The Global Perspective; Bullets for ISI

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Proposition

Statistics play a crucial role in the Global quest to attain sustainability, but only as one system of information to be integrated with other spatial and temporal data that contribute to useful descriptions of the Earth required for a sustainable co- evolution of nature and culture.

Abstract

This paper is not a contribution to science in its classical sense. There the task of science is to describe and explain the given. It is a contribution to describe the need for information to counter threats and exploit opportunities. The task of Praxis is to use the results of science to improve the human condition.　From a scientific perspective the task of statistics is to provide us with "ex post" information to describe and explain the world, and that of the professional community to provide "ex ante" information to serve as a foundation for action to change it.

For this purpose we need to design and build one integrated system of shared information to serve both of these purposes. The GGIISS proposal is intended to demonstrate this idea. This will require the integrated system of spatial and temporal information that share one common foundation of high resolution observation of objects and their attributes in space and time.

To be really useful, the statistical system of the future should be seen as systems of attributes of these objects spatially aggregated into systems of regular and irregular tessellations to serve as a qualified foundation for the design and implementation of community action on the one hand, and the evaluation of their impact on the other.

Introduction

This is not an conventional paper to contribute to the statistical (albeit geo- statistical-) system alone, nor to that of　any other community of specialists. It is the contribution from an architect an urban and regional planner, who during a long professional life has been concerned with the information and methods required for the development of complex man environmental systems (MES) from an integrated, holistic perspective.

The paper's perspective is Global, because the author is convinced that the time has come for man to realize that we have reached a point in history where it lies within the power of man, to make or break the Earth as a fit environment for the human species.　Our problems are Global and require Global to local response.

It is becoming clear to most of us, that we are at present entering a Global age where have to develop the Earth as recent generations built and developed competing national states. This challenge calls for a one integrated system of information to describe the Earth as a MES from both- and 　 "ex ante" 　and "ex post" perspective.

The Challenge

"Hamlet:

To be, or not to be, that is the question:

Whether 'tis nobler in the mind to suffer

The slings and arrows of outrageous fortune,

Or to take arms against a sea of troubles

And by opposing end them...... (Shakespeare 1936)

1. Human species overwhelmingly successful

   (End of an epoch. From nationalism to Globalism. An Emerging Global culture?)

   Man, himself the product of Natural evolution has been so successful that he is currently challenging the very foundation for our culture of cultures; some of the critical signs are known to all(Brown 2008);

       i. Overpopulation

       ii. Resource constraints

       iii. Disruption of major Ecosystems

       iv. Global warming

       v. Etc.

2. Evolution is not what it used to be.

   (*One method required for both natural and artificial evolution*)

   Hitherto the blind watchmaker (Dawkins 1986) has   produced a world as a more or less sustainable system of natural systems.   Man on the other hand is in the process of developing a global culture that owes its success to an artificial evolution that, however, is not sustainable. It does not adapt itself to nature but threatens the prospects for the welfare of future generations. "Logos "and "Physis" are at loggerheads. To improve our prospects, we need to scrutinise the basic axioms of our culture that have led to this unholy conflict of interests. See (White 1967)

3. The   success or failure of mankind not a problem for "Mother" Earth

   ("*The wind bloweth as it listeth*")

   Although we have currently brought natural systems off balance, not a problem in the longer perspective. Our failure to adapt is a challenge to the human species alone, not to "Nature". Nature is not in the service of man. The story of human culture has at least in this preliminary stage of development emerged as a comedy, but might very well prove to be a tragedy in the end. "And even in our sleep pain that cannot forget falls drop by drop upon the heart, and in our own despair, against our will, comes wisdom to us by the awful grace of Gods." (Chorus line from Agamemnon"(Aeschylus 1977))

4. Human civilisations   are threatened with a Peripetheia[1]

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[1] The reversal of the situation in the plot of a tragedy is the"peripeteia". According to Aristotle's Poetics (Aristotle 1996), the change of fortune for the hero should be an event that occurs contrary to the audience's

(Is the comedy being transformed into a tragedy?)

