SOCIOPHYSICS AND ECOPOLITICS
Reconciling Natural Problematics & Cultural Cybernetics

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Introduction

The subject of this paper correlates the content of the social system in the context of its natural environment. *Ecopolitics combines ecology and polity*: the former in its holistic and the latter in its cybernetic sense. This distinction emphasizes the interrelation and interaction between the natural and cultural aspects of public affairs.

The relevance of ecopolitics in the dawn of the new millennium stems from the increasing impact of human activities upon nature and the grave problems arising for both its subjects and objects. Politics enters this picture whenever human groups disagree as to the course of collective action they must take to control their behavior or resolve the issues related to social and physical problems.

The dilemma we are facing now is how to sustain cultural progress without diminishing natural viability, or engage in social development within natural evolution. In trying to answer that question this essay delves into the central role of political action in influencing public policy, especially as it pertains to the environment. Our thesis is that by increasing citizen participation, democracies can raise public consciousness to environmental problems, hence improving the governability of their societies and legitimacy of their policies.

As such, ecopolitics is an accentuation of the necessity and optimality of the acceptable settlement of social issues on a larger scale or longer range. This means that ecopolitics is called upon at least to appreciate and acommodate, if not retrieve and resolve, the trilemma of ongoing spatial (local versus global; parochial-planetary), temporal (immediate versus ultimate; ephemeral-perennial), and last but not least existential (physical versus social; natural-cultural) contradictions.

This essay introduces a *Sociophysics* paradigm as the best way to analyze these complex global problems and synthesize their political solutions. In order to tackle these issues, we propose a diagnosis, anagnosis and prognosis of our collective condition and evolving situation. This systematic combination of geohistorical, contemporary and futuristic methodology is a prerequisite to finding the correct therapy for our social pathology, thereby contributing to the ongoing search for an optimal ecosocial coexistence between humanity and ecology.

The following sections of this short paper cover the conceptual framework, systemic structure and systematic process of our theme, thus giving an idea of the analogic, anatomic and analytic qualities which should pervade a full study of this crucial problem.

Situational Problematics: Culture versus Nature

A central characteristic of the modern world consists in the growing predominance of artificial products over natural creatures. Due to the fantastic creativity and prosthetic productivity of humanity, our species has multiplied its power and now reigns over the planet. This accumulation of power means that we are now capable not only of deploying but also of destroying many things, including ourselves.

It is by now rather banal to affirm that the turn of the century world is undergoing a critical period of transition in which a multitude of problems is accumulating apace. Of course, such perceptions and sentiments have been expressed many times throughout history. Crises and complaints, therefore, are nothing new in the ongoing saga of men and nations.

Yet, there is something new both in the quantity and quality of present problems. For the first time in history, the world is a single supersystem; with a multitude of interacting and interdependent subsystems. We therefore live as never before, in a "global village" or "Spaceship Earth" with its plethora of attendant complex planetary problematics.

The uniqueness of our era is marked by a prevalence of cultural over natural problems. Fast changing technical innovation in contrast to slow moving natural evolution, is at the root of most social problems which now multiply faster than we are able to solve them, while our lead-time for making critical decisions shrinks into nothingness.

Since the number and weight of our problems has grown beyond anything known previously, their novelty and complexity are taxing our capacity to understand and manipulate them. It seems that current events are becoming too large and are moving too fast for us to grasp, let alone control. Human actors and institutions thus appear increasingly diminutive in comparison to the cascade of critical events swirling around them.

Although mankind has always been at the mercy of chaotic forces and natural disasters, this is the first time our own actions have reached such extent and magnitude as to overshadow the problems posed by nature and chance. Science and technology have advanced to the point where they seem to have taken a life of their own, moving by their proper momentum, almost out of control. What is worse, many of their toxic syndromes have neither been foreseen nor intended; hence, their repercussions upon our individual and collective life are both dramatic and traumatic.

Theoretical Sociophysics: Cultural-Natural Metaphors

In trying to understand the momentous phenomena of our times, we need a theoretical perspective which can expose and explain them. Among the many theories and ideologies competing for such task, we have chosen Sociophysics as the best candidate whose basic traits we now outline.

