

Welcome to the CD-ROM of the International Conference:

"Nature, Society and History"

*Long Term Dynamics of Social Metabolism*

from September 30 to October 2, 1999  
in "Kursalon im Stadtpark", Vienna, Austria

The conference will focus on the long term dynamics of social metabolism. Therefore we will address relevant issues in six different and cross-linked symposia. To learn more about the symposia click on one of the top buttons which will lead you to the symposia's key questions and finally to the abstracts of accepted papers.

Various scientific communities will contribute their intellectual fruits to this interdisciplinary conference in order to generate insights that cut across intellectual and policy domains. For further general information please click on one of the buttons to the left.

A list of almost 150 presentations sorted alphabetically by the first author can be viewed under the presenters button to the left. There you will find the presenters, their e-mail addresses and - with one more click - conference abstracts.

Our conference CD-ROM is meant as an invitation to browse through the variety of abstracts and papers contributing to an improved understanding of sustainability problems. And if an abstract or paper attracts your interest, please stop, and contact the author directly.

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### **Our Vision**

On the threshold of the third millennium the global community faces a number of unprecedented challenges. Among these one of the most daunting is the challenge of making the planet ecologically sustainable. How can humans redirect the global ecology to achieve this unassailable goal? How can we reshape our systems of production and our patterns of consumption - our societal metabolism - to be sustainable over the long-term? How can we foster new forms of social and economic organization that enhance, rather than degrade, the carrying capacity of the earth's ecosystems?

This current ecological challenge is the contingent result of the long-term historical development of anthropogenic systems. Modern systems of industrial metabolism - encompassing material and energy flows - are also an outcome of this history. Hence, an understanding of industrial metabolism is crucially dependent upon an understanding of long-term historical dynamics..

Since the 1972 Stockholm Conference on the Human Environment, a turning point in global ecological awareness, there has been considerable progress in theoretical knowledge, empirical knowledge, policy knowledge, management knowledge, and geopolitical knowledge on the one hand. On the other hand there has been far less progress in integrating these various knowledge systems. The variety of knowledge systems has evolved often unmindful of one another, staying within their often self-contained domains of inquiry. As a result, the intellectual landscape is an orchard with trees bearing different fruit.

This conference seeks to harvest the intellectual orchard and collect its valuable fruit from different scientific communities at one location. So sociologists, environmental historians, cultural anthropologists, geographers, material accounting experts, and others are invited to bring together their special expertise, and to commonly look at the long-term dynamics of societies' metabolism.

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**International Conference:  
Nature, Society and History  
Long Term Dynamics of Social Metabolism  
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Risk, Crises and Continuities**

**On the tragedy of the commons and the evolution of political systems: a  
biohistorical approach**

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**Abstract**

How to manage the global commons in the risky next century? Garrett Hardin showed, very persuasively, that there are intrinsic difficulties in the managing of collective property systems. Unfortunately he, as most scientists from the North, did not have a direct experience on how these systems have worked in real rural communities across the world. It was easy to arrive to the well known conclusion that only private property and market trade of individual selfishness could guarantee the long term viability of human ecosystems. This is, of course, one of the basic tenets of the Northern, Western view of the world.

Then came the fall of the Wall and the end of History, nothing less. Ironically there are, there always have been, fast growing gaps in this predominant outlook. Particularly there is relevant evidence showing the incompatibility between the omnipotent Market forces and the desirable advancement towards a sustainable society. The proclaimed freedom of the economic agents results in unsustainable lifestyles which are, literally, killing the Earth. At present is hard to imagine how these are going to be limited or controlled under the capitalist rules in liberal democracies. Globalization and ecological sustainability will have to be based on different types of societal arrangements. Historically there have been two ways of setting a limit in individual rights: external authority in dictatorships and absolute monarchies (which could be expressed in the future as a form of ecofascism) or self-imposed, collectively accepted, limits in the management of local commons or the proposals for anarchist Utopias and revolutions.