The current favourable exponential growth of welfare for an exploding population has so far experienced no really challenging setbacks. However we have a lot of experience with complex systems that are pushed too far beyond their bifurcation points (Prigogine 1984). If the human culture of cultures fail to adapt, we will, not perish so at least suffer a major setback for the emerging Global Culture.

5. Man is responsible for his own destiny

(*Should we rely on the Gods or ourselves?*)

In a famous interview with "Der Spiegel", Heidegger, referring on this tragic state of affairs, famously complained "nur ein Gott kann uns retten" (Heidegger 2007).   I object to this conclusion. As long as the Gods seem to have abandoned us (or withdrawn as Heidegger would put it), we have to fend for ourselves, in the hope that the Gods will help those who help themselves.

6. Co-evolution of Man and Nature.

(*Spinoza's God single substance? (Spinoza 1996)*)2

If man is to be regarded as the cause of our current problems, he is also carries the possibility of putting things right. This however will require a change in attitude. It is probably a question of contributing to the "morphic" (that we have to adapt to) or the "enthropic" tendency (that we may contribute to). The Cartesian idea that "logos" (or the mind) is separated from, and superior to "physis" (or the body) is probably leading us astray.   In the larger perspective this is an attitude of "Man provides" that takes for granted that "Nature provides" all that is required. But then a whole new generation is aware that the Earth's resources are limited and consequently prefer a "Both - and" attitude of co-operation and co-evolution.

- This line of thought calls for the design, construction and development   of an integrated system of spatial and temporal information (GGIISS) to serve as a foundation for the development of the Earth into a   sustainable home also for future generations of   human beings. This paper tries to provide a practical response to this challenge.

Grasping the whole

The Global perspective (A Systems of Systems)

7. The Universe may be regarded as a hierarchical structured System of Systems

A system approach to the description and analysis of our world is based on the idea of hierarchies of systems, subsystems and supra- systems (the systems approach) all of which are subject to two opposing forces; the morphic (generating increased complexity) and the entropic (breaking down complex systems). It is generally regarded as practical (if not "true") to describe the universe in

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expectations and that is therefore surprising, but that nonetheless appears as a necessary outcome of the preceding actions.

2 Consider "I believe in Spinoza's God who reveals himself in the orderly harmony of what exists, not in a God who concerns himself with the fates and actions of human beings." (Albert Einstein in New York Times Magazine, November 9, 1930)

scale intervals following the 10n or "power of ten" principle3.

8. <u>Natural Systems and man as "physis". (Man as a result of natural evolution)</u>

    Natural systems like man as a product of natural evolution. All "living" systems are closed, but display different levels of awareness. Due to the development of human consciousness. Man has become godlike spearhead of evolution with the power to make or destroy the prospects for future for many species and new generations of human beings. The future of the human species on this planet rests on our ability to use our mental resources to adapt to the evolution man as a part of nature.

9. <u>Artificial systems and man as "logos". (The extensions of man the result of artificial evolution)</u>

    Artificial systems where originally designed to be controlled, managed and developed by man using knowledge and rationality (logos).   Artificial system are in themselves "open" . They should be seen as extensions of individual human beings and societies of men. These "tools" or "extensions" are assumed to be consciously controlled and maintained by human beings, but we tend to forget this and treat man-made systems like our economic systems become too complex. The danger is that they will be regarded as "natural" or "given", systems to which we have to adapt.   Business and technology must adapt to man and nature, not the other way around as the basic axioms of our current "culture" seems to imply.

10. <u>The Earth is a hierarchically structured Man Environmental System (MES)</u>

    The dichotomy between Nature and culture is decisive for the current historical situation. The impact of conscious actions on vital natural systems (on all levels from local to global) is decisive. Using the metre as a foundation the scale of the Earth spans over 7 scale intervals where $6 \geq n \geq 0$ (1metre to 10000km).