Sociophysics recognizes the inherent isomorphies between natural and cultural systems, emphasizing formal metaphors between them as the best way to understand and appreciate both. Our paradigm involves the essential analogy between mental, social and physical systems; hence their problems fall into conceptual (inconsistencies), cultural (oddities) and natural (dysfunctions) categories. Many key notions (metabolism, entropism, parasitism) apply similarly to different realms (physiology, biology, sociology, technology). Consequently, such interdisciplinary holism can handle problems in one level by solutions in the others.

This approach constructs general standards and particular indices assessing the quantity and evaluating the quality of ecosocial life. Sociophysics thus measures the material components of human societies by the ratio of their biomass (fauna + flora) and technomass (constructions + commodities). More significant than GNP, for example, sociomass is a better index of the primary condition and composition of any society.

In addition to weight, other significant indices are those of social density, pressure and temperature, because they measure an apparent systemic state at a particular time and place. Social density not only measures population per unit area, but also its possessions and creations. Similarly, social pressure and temperature measure the impact of social forces or working energy and the heat motion they produce. The more people occupying a certain area and the more energetic they are, the greater their pressure against each other, as well as against their environment.

Finally, other more intangible indices can measure social essence rather than substance. The amount of information and communication indicates the quality (subjective valuation) of social dynamics, just as matter and energy do for the quantity (objective condition) of physical systems.

In exemplifying the general Theory of Sociophysics in this particular case, we proceed to perform a "human condition assessment in the global system". This provides a test by which to judge the efficacy of our theory. It is our primary thesis that sociophysics is best suited to explain the statics-dynamics-dialectics of the nature-culture-nurture interfaces. Thereby, we expect to understand and even undertake to resolve our multiple ecosocial problems in a most effective manner.

Ecopolitical Cybernetics: Controlling Social Impacts

Paradoxically, the plethora of problems does not imply a paucity of solutions. On the contrary, there are many but contradictory answers to the few questions that we are able to pose. Therein lies our central social issue: people disagree not only on what problems plague the human condition, but on what

are their best solutions. Thus public opinion differences and policy disputes make effective and efficient collective decisions and concerted control very difficult, if not impossible.

Obviously, what we need are better ways of resolving political issues as well as solving technical problems. Ecopolitics can contribute to this arduous and continuous task by recognizing the statics and dynamics of sociophysics and emphasizing the dialectics of social interaction as the prerequisite to a legitimate democratic governance.

As the social process of conflict resolution by dialectical means, politics is the consummate civic act of humanity. Unlike other methods of unilateral problem-solving, politics does so consensually by consultation and negotiation of all those involved. It is thus the most moral as well as civil way of public policy making.

In an era of increasing ecological problems and sociological issues, ecopolitics combines our concerns for both natural dependency and social democracy. In doing so, it exposes and explains the critical problems facing people, as the first step in understanding the pathology of the human condition. What we can do here then is outline the salient points in such presentation and clarification of the necessary and sufficient dimensions of our current global ecosocial situation.

This attempt relies on six fundamental parameters which contain the most important points we should know about our worldly existence in its earthly environment. Accordingly, our problematic condition must be: operationally defined; contextually situated; temporally dated; subjectively specified; functionally explained; and potentially treated.

This sixfold objective corresponds to our statement of purpose, which is to perform "a human condition assessment in the contemporary global reality". This broad undertaking responds to the most fundamental aspects of subject-purpose-method of our topic.

The next three sections analyze these existential aspects of the contemporary world by constructing its basic system model, proposing a suitable method of assessing its problematic condition, and outlining the process of its resolution.

Systemic Typology: Concentric Sphere Model

Like General Systems Theory, Sociophysics regards reality as a number of units or atoms connected by various relationships. Here, the principal units are human beings, tied together by many intersecting relations into large and small groups which combine in various ways to form social systems, coexisting and interacting within the natural environment.

Systems may be classified into three general types and illustrated as concentric spheres: the innermost *egosphere* contains human beings as its anthropocentric core; the middle *sociosphere* envelops man as a social animal; the outer *ecosphere* includes everything else as their environmental periphery. These three broad distinctions will then serve as our primary schematic map, also depicted in the following continuum.