The paper deals with these issues using the framework of Stephen Boyden's Biohistory. The main hypothesis are: 1) the importance of an explicit model of human ecoethology, a "human nature" approach, in understanding the current global crisis and the previous ecological history; 2) the basic role of the "technological arm" in shaping the biosphere and coevolving with political systems in the successive ecological phases, from hunter-gathering to agricultural to high energy to the hypothetical "high information" societies. Internet and the advanced information technologies are providing us with a "global brain" in the moment in which we need it most to deal with the growing uncertainties of the future. It is a question of risk, continuity and crisis. Will we be capable of making a successful, not too costly, transition? Will we be able to conciliate the needs of human nature, our nostalgia of a lost paradise, with the limits of the planet's life support systems? The future is, clearly, not anymore what it used to be.

## **1. On human ecology and biohistory**

This paper briefly presents tentative and personal ideas on subjects of great complexity and importance, but although its range is ambitious, it is based on relatively simple premises. Basically the point of view which will be supported here is that the natural history of our species can shed light on the present predicament of humanity and our prospects for the future. This is the approach of biohistory (as presented in the text of Stephen Boyden, 1987), a very useful conceptual framework in the study of human ecology.

Human ecology, or the attempt to understand the interaction between humanity and the biosphere, is an intellectual task of enormous difficulty. It deals with understanding ourselves, which is intrinsically demanding, in relation to the complex processes of natural and social systems. Of course it should be a synthetic and transdisciplinary science of a mainly descriptive character, as the possibility of experimenting with human ecosystems is very restricted. There is no unifying theory which can give it sense and the nearest we can approximate to this is by looking at it from a historical approach.

In fact, if "conventional" ecology can be defined as the study of the structure, function and history of ecosystems, human ecology is a discipline essentially based in the temporary dimension. The abrupt transformation, which is steadily accelerating, of the face of the earth caused by our species is best described as a historical process rather than through the predictive models characteristic of basic sciences.

Our species is characterized by an adaptive flexibility, the complexity of which can be appreciated simply by contemplating the diversity of cultures that have existed in recent times. But this variety, that causes intellectual vertigo (and indigestion for the social sciences) makes sense when the successive ecological roles of *Homo sapiens* are taken into account. These are relatively simple and can be described

through what Boyden calls ecological phases. Other authors, such as the well known conservative futurologist Alvin Toffler (Toffler, 1980) identify these as the periods between waves of civilization. Many independent observers have coincided with similar visions of the ecological history of humanity as a whole (Ponting, 1991). However, professional historians sometimes tend to consider such general holistic models as too simplified to reflect the complexities of mankind's history.

Human beings are designed as hunter-gatherers. We come "ready made" prepared for living in small nomadic groups that move within extensive territories consuming plants and animals that we neither cultivate nor domesticate. We are still in the process of understanding our complex evolutionary trajectory, as a branch of a family of African primates that separated from the chimpanzee barely 5 or 6 million years ago. Since our recent origin in Africa about perhaps 200000 to 100000 years ago, according to the controversial model of "African Eve" (Lewin, 1989) we have extended all over the world occupying very diverse habitats. Ten thousand years ago in the Old World and two millennia later in the Americas the Agricultural Revolution took place and everything changed: the nomadic populations settled and "cultivated the land with the sweat of their brow". The first cities appeared and societies became more complex. Two hundred and fifty years ago a new crisis, the so-called Industrial Revolution, produced technology that allowed the use of forms of energy that had been accumulated in other periods of the history of the planet.

Therefore we have three ecological phases that describe the dominant form of social organization at different moments of our relationship with the biosphere: that of hunters and gatherers, the farming phase and the "high energy society" in the terms of Boyden. Here we have simplified his original model in which a fourth phase, the early urban phase, is recognised. It could probably be considered more of a spatial subsystem of the farming phase, as it was agricultural surplus that allowed the concentration of people and goods in cities. This created the urban-rural dialectics that has continued to the present day.

Another important aspect of the historical approach is that it offers us a "story of creation" appropriate to the scientific culture of our times. Human beings are thirsty for explanations; we want our world to make sense. So, just as the myths of creation of "primitive" peoples have the mission of reconciling them with a very strange universe, the present day equivalent could well be the biohistorical approach.