In search of a metaphor

11. <u>Spaceship Earth</u>

There are probably many solutions to our challenge, but during my lifetime, few have sounded as inspiring to a generation than he well known   architect and engineer Buckminster Fuller's spaceship Earth idea from his   "Operation manual for spaceship Earth"   . Here an excerpt from the text; "*To begin our position-fixing aboard our Spaceship Earth we must first acknowledge that the abundance of immediately consumable, obviously desirable or utterly essential resources have been sufficient until now to allow us to carry on despite our ignorance. Being eventually exhaustible and spoilable, they have been adequate only up to this critical moment. This cushion-for-error of humanity's survival and growth up to now was apparently provided just as a bird inside of the egg is provided with liquid nutriment to develop it to a certain point. But then by design the nutriment is exhausted at just the time when the chick is large enough to be able to locomote on its own legs. And so as the chick pecks at the shell seeking more nutriment it inadvertently breaks open the shell. Stepping forth from its initial sanctuary, the young bird must now forage on its own legs and wings to discover the next phase of its regenerative sustenance. My own picture of humanity today finds us just about to*

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[3] See here http://www.youtube.com/watch?v=0fKBhvDjuy0.

step out from amongst the pieces of our just one-second-ago broken eggshell. Our innocent, trial-and-error-sustaining nutriment is exhausted. We are faced with an entirely new relationship to the universe. We are going to have to spread our wings of intellect and fly or perish; that is, we must dare immediately to fly by the generalized principles governing universe and not by the ground rules of yesterday's superstitious and erroneously conditioned reflexes." (Buckminster Fuller 1971)

The Evolutionary approach (Change or Evolution)

Development; The evolutionary approach

12. <u>The Earth and its sub- systems are evolving.</u>

    Evolution as the fundamental metaphor for development. All things artificial and natural are the result of evolutionary processes. The function as Darwin machines in the sense that they have mechanisms to generate variety on the one hand and systems of selection and accumulation of knowledge and abilities on the other. This means that the evolutionary method works for both natural and artificial systems.

13. <u>This applies to both natural and artificial systems.</u>

    We must regard artificial systems as integrated systems of open in the sense that to operate they need human being to function. With human beings they form closed systems closed systems. The iterative Method works for both natural- and artificial -systems through a series of iterations (evolutionary processes "in vitro" or "in natura".)

14. <u>The principle of multilevel selection.</u>

    The principle of multilevel selection implies very crudely stated that "Selfishness beats altruism within single groups. Altruistic groups beat selfish groups". In primitive interpretation of evolutionary processes the key, if not dominating role of altruism, for the success of mankind has not been recognized. The importance of enlightened and compassionate government "by the people, of the people, and for the people" for the success of the human species is only gradually dawning upon us. Greed, without the correlative of proper government is selfish and nihilistic; it has no direction, no vision, no quest.

Methods for development

15. <u>Darwin Machines</u>

    If we have two development processes at large in the world, one "natural" and unconscious" and one "artificial" and "conscious" these two have to be pursued together, with the same "iterative" method. Evolutionary biologists use the term "Darwin machines" 4 that may be used for both the process of both natural and artificial selection.

16. <u>The (Integrated) Ecological approach</u>

    The ecological approach is based on the insight that we have to overcome the Cartesian Split between "Mind" and "Nature", and accept that the artificial must adapt to the natural evolutionary process. The Ecological approach implies the need to test all initiatives in a given field (e.g. major socioeconomic systems) according to the project's impact on all the other aspects of artificial-(man-made) and natural- systems (which includes the human species).

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4 I owe this very useful concept to (Boyd 2009) with reference to it origination (Simonton 1999)

17. The Three Tier method for the development of hierarchies of complex systems.

    Systems are, according to the ecological approach, described as hierarchies of MES

        i.   Supra- systems

        ii.   Systems proper

        iii. Sub- systems

18. Actions of natural and human origin are judged according to their impact on the system itself, its supra- system as well as its sub- system. The three tier idea implies that for the development of a system in a hierarchy require that we (at least) scrutinize the effect of our actions on the system level in question but also up in the hierarchy (on supra- systems) as well as don in the hierarch (on subsystems).

Quo Vadiamus?