Person		World		Earth
PSYCHOLOGY >	———	< SOCIOLOGY >	———	< ECOLOGY
Nurture		Culture		Nature
Element		System		Environment

This existential classification divides our subject into the broad personal social and natural realms. Everything falls into one or another of these categories, whether it involves our internal (conceptual) mentality or external (material) reality of either cultural or natural character.

At the central cultural level, we encounter situations among people, rather than within them. These interpersonal relations and behaviors are in the heart of social reality and involve both the psychological and ecological realms at each end. This particular study is primarily concerned with the interface between culture and nature, where our main ecosocial problems are to be found.

Undoubtedly, there are many such problems in the contemporary world, from depletion to pollution. Their number, of course, depends on what categories and levels of abstraction or aggregation one uses. Whatever their quantity or quality, what is important is that they are recognized as such and dealt forthwith.

In order to do that, we must distinguish them according to certain criteria, the most fundamental of which are their space and time coordinates. These geographical and historical aspects tell us if a problem is local, regional or global, as well as if it belongs to past, present or future, thus situating its proper spatio-temporal context.

Geographic Topology: General Globalization

All beings and things take place somewhere. Whether, large or small, systems can be situated in a certain place, far or near, and thus be located by space and size. These two measures may be ranged within a continuum whose extremes are *micro* and *macro*. Towards the micro end would be found individual and local things, whereas towards the macro end are global and universal ones as illustrated below.

Local			Regional		Global
MICRO <———		———>	MESO >	———	< MACRO
Parochial	Provincial		National	Continental	Planetary

Evidently, this topological range uses the same conceptual frame as the previous ontologic classification. We have retained this uniform trinary taxonomic scheme to facilitate comparison and symmetry. Accordingly, we classify our geographic reality within three main areas: local, regional and global.

Local things or events take place in relatively restricted areas, all the way from a neighbourhood to a city or county. Within this range are found individuals, families, communities, tribes, or combinations of them. At the next level of magnitude are located regional systems involving larger nations, continental alliances or trade blocks. The components of the first, second and third world respectively would be placed within these areas. Finally, at the highest level of generality are global systems or issues involving mankind as a whole. These could be transcontinental relations, interregional institutions or planetary organizations.

Sociomass, including human populations, is clumped in certain regions more than in others. This agglutination is due to varying social forces acting upon different bodies. When social relationships are long and strong, they form persisting social structures. These institutions create and maintain lasting bonds among compatible people who gravitate to them. In this way, societies are divided into various inclusive and exclusive groups, tribes, classes, which compete and cooperate with each other and their natural environment.

The increasing interdependence of the world makes all these spatial levels and geographical areas more interrelated, both horizontally and vertically. This globalization causes serious frictions and conflicts, since the scarce natural resources and artificial products desired by everybody are unevenly distributed on the planet.

Historic Chronology: Cultural Acceleration

Social systems exist in time as well as space, so they have a certain historic life-time, measured from years to centuries. Some societies last a longer and spend their time differently than others. Like organic, social systems have memories of their past experiences which influence their present condition and affect their future plans. All together, these diachronic indices give a good idea of the particularity of a society in the overall scheme of things.

Since events are temporal happenings, they can be classified on the basis of two criteria: timing and duration. The former tells us when something happens and the latter how long it lasts. Obviously these vary in both these dimensions; so we can construct two continua to measure their occurrence. The first one distinguishes three major periods:

	Memory		Imagery	
PAST >	———>	PRESENT >	———	< FUTURE
HISTORY		ACTUALITY	POTENTIALITY	

Nevertheless, not all things come and go; some remain with us for a long time, even forever. Their lifetime, therefore, varies from quite short to very long. On this criterion, they may be divided into three main types: ephemeral (temporary, momentary or incidental); periodic (recurring, cyclic or repetitive); and eternal (perennial, endemic or inherent).