To look deeper into human ecology from the biohistorical framework we think two hypotheses are relevant:

a) The importance of an explicit model of human ecoethology, a "human nature approach", in understanding the current global crisis and the previous ecological history. This field is very poorly researched and is very controversial, the false dilemma being maintained between the approaches nature/nurture in the genesis

of individual and social human behaviour. A more realistic synthesis could probably be obtained in the next decades, but it will not be easy to achieve. There seems to be a tendency in Western civilization to hide and negate the human behavioural baggage coming from our evolutionary history. This, among other factors, is a serious obstacle for an impartial understanding of what it is to be human. Such a vision is basic in human ecology as behaviour in any animal species is the vehicle for adapting to the environment. So we should really be looking at the wider terms of human ecoethology.

b) The materialistic vision of the world, characteristic of modern science, gives priority to the action of material conditions, the infrastructure of Marx, over the ideology or belief in the evolution of societies. There must undoubtedly be feedback between both types of factors but here we assume the hypothesis that the dominant aspects in the transformation of the biosphere and, as we will discuss later, of the very structure of society is the technology at the disposal of human groups. Technology widens our somatic capacity to create real sensorial and motorized extensions of ourselves, veritable "cultural prosthesis". This constitutes what we could call a "technological arm" which is the key factor in shaping the biosphere and coevolving with political systems in the successive ecological phases.

## 2. The **tragedy of the commons**

A key aspect in the management of all human societies at local, regional, and nowadays, global scale is the problem of assigning natural goods from shared commons to individuals and collectives. Garrett Hardin showed, very persuasively, that there are intrinsic difficulties in the managing of collective property systems, the model known as the tragedy of the commons (Hardin, 1968). Unfortunately he, as most scientists from the North, did not have direct experience of how these systems work in real rural communities across the world. He arrived at the sensible conclusion that we need "mutual coercion, mutually agreed upon". However, this view has been usually interpreted to mean that only private property systems and market trade based on individual selfishness could guarantee the long term viability of human ecosystems. The famous and controversial model of Hardin - characterised by some scholars as a special case of the prisoner's dilemma in game theory • can be solved at local level, as experience shows that in many cases a consensus of the communities involved has been reached on the loading capacity of the biophysical systems. So agreements are reached on operating or management rules that are controlled collectively and that allow quasi sustainable management of humanized ecosystems. Of course adequate solutions are not always reached and the collapses of civilizations in the past demonstrate the difficulty, especially at regional scale, in achieving social consensus and effective, sustainable action in the use of nature.

However, the tragedy of the commons appears to apply in all its crudeness to global commons such as the seas, the atmosphere and outer space. At present

we do not have efficient systems for controlling the selfishness of individuals, social groups or nations, that use without limit common property and produce pollution for which no control mechanisms exist. Another problem which is difficult to solve is the sustainable management of the components of human patrimony situated in private areas or under the jurisdiction of states. Among these we have the genetic material which supports biodiversity and rapidly diminishing valuable landscapes, languages and human cultures.

The impacts to the physical and chemical parameters of the atmosphere caused by emissions coming for the most part from industrialised countries • inducing ozone depletion that will continue, even after the limiting of CFCs, until the year 2050 and climatic change whose regional and global impact is difficult to evaluate - is the best example of a serious problem for which we do not have an effective solution. The successive negotiations in Rio, Kyoto and Buenos Aires show the impotence of the system of national states and supranational organizations such as the UN to agree on and to put into practice limits on the emissions that cause the greenhouse effect. Another relevant example of the misuse of the global commons is the pollution of spatial garbage orbiting the earth along with communications devices and other types of satellites. These saturated orbits will become more difficult and expensive to use when the Southern countries find themselves able to access these services. Another case which is not sufficiently recognized is the impact of the abuse of antibiotics to the defence barrier shared by all humanity against infectious diseases, with the rise of antibiotic resistant genes. Also relevant is the problem of the widespread chemical pollution with PCBs, dioxines, etc. In all these cases an individual and immediate benefit endangers the present human collective and the future generations by diminishing the natural goods and increasing our share of environmental risks. The creation of consensus and efficient actions of control appear difficult at present.