Narratives as projects

19. Global Narratives as projects.

    For the Greeks the "Illiad" and the "Odyssey" where not only narratives for consumption, they where stories that served as expressions of Greek culture, their customs, language and aspirations. They where carriers, down to our day, of the overriding Greek project. French philosophers, among then Lyotard, have argued that the days of the grand narratives have come to an end. I believe that this is a major error of judgement. Now more than ever, we need to invent and develop a sustainable grand narrative for the development of a global culture and a global project.

20. A synthesis of many sources

    We need a "rhapsodein5" like Homer to stitch the bits and pieces of a framework for a global culture that we may share cross all borders, economic, religious /philosophical, natural and political. This will require a strategy like the Actant model (and method) developed by the Russian semiotic Propp and the French philosopher Greimas. What a noble challenge for the intellectuals of our time!

Action; the implementation of projects.

21. Navigare necesse est6.

    Well aware of the origin of this proverb, I prefer to use the term "navigation" in its broader sense as a response to the problem of finding ones way about. If the development of man environment systems implies that artificial systems have to adapt to natural systems, then the co-development of man and nature is only feasible as long as we know where we are going, and what actions we choose to get there.

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[5] Aristotle discusses narrative as the mode of imitation of the epic, which is conveyed to the audience by a single storyteller or rhapsode, in contrast to the tragedy, in which the story is dramatized by the speech of actors and a chorus. The poet who constructs a narrative can speak either in his or her own voice or assume the voices of different characters. (Aristotle 1996)

[6] "*Navigare necesse est vivere non est necesse*". (to sail is necessary; to live is not necessary) This is attributed by Plutarch (who wrote in Greek) to Gnaeus Pompeius, who, during the threat of severe storms, commanded his sailors to bring food from Africa to Rome.

Modelling the Earth

If you cannot describe it you cannot manage it

22. If you cannot describe it (the world), you cannot manage it.

    If it is in our interest, to strive for the co development of nature and human "culture" or man's "extensions" as McLuhan put it, we need to develop common descriptions the earth as an integrated hierarchal system of natural and artificial systems. This is of course the function of culture, to serve as a description of the world and our place and purpose in the general order of things. There is no given method for descriptions like this. We have to design a solution to the best of our abilities and change it into a Darwin machine for development.

23. The Nature vs. Culture dialectic crucial

    It seems to most critics essential that all conscious efforts to achieve sustainability will depend on our ability to overcome the so-called "Cartesian Split" between the found (res extensa) and the made (res cognitans). They form the two major subsystems that make up our "Spaceship Earth". And for which the latter must adapt to the former.

24. Descriptions of nature (the natural, the found)

    There is of course no "true" way to describe natural systems. But against the evolutionary background we suggest that nature could be described as two integrated systems. The physical non-living environment on the one hand and the living (and evolving) environment on the other. According to the DPSIR method this is the system of systems (including man as "physis") that have emerged as the result of natural evolution.

    i. Natural Environment

25. Descriptions of culture (the artificial, the made)

    There is of course no "true" way to describe artificial or man-made systems. We suggest (through the GGIISS proposal) that the artificial, or man-made, should be described in terms of Socio- cultural and Socio- economic systems on the one hand, and the physical habitat that makes up our built environment on the other. These Systems constitute; according to the DPSIR method the group of man- made systems that provide "Pressure" on the natural environment to which we must adapt.

    i. Man-made environment

    ii. Scoio- cultural systems

    iii. Socio- economic systems

The Object approach

Objects

26. Objects

    A system described according the object method consists of objects + relations between objects. Dynamic modelling requires knowledge about relations between objects and the flow of information between them. At present most models "kit of parts" static 2d object models described without relations. A crude object description could consists of:

Objects and time (Objects + Time)

27. Object Dynamics

    The modelling of objects in time is done with system dynamics. This is generally done with

mathematics calibrated with statistics (collected in time series). One very early and important effort to approach the problem of resource constraints was the report of the "Club of Rome" (Meadows et al. 1972).