Real systems, of course, may straddle these categories in various ways. Certain phenomena which were thought of as obsolete may rise again to haunt us. Civilizations which are considered eternal may disappear with changing circumstances. It is not easy to say which are inherent in the human condition and which are merely incidental.

Yet we must be able to distinguish between passing and lasting things, be-

cause they should be treated differently. Natural evolution is much slower than social development, especially now by the acceleration of history. Similarly, traditions are much more difficult to change than fashions and popular ways of life are notoriously impervious to alteration.

The great revolutions of macrohistory: Agricultural, Industrial, and Technological have transformed humanity from its simple pastoral stage ten millennia ago to its complex post-modern one presently. Along with these accelerating historical changes have arisen new ecosocial problems much faster than our capabilities to solve them. It behooves us then to recognize these changes and improve our proaction to them.

Human Sociology: Anthropocentric Naturalism

In addition to its place and time, a system requires certain components and connections. As we mentioned, the principal elements of society are human beings whose experience or observation plucks reality out of its quantum uncertainty. When observed by consciousness, reality appears to be material, but without conscious subjects, there may be no real objects.

On this anthropic assumption that we are the protagonists on the world's stage, our actions affect not only ourselves but everythng else. Since the impact of these actions becomes socially significant only when it is perpetrated collectively, we focus on social system dynamics as the center of our concerns.

As defined here, human societies are composed of people plus their natural possessions and artificial creations. These living subjects and inanimate objects are structured in various ways and function to promote collective economic, cultural, political values.

The economy provides the infrastructure and metabolic function of the social system. Its primary sector (farms, mines) extract or cultivate natural resources, its secondary sector (factories, studios) transform or convert natural resources into finished commodities, and its tertiary sector (banks, shops) trade and finance their distribution in society.

Society provides the central structure which utilizes these economic products and services to maintain and perpetuate itself in traditional and innovative ways by both genetic and mimetic methods. Its various institutions (families, schools, churches) ensure the regeneration, enculturation, and education of cities and species.

Finally, the polity provides the superstructure (parliament, government, court) and cybernetic (legislative, executive, judicial) functions which lead and control the whole system in a dynamic equilibrium.

The problem here is that these social institutions operate in a much shorter and narrower scale than natural ecosystems. Thus traditional private morals and public affairs cannot handle the present globalization of geography and acceleration of history that is bypassing and overwhelming them. In this critical juncture, it is imperative to upgrade and update social institutions to ecopolitical standards, not for the sake of the natural environment and its

biological evolution, but for the benefit of human survival and the sociological development upon which they depend.

Synthetic Problemology: Ecosocial Pathology

Within the frame of that contextual perspective, our aim is to determine the human condition in order to uncover its critical or potential problems. This knowledge will show the dangers or opportunities facing us, so that we can respond to them, timely and globally.

To do this, we begin by defining "problem" as an abnormal, dysfunctional or disturbing situation. As such, it may be either an existential state or a mental condition. A problem is thus an incident creating some dissonance, contradiction, discrepancy or imbalance in a given situation. So qualified, a problematic condition is an extraordinary state which presents a potential threat to its subject.

Problems may be either objective or subjective. The former is whatever interferes with the proper functioning of a system by impeding its optimal performance, whereas the latter is anything that disturbs the onlooker rather than the system. Clearly, "proper" and "optimal" are normative criteria of systemic function, against which a problem can be measured: the more this function is disturbed, the greater the problem.

In this sense, a problem may be described as a malfunction of a system from its normal or ideal state. If something is not working as it should be, there is a problem. Thus, another way of perceiving a problem is to look upon it as a gap between facts and values; a difference between what is and what ought to be: the wider the gap, the bigger the problem.

Subjective problems are rather psychological and attitudinal, so they may or may not be objectively real. In any case, social reality involves both kinds of problems and so must be taken into account one way or another. This juxtaposition of objective and subjective conditions means that a situation is not only a "state of affairs" but also a "state of mind", since ecosocial problems obviously depend on both systemic malfunctions and human perceptions.

Although problems are usually unwanted and avoided, they can often be quite functional in the development of systems. As gaps or imbalances, they present challenges and opportunities for action and correction. Without problems a system would have little incentive to progress and adapt to changing conditions.