### **3. The technological arm and our role in the biosphere**

The dominant role of technology in the organization of human societies is in general not perceived very clearly, as technological advances are merely considered as "another factor" to be added to the complex world of daily life. And this in spite of the fact that we find ourselves in the moment of the most dynamic rate of cultural and technological change in history. Perhaps the very vertigo in which we are submerged blinds us from a more lucid vision of the process. However, it can be argued that the great technological leaps (such as the domestication of plants and animals, the use of metals and other progressively more sophisticated materials, the intensive use of fossil fuels through engines, biotechnology, electronics, advanced information and communication technologies) decisively transform our relationship with the biosphere and the very structure of the social relationships where they are introduced. If we add a technological element, such as, for example, the private vehicle propelled by fossil fuel derivatives using infrastructures such as tarmac roads, we do not have the

previous society "plus" this new factor: we have a completely different society and this independently of the opinion we may have of it.

From an ecological point of view this argument is even clearer. The magnitude and quality of the "technological arm" with which we are gifted in each ecological phase converts us into the equivalent of ecologically different species throughout the ecological history of humankind. For an external observer, such as a hypothetical "Martian", who had been witness to the last 10000 years in the history of the planet it would be clear that a biologically stable species has developed waves of cultural transformation which have radically changed its real ecological niche. This is another of the peculiarities of human ecology as a science: the object of study is a species which has not decisively changed in somatic, physiological or behavioural aspects, but it has changed dramatically the ecosystems in which it has settled and those which it uses - nowadays the complete biosphere. So we would have an archetype "ecological species" in *Homo sapiens sapiens* the hunter-gatherer, the tailor-made species. There is then a qualitative leap between this species and that which we can characterise as "*Homo agricola*", the protagonist of the farming phase. Then again "*Homo industrialis*" established a completely different relationship with the biosphere in quality and scale. A hypothetical "*Homo internetensis*" would without doubt be a different type of ecological species, occupying a new global niche which is still difficult for us to imagine.

It must be mentioned that the successive ecological phases do not immediately and completely replace the former ones; instead there is a certain coexistence between them. Nowadays there are hardly any hunter-gatherers, but a large part of humanity still lives in the agricultural phase. In each case the last phase is the most advanced way of interacting with the biosphere, which does not necessarily mean to say the most sustainable way, and it becomes the most economically and politically dominant. Another point of interest is that in human ecological history we appear to interact with progressively more subtle components of the physical world. We began with the progressive control of materials, including stone implements, and, in the process of domestication, vegetal and animal biomass. The Industrial Revolution is characterised by the control of energy that strengthened our "technological arm". Now we appear to be compelled to domesticate information, the most abstract and subtle component of the universe we inhabit. And perhaps to deal massively with information is intrinsically different from what we are used to, both as individuals and as societies as a whole.

It is also interesting to observe that what we could call the "imagination window" of a particular historical time is very much linked to the prevalent ecological phase. And it seems impossible to preview the future from the cultural atmosphere of one dominant phase, there is an effective dark veil for this. Hunters and gatherers had myths configuring their particular "dreamtimes", most of which have not been preserved. They possessed in many instances a highly spiritual quality. The fantasies of the farming phase were of a much more interventionist character. The typical hero could be Gilgamesh the great deforester and searcher for immortality.

In various places around the world the agrarian civilizations tried literally to reach the sky • as in the biblical Babel tower through ziggurats or pyramids. Industrial civilization builds skyscrapers and has got its own imaginative climax when men stamped on the soil of the moon. The dreams, and nightmares, of the information age are difficult to predict at present but the next wild frontier could actually be inside the human brain as much as trying reaching for the stars. We would be perhaps closing the circle and coming back to the old, eternal ambitions of sorcerers, alchemists and shamans. A whole new unexplored universe, a brave new world of heaven and hell, could be expecting us "to boldly go where no man has gone before".

#### **4. On the politics of human ecology**

If we observe the relationship between human ecology and political organization of societies, the first hypothesis from which to start is that hunter-gatherers were anarchists. This is not a risky affirmation if we consider that such human groups were nomads, they did not accumulate material possessions that distinguished some individuals from others, and their hierarchical relationships were flexible. Taking decisions was direct and collective with consensus being reached depending on experience and the capacity of persuasion, and probably with a balance of power and the use of moral authority. Although the behavioural substrata of such a form of organization remains unclear and debatable the author is inclined to consider that this primitive anarchism was more ecological than ethological. By this I mean that the natural human inclination towards selfishness, and the obtainment of individual advantages, must have been counteracted by the ecological limitations of a lifestyle that impeded the accumulation of possessions and power. As an indication that hierarchical societies can be created in this ecological phase we have the example of the indigenous people of British Columbia, the "potlatch societies", whose fairly stable supply of salmon allowed tribes to settle and the establishment of hierarchies with chiefs and slaves (Jonaitis, 1991). So it would appear that the imposition of a nomadic life was determinant in maintaining anarchic societies, the "natural" form of human social organization.