Objects and space (Objects + Space)

28. Datum, Projection

We need to agree on a Global datum and projection that will enable us to display and study spatial patterns in a form that suits its purpose. In an international perspective, it would, according to the "Occham's razor" principle, be advantageous to implement as few projection standards as possible. Preferably one only.

     i.   National projections (e.g. Sweref99 for Sweden)

    ii.   Projections for a hemisphere (e.g. ETRS89-LAEA for Europe)

   iii.   Global projections (e.g. UTM for the Earth)

29. Two systems of length and area Units

In order to develop an efficient GGIISS that may be used to perform spatial analysis, the global community will need to create a harmonised point- based foundation for statistics that may be aggregated to a neutral system of spatial units. For this purpose the EFGS propose the general use of two possible solutions;

     i.   Metre-based system with a resolution down to 1m accuracy. A standard grid for spatial analysis based on 1 Km (1000m) grids

    ii.   Longitude / Latitude- based system down to a 1 arc second accuracy. A standard grid system based on 30 arc second- grids.

Object and attributes (Objects + Statistics)

30. Object attributes

Traditional statistics have been collected and aggregated for evaluation and accounting purposes, here they will serve the imitation of objects the given nad made..

31. From object attributes to Statistics

There exists a project to develop a hierarchical system of statistics that has been under development for the recent generations. The methods are twofold. Wherever it is possible, statistical systems are developed "bottom up" through the diligent work of NSI's, and where this is not possible through the development of "top down" methods using estimations based on remote sensing techniques.

32. Spatial analysis

In our day this motive for collecting information is still important, although with the dissolution of national borders it has become increasingly important to be able to map and analyse spatial patterns in cross-border situations.

GGIISS; Integrated systems of information

The Layer method

33. The Layer method

The management of MES require integrated spatial- and temporal- models. These are generally modelled in GIS systems according to the "layer" method. According to this method, all known objects belonging to the same class are stored in the same "layer".

34. <u>Subsystems as systems of layers</u>

The Ecology approach require that all actions are judged in terms of their consequences for MES as wholes and their major subsystems. How these subsystems are to be defined is not given. They could with advantage be modelled according to the following   frequently used schema:

    a. Environmental "real" systems (Modelled generally with focus on object features (maps))

        i. Natural environment

            1. Layer 1a (features)

            2. Layer 2 a (features)

            3. Layer 3......

        ii. Artificial (man-made) environment

            1. Layer 1 a (features)

            2. Layer 2 a (features)

            3. Layer 3......

    b. Human   "virtual" systems (Modelled generally with focus on object attributes (statistics))

        i. Socio-cultural systems (man-made)

            1. Layer 1a (grids), 1b (blobs)

            2. Layer 2 a (grids), 2b (blobs)

            3. Layer 3......

        ii. Socio economic systems (man-made)

            1. Layer 1a (grids), 1b (blobs)

            2. Layer 2 a (grids), 2b (blobs)

            3. Layer 3......

Object attributes and the role of Statistics

Spatial statistics

35. <u>Spatial statistics</u>

These are two principal types of layer hierarchies are important for spatial modelling of human systems (societies) with statistics.

    a. Irregular tessellations (blobs); A system of spatial statistics aggregated to administrative areas (irregular tessellation) primarily intended for accounting and benchmarking.

    b. Regular tessellations (grids); A system of spatial statistics aggregated to a standard system of grids primarily intended for spatial analysis (discovering and reacting upon spatial patterns).

    c. Shared common denominator (points); A common foundation for both systems of regular and irregular tessellations

Irregular tessellations

36. <u>Hierarchies of irregular tessellations (blobs) for accounting, benchmarking</u>

The management of the Earth (or parts of it) as a MES (system of systems) through actions initiated planned and implemented through hierarchy of public authorities from global to local. The practice of developing human societies have established a management hierarchy of administrative units spanning over roughly 6 scale intervals from Global to local.

    i.   Global system (the whole)

   ii.   Hemisphere (e.g. Europe)

  iii.   Large country

  iv.   Small country / Large country region

   v.   Commune / municipality urban systems

  vi.   Neighbourhood / smallest administrative units, e.g. census areas, neighbourhoods / urban block

