaki: Carbon dioxide removal is considered costly for public budgets when most parties seem keen in their attempts to cut down their public budgets. It can also be a relatively slow method, whereas the prevailing time horizon of profit maximizers and politicians tends to be very short.

The best method by far would be reforestation and the leaving of as much forest-space as possible to its natural stage (for example, the contemporary Finnish forests contain only a fraction of wood that the old forests did). But as you indicate in your question, there are also technological solutions that can and must be considered and used. The cleaning and stabilization of the planet Earth will be a costly long-term project. The good news is that from a global-Keynesian perspective, these kinds of investments can also stimulate the economy and reduce unemployment.

Graciela Chichilnisky: The reluctance is based on lack of information and the fear of large cost mammoth-like failed examples of plants that have done carbon capture and sequestration (CCS) until now. All failed. None produced CO2 at a cost that could be sold for economic value. But Global Thermostat's new technology is completely different from our grandfather's CCS ("carbon capture and sequestration") which, as I mentioned, has failed and failed time and again, costing a lot of time and money loss in the process. How different? Global Thermostat's plants are small portable and modular, not huge mammoths. Each unit is about 12'x15'35' -that is all. To build a 1MM ton plant you put together several units. And Global Thermostat ' CO2 removal cost is very low because the CO2 is farmed from air that is free and the energy used by GT is residual heat from industrial facilities that costs nothing. Free inputs and free energy explains why the price is so low. And let's not forget that CCS buries the CO2, which is what "sequestration" means, so it is all cost. Instead, Global Thermostat sells the CO2 it removes from the air to a large and hungry market mentioned above, making the whole thing a commercially viable proposition. And no additional emissions are created since no electricity is used. GT does not fall into the

electrical cars trap, which use no gasoline but a lot of electricity, which is the worse emitter of CO2 in the world.

J. Polychroniou and Marcus Rolle: One final question. Why doesn't climate change trigger the moral judgment system as do some other social issues and problems?

Heikki Patomaki: Many scholars and movements are calling for new institutional responses to the risks and threats created by the processes of the originally European first modernization that has now become global. So it is not entirely true that climate change does not trigger the moral judgment system as do some other social issues and problems. Moreover, I would stress that there is something truly unique in this reflexive response to the problems we have ourselves created. For the first time in human history, we are systematically anticipating the next 50-200 years and trying to modify our practices and institutions accordingly. We are also increasingly aware of the politics of anticipation.

But there is a sense in which your question is well taken and right on the mark. It is of course difficult to orientate toward consequences that are hardly visible in one's everyday life. This practical difficulty of learning the lessons from what is happening can easily be combined with the prevailing mythology of liberal-capitalist market societies, A basic "mythologeme" of liberal-capitalist societies of the late-twentieth century and early-twenty-first century comprises of three temporal tiers:
(i) the first tier is constituted by cosmic myths of desperation, involving the Copernican principle — "we don't occupy a privileged position in the universe" — and various narratives about how the story of humanity will inevitably end up in death, at some scale of time;
(ii) sensibilities verging on cosmic desperation are then liable to fostering competitive ego- and ethnocentric short-termism, both compatible with Darwinist ideologies; and
(iii) belief in technological progress and economic growth, providing sources of welfare and pleasure to the growing human population at least in the coming decades (i.e., at least as long as I, or we, can expect to live). All this amount to saying nothing really matters; let's have fun here and now.

Against this worldview, I would like to propose an alternative, counter-hegemonic story. It is possible to outline an alternative story-line that revolves around life

rather than death. Those real cosmic risks that are relevant in the human-historical scales of time — from decades up to tens of thousands of years — can best be addressed by means of future-oriented planetary co-operation. From a long-term perspective, it is critically important to recognize that our universe is not only physical. It is also biological and cultural, and constantly changing. The emergent layers of life and culture may gradually assume an increasingly important role in the further developments of the universe. Biological reality is multi-layered, hierarchically organized and involves interdependent functional synergies and higher-level controls, making purposive behavior possible. Complex systems of life have shaped the chemical composition and development of planet Earth for more than three billion years, setting it on a path of development systematically off its thermodynamic and chemical "equilibrium". The Earth is blue because it is teeming with life.

Since the industrial revolution, human culture has started to shape developments on a planetary scale. Thus we are talking about the Anthropocene. The impact may have been problematic so far, as shown by the mass extinction of species and anthropogenic global warming, but the role of humanity may turn out to be more life-promoting and ethical in the future. We humans are now deeply involved in the future developments of the planet. By cautiously generalizing from the experiences of the Earth, it is conceivable that, in the future, life and consciousness will play a co-formative role in our galaxy and possibly also in the universe as a whole.

Perhaps, as the well-known physicist Freeman Dyson has proposed, the gradual greening of the galaxy will become an irreversible process, in which we are playing a role. The expansion of life over the universe and its evolvement qualitatively into new dimensions of mind and spirit would occur simultaneously. This scenario of the greening of the galaxy involves a future project for humanity; the expansion of life and culture into space may be one of the chief tasks awaiting humankind. But first we must make life on this planet sustainable in the very long run. This is the only haven of life we know so far. No matter what will happen in the future, this will remain the home for the bulk of humanity for a very long time to come. There is no escape to the space.

Graciela Chichilnisky: What moral judgment system? This sounds like a good idea, to paraphrase Mahatma Gandhi when he was asked what he thought of Western Civilization.