As has been shown in the field work of contemporary anthropologists for instance on Australian Aborigines and the Bushmen of the Kalahari, the way of life of hunters and gatherers was full and satisfactory (Lee & DeVore, 1968). Specifically, the concept of work as an imposed, routine activity, carried out for the benefit of others did not exist, a concept too familiar to us in the agricultural and industrial phases. The situation changed when we "abandoned paradise" and began to practise agriculture and sedentarism. We still do not know if this dreadful biblical curse happened due to climatic change at the end of the last ice-age or due to steady demographic pressure which led to the occupation of the majority of the available habitats in all the continents. Or perhaps due to a combination of both causes. The fact is that a lifestyle developed that allowed a more intensive use of the earth and the securing of a higher proportion of energy from

photosynthesis per surface area. So the population rose and complex urban societies were created with hereditary headmen, social casts and separation of professional roles.

The personal interpretation of the author is that the numerous myths of Paradise in stories such as the epic of Gilgamesh and the much later biblical tale, as well as the myth of the "Golden Age" related in the work of Hesiod and repeated by classical authors, represent the survival in the collective memory of a period of better times. Of a past age in which their ancestors did not have to work and collected the fruits of the woods in relative harmony with a nature that allowed the integration of this peculiar species of primate. In brief, the ancient paradise that we yearn for would be the world of the hunters and gatherers. Our return to this kind of life is, in any case, impossible. At the moment of the transition to agriculture some tens of millions of humans lived on the planet. Nowadays there is no place for an ecological phase which involves such extensive use of space. Only rich people can afford the luxury of imitating the lifestyle of our ancestors in golf courses or private hunting states (the original etymological meaning of the Persian word which became "paradise").

The farming phase allowed the expression of ethological selfishness, now without ecological controls, and led to numerous experiments of state societies with absolute monarchies and complex bureaucratic and military organizations. Inequality between humans increased notably and the taking of decisions was handed over to privileged civil, military or religious groups. This despotic organization, with some attempts at "aristocratic democracies" during periods in Greece and Rome, seemed to fit in with the condition of the ecological phase that required the control of natural goods such as cultivable land, water and strategic minerals. This presentation of history is, without doubt, very simplistic but it summarises the basic fact of the connection between social organization, ecological phase and the technological level of human groups. Such relationships should be studied more deeply as it is clear that the complexity of the course of history is much greater than what is tentatively outlined here.

Industrial society required new rules for the game. It does not appear to be by chance that in some of the nuclei of thought of that time • such as the famous "Lunar Society" of Birmingham • three revolutions coincided: the French, the American and the Industrial (Ritchie-Calder, 1982). The nascent ideology and the design of new forms of political and social organization were due to complex feedback from technological innovations. A society of merchants, manufacturers and technological-craftsmen was being created to satisfy a growing need for innovation to serve markets that were in the process of massifying and internationalizing. Despotic monarchies had to give way to systems of representation in which new social agents in ascension would be the protagonists. So appeared the roots of the parliamentary democracies linked to economic capitalism in the so-called free market economies. Again the ecological phase, technology and the style of social organization form a coherent whole which has succeeded in reaching a hegemony in present day globalization. The ideological

defence of such a type of society is what has led to the very premature announcement of "the end of history" by Francis Fukuyama.

The world in which we live on the brink of the XXI Century is complex and full of environmental, social and economic uncertainties. The undeniable ecological crisis is produced by impacts to the biosphere, in particular from the development of industrialized countries. This is due to predatory economic processes on the natural environment based on a logic of unequal exchange between countries that produce raw materials and others that produce manufactured goods. A logic that comes directly from the colonial era. The more and more obvious unsustainability of this model of human development is taking place at a moment in which the most probable candidate for sustaining a new transition of ecological phase is the combination of advanced technologies of information and communication. Since the end of the cold war the international scene has been characterized by the increase in nationalism and internal wars. It could be suggested that in the next century the conflict between reason and irrational impulses • such as those that sustain nationalism and tribalism, supported by powerful economic interests • will be the arena in which humanity plays out its future.