In that sense, problems are not only unavoidable, but also necessary and desirable in an imperfect and evolving world. Be that as it may, the ubiquity of problems forces us to deal with them. We, therefore, conclude our search on the different aspects of problems with the problem-analysis method next.

Systematic Methodology: Analytic Algorithm

Systematic problem-solving should go through three phases: theoretical comprehension; political resolution; practical execution. These three activities are indispensable to any competent problemology and require a capacity to perform

various tasks, combining both theoretical and practical components. In that sense, scientific theories ultimately serve as problem-solving methods, so it is in their effectiveness that they should be effected and evaluated.

Evidently, one does not go through scientific algorithms for everyday problems which are often handled instinctively or traditionally. But, as systems become more complicated, so does the problem-solving process. Simplistic solutions to complex problems not only are ineffective but tend to aggravate an already disturbed situation. So, certain technological efforts to buffer human activities from small disturbances may make them more vulnerable to large-scale catastrophes.

Recognizing this reality, our methodology here concentrates in the primary task of theoretical understanding and proceeds in three phases:

- *Diagnosis*: current problem-identification and descriptive exposition of present actuality by discovering symptoms and measuring discrepancies.
- *Anagnosis*: historic problem-evolution and causal explanation of pathogenic etiology by chronological regression and statistical correlation.
- *Prognosis*: future problem-projection and implicative expectation of probable potentiality by scenario forecasting and trend extrapolating.

These three distinct but complementary tasks are the necessary and sufficient procedures to perform a complete analysis of any problem. Ideally, this process attempts to discern the past, present and future of a condition, which is only possible in simple deterministic systems. Of course, its application to complex systems, such as human societies, can only approximate this unobtainable goal.

Whatever its limitations and imperfections, this method should put us in a better position to undertake the ultimate task of problem-solving, which of course is an altogether different matter, to be tackled in other studies. As a prerequisite to them, this triad forms the necessary and sufficient condition for the complete analysis of any problem.

In the area of real ecosocial problems and actual ecopolitical issues, this method will define and describe our contemporary pathology, its historical causes and potential alternative outcomes. In this way, we hope to clarify any dysfunctional or unacceptable conditions and thus be better prepared to treat them later on.

Conclusion

As contemporary societies become more complex and interdependent, world affairs become more intricate and global problems more intractable. Under the circumstances, international issues are increasingly difficult to resolve by traditional means. Political decisions based on haphazard or impressionistic grounds no longer suffice to meet the mounting challenges of a dynamic world.

Consequently, what was clear and easy in simpler and slower times, becomes difficult and dangerous in a more fragile and volatile world. The global condition then can no longer be treated in the ignorant, haphazard and piecemeal ways of the past. Better models and methods must be found to

recognize, understand and treat the multiple critical situations which confront us now.

Unfortunately, the compartmentalization of knowledge has lost sight of the world as a whole, so only reactive, partial and isolated solutions are usually given. This analytic specialization and scientific fragmentation tend to create more problems than they solve, so a more synthetic approach must be added to our present techniques. A unification of knowledge requires the consilience or leading together of all disciplines, not the divergence or growing apart, as is the case now.

In order to improve the policy-making process, political institutions try to develop more systematic methods of problem-solving and conflict-resolution. A necessary prerequisite to such systematization is a better procedure for sensing, understanding and forecasting world events. Such improvement increases our capacity to describe, explain and anticipate environmental continuities and changes.

With the present critical situation in mind, we propose a comprehensive theory and method to initiate a rigorous exposition, explanation, and exploration of our global condition. This social assessment lays down the foundations for a systematic and systemic work by outlining the concept, structure, and process of social problems and answers the questions related to the nature, meaning, type, location, time, and solution of the world's most critical ecopolitical issues.

By portraying the dialectical qualities of polity and ecology alike, a complete ecopolitical study should make systematic observations, explanations and projections of the world system in its planetary environment. Thereby, it can undertake a natural problemology and cultural pathology of the human condition, thus advancing our ideal of "human coexistence in a responsible and solidary world at the dawn of the third millennium."

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