Grids or regular tessellations

37. <u>Hierarchies of regular tessellations (grids) for spatial analysis.</u>

These phenomena to be managed by human agent do not follow the structure of administrative units and cannot be modelled or analysed with hierarchies of administrative units. For the description, analysis and planning of actions to counter threats and exploit opportunities a spatially neutral hierarchy of grids are used. They are structured to follow the same hierarchical structure as above:

    i.   Global (the whole)

   ii.   10000km scale for mapping whole hemisphere territories (e.g Europe)

  iii.   1000km scale for mapping large country territories (e.g. France, Poland)

  iv.   100km scale for mapping large national regions (e.g. Bayern)

   v.   10km scale for mapping communes and urban systems (e.g. Stockholm)

  vi.   1km scale for mapping neighbourhoods, urban blocks

38. <u>Coding system for grids</u>

Grid hierarchy for statistics for spatial analysis (10n/2m) according to the EFGS. A Primary grid systems consisting of 10^n grids (where $6 \geq n \geq 0$). These grid sizes are essential for defining the 6 scale intervals from local to global.

A secondary system of grids based on a two level quadtree $10^n/2^m$ (where $6 \geq n \geq 0$ and $2 \geq m \geq 0$) . This defines a more extensive series of grids; 10m, 25m, 50m, 100m, 250m, 500m, 1km. 2,5km, 5km, 10km, 25km, 50km. These have the advantage that the grids provided with (m>0 (e.g. m=2 or 250m grids)) will all aggregate up to the next primary grid (m=0(e.g. 1000m grids)). In the Grid ETRS89-LAEA system we will, in the case of both n = 0, and m = 0 , be talking about point data of the accuracy that is defined by the smallest common denominator of the system.

A Shared foundation

39. <u>Shared foundation (Point- based statistics)</u>

People live and work in houses. Models of Socio- cultural and socio- economic systems are often described based on statistics related to natural- and juridical- individuals and groups of individuals (agents). Therefore all cultural and economic activities are assumed spatially related to fixed locations with known coordinates preferably related to buildings.

    i.   Real estate units

   ii.   Buildings

  iii.   Street addresses, Apartments

These smallest common denominators are for practical reasons generally modelled as points in geostatistics. Analogue for the hierarchy of administrative units on scales below level 6 with the

highest resolution we may as in the case of administrative units add:

  iv.   100m scale for clusters of buildings

  v.   10m scale for individual buildings

  vi.   1m scale for street addresses

These smallest common denominators are for practical reasons generally modelled as points in geostatistics and may all serve as a geographical foundation for population statistics and the modeling of human systems.

Conclusions

1. A Global concept in response to a Global challenge

    Our problems are Global. We need to take Global action to do something about them.   We need to take and develop the Global perspective. A Global project, a global set of actions. Based on a realistic assessment of the current situation and realistic scenarios for the development of the Earth as man- environmental system.

2. Vision

    We need a develop a vision based on ideas to counter threats and exploit opportunities.   To formulate this in an easy to understand metaphor, to communicate the vision for all to understand. (e.g.   the Spaceship Earth idea)

3. Project

    We need to formulate an overriding project aimed to secure the survival and welfare for future generations of both man and nature.   This is a call for a global "grand narrative". In this sense cultures are no less than complex descriptions and elaborations of projects in this sense.

4. Method (Evolution)

    We need to formulate systems of actions that exploits a system of methods that work for both human "artificial" actions and that of nature. This will probably imply the use of an evolutionary method known in the theoretical sciences as the ecological method and in the applied sciences as the cybernetic or iterative method.

5. Models

    If you cannot describe it you cannot manage it. To follow the ecological approach to the development of we need integrated systems of information to describe both natural and artificial systems. For this purpose we have proposed the GGIISS method.

6. Statistics

    Statistics features will play a key role in the integrated systems of spatial and temporal information suggested in the GGIISS concept. However, they will require that future systems of statistics provide a neutral foundation for statistics suitable for spatial analysis. We need to plot the global population on km grids.

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