## **5. The future dilemma**

Now we return to the central question of this paper: the apparent incapacity of present social, political and economic organization to deal with distributing the costs and benefits of the impact of technometabolism on the global commons. At the present time it seems unlikely we will find real solutions to the problems we have already created. As an example of the intrinsic difficulties that exist I will mention a declaration, that to the author appeared very significant, of a representative of a democratic country, Canada, during one of the meetings of the Preparatory Committee in New York for the Earth Summit in Rio. In answer to the continuous requests by the group of least developed countries to include mention of the throwaway "lifestyles" of the rich countries in the text of the future Agenda 21, the delegate strongly expressed that the constitution of his country, as all those of the democratic world, guarantees their citizens the pursuit of happiness with no limits imposed by the state on the enjoyment of their piece of the planetary cake. So summits can be arranged on the growth of world population but it does not appear to be viable to discuss the per capita burden on the biosphere, a concept which has been expressed in many ways, including the well known image of the ecological footprint (Wackernagel & Rees, 1996).

This leads us to a complete deadlock in our capacity for global scale environmental management. As our experience on the management of local commons shows, in order to achieve a sustainable future the establishment of agreed limits on individual behaviour is required and the intervention of the community is needed to guarantee that such restrictions are respected. The present democratic-capitalist society appears incapable of carrying out this operation and not merely due to operative difficulties, but due to its profound logic,

the rules of the game that have been established in the ecological high energy phase. Only effective world wide controls on the selfishness of individuals, corporations and countries can effectively solve the environmental crisis. Real sustainable development requires the transfer of resources from the North to the South to help to cope with the increasing problems. This, to put it mildly, is not happening on the required scale. The struggle for social justice and the decreasing of inequalities are not having much success. On the other hand the role of national State, responsible and intermediary of the liberal capitalist system, appears to be eroding rapidly leaving the arena of societal debate to civil society organized through NGOs some of which are globalized in genuine "ethical transnationals" as opposed to the powerful transnational corporations. Globalization and ecological sustainability will have to be based on different types of societal arrangements. History, obviously, has not ended.

A superficial analysis of historical experience can show that there have been two main ways of setting limits on individual perceived rights: external authority in dictatorships and absolute monarchies, or self-imposed collectively accepted limits in the management of local commons or in the anarchist proposals • and limited experiences as the ones during the Spanish revolution • for the organization of society. Here I propose the idea that in the future the evidence of the crisis and the necessity for planetary scale action will require the adoption of such controls. A dilemma will unfold before us. Will we accept a social dictatorial system of organization, a form of ecofascism in which "councils of wise men" will take vital decisions for us, or will we be capable of constructing a real global democracy in which the informed decision of the inhabitants of the planet will be of consequence?

Technology will be again the key in the transition to a hypothetical ecological "high information" phase. Of all the controversial elements of globalization the newest aspect, and probably that with the largest capacity for social and bio-spheric transformation, is the apparition of the nascent "global brain", outlined in the still primitive Internet (in itself, so far, an "anarchic virtual common space"). It comes at the moment in which it is most needed to help us face the future. The new technologies can perhaps allow us to recuperate some the old paradise which we nostalgically yearn for, although of course darker scenarios can be imagined. We are arriving at the threshold where it will be technically possible to "devolve" to citizens the information and capacity to take decisions which are now in the hands of professional politicians, who usually look after the interests of the sponsors of their electoral campaigns. In the global village which we are moving towards it will be possible to adopt quickly concrete decisions of the inhabitants of the planet, which would be based on the available scientific information and the debate among the various ideological or ethical proposals about a problem. The recent campaigns of international organizations and social protest carried out through the Internet are barely the beginning of something new that is striving to be born. Also we have to consider the importance of the direct communication which is quickly being established between social and environmental groups of Northern and Southern countries.

To achieve what is natural, to close the circle of civilization, appears, paradoxically, to be the most difficult for humanity. Could we perhaps organize a sustainable ecological future through the oldest system of social organization and recreate primitive anarchy, direct democracy, on a planetary scale? Could we agree on how to fairly partake of the goods provided by the global commons?

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