About Ecology in the City: an Attempt of Classification of the Political Trends

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1 ABSTRACT

The transition to an eco-compatible society is analyzed in terms of causes and reasons. At each time there is a "vision of Nature" made up of knowledge of the causes and knowledge of the reasons. There were successively the "geometrical Nature", then the "artificial Nature" and today the "sustainable Nature". The transition is long-lasting and complex because we have to pass from "artificial Nature" to "sustainable Nature". The approach is applied to the Information Theory (that is to say the contribution of Information Technologies to the transition) and the precautionary principle. In the conclusion, the topic of political ecology in the cities is evoked.

Keywords: responsibility, transition, classification, eco-compatible society, political ecologymy

2 INTRODUCTION

The mainstream in the political change today (namely, policy aimed at the transition toward an eco-compatible society) is familiar, but not "for that, known".No wonder if the process is long-lasting and complex, since we have to pass from a society relying on modernity and certainty to a society relying on the subtle "precautionary principle". One can try the notions of Reform and Revolution, but it is not enough. There are not two Rs (Reform, Revolution) but five Rs (Revolution, Regeneration, Renovation, Reform and Regulation):

- Revolution. We do not need "hope". One knows the answer of Hans Jonas in "The principle of responsibility" to the book of the German philosopher Ernst Bloch "The principle of hope". Hope is when the humankind transforms the world. But, according to another German philosopher, Gunther Anders, "we have no more to change the world, but to preserve it". According to Hans Jonas, we should consider Nature as a heritage to transmit to the next generations as safe as it is.
- Regeneration. It means to change the morals. Thus, greedy is criticized, for instance when an actor grabs some space to realize a project which is advantageous for himself, or when providers make pressure on customers (like in the case of "intellectual extractivism", which is described later in the paper).
- Renovation. Renovation is the minimal version of the transition. Indeed, the transition is global. Renovation supposes that in some sectors, one has to replace the technologies and the behaviors by others, which are more adequate. But the transition is more than changes in a few sectors. Technical innovation is necessary to the transition, but does not define it.
- Reform. The transition will be the consequence of decades of reform. Of course, the support of Opinion is indispensable. It should exist. In this paper, the hypothesis of the German sociologistTonnies is accepted: according to him Opinion changes and is educated, slowly. The instantaneous Opinion is different,"gaseous" (spontaneous, unpredictable). But on the long term majorities will appear, supporting stakes like struggle against global warming, against pollution, or erosion of biodiversity etc. Majorities have already appeared on topics like tobacco, attrition of car traffic (and passing to electric vehicles), struggle against artificialization of landscapes, control of the quality of the food etc.
- Regulation. Regulation encapsulates the decisions taken when reforms occur. Of course, it is a stake, in the context of the transition. It will develop in more and more fields. The impact of humankind on the environment triggers more and more problems.

In this paper, we try to explain the complexity of the transition by speaking of causes and reasons.

The opposition between causes (Science) and reasons (sentiments, values) has been described by the French philosopher Cournot (he reversed the meanings of the two words). It has been resumed by the sociologist Tarde in his book on the Cournot's works (Tarde, 2002). For Tarde, there are "logical duels" which concern the causes (Science) or the reasons (sentiments, tastes, values …). The outcomes of these logical duels, accumulate. For instance, if the topic is Nature, the outcomes of the logical duels concerning causes and

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reasons accumulate and a kind of "doctrine" or "vision" appears. Someday, this doctrine on Nature becomes obsolete because of the changes in society, and is more and more used to "save the phenomena". Another doctrine is needed. Again, there are logical duels concerning the causes and the reasons. In this paper, we shall argue that there have been three "visions" of Nature, succeeding one to the other: the "geometrical Nature", the "artificial Nature" and the "sustainable Nature". The complexity of the transition (to an eco-compatible society) is explained: one has to pass from a vision of Nature (artificial Nature corresponding to the industrial era) to another, sustainable Nature, when the impact of humankind on environment has to be taken into account.

In this paper, one insists on the symmetry between causes and reasons. One finds arguments (for the symmetry between causes and reasons) in the Castoriadis 's works ("The imaginary institution of society") and the Ostrom's works.

The causes and the reasons are different, intertwined[1] and articulated, and symmetrical.

The idea of artificial Nature comes from George Sorel.

The plan of the paper is the following:

- One sets out why the causes and the reasons, and their symmetry, matter
- One describes the successive visions of Nature.
- An example of the approach is given with the Information Theory (examining the contribution of the Information Technologies to the transition)
- Another example of the approach is the precautionary principle
- Conclusion (the stress is put on ecology and cities).

3 CAUSES AND REASONS, AND THEIR SYMMETRY

3.1 Causes and reasons

To describe what are the causes, a pertinent approach is to examine the birth of the first modern science, astronomy. The American philosopher Whitehead stated that the challenge was to overcome the gap between accurate data on the stars (Tycho Brae) and simple hypotheses, like mathematical laws, able to explain the data. It was achieved in a few centuries, from the time of Copernic to the time of Newton. This process is described in the Joseph Bertrand 's book on the founders of astronomy. On the same topic, Arthur Koestler wrote "The sleepwalkers", insisting more on the social atmosphere and the psychology of the "sleepwalkers" (the scientists). There was a strong need of faith in science, of motivation, since the effort was very uneasy. It is "serendipity". Arthur Koestler gives an example. Someday, by chance, Kepler remarked two numbers concerning the trajectory of Mars, equal. He thought that it could not be the hazard, and recovered his energy to continue his works. Indeed, it was not the hazard, but Kepler could not understand it, because the identity of the numbers requires analytical geometry, to be demonstrated. It was not available at this time. Scientific discovery is a play against Nature in which the hazard has its role, like in an adventure. That is why serendipity is necessary to scientists. Indeed, from the milieu of scientists, the idea of serendipity has diffused towards all the people (Messac, 1975).After a discovery, a presentation of science occurs, in accordance with "strength" or "power": it was necessary to discover these ideas, so a "corpus" appeared (Latour, 2006). There are incommensurable theories during the logical duel, and the indisputable when it ends. Scientific discovery is also a game between human beings. There are rival networks, each of them has to trigger interest to get the means allowing the scientific work (Latour, 2006). The sociology of science (Bruno Latour) has clarified the issue of how the knowledge of causes is generated.

Concerning the knowledge of reasons, we have to pay attention to the logical duels on values: "voices" in the Medias, debates on what is desirable for Society etc. Historically, the books on prophets show how the reasons are generated (for instance, the book on Mahomet by the poet Lamartine, or the book on Islam and Mahomet by the sociologist Le Bon).

[1] Examples are given later in the paper.

3.2 The necessary symmetry of causes and reasons

The Latour's book "We have never been modern" has for subtitle: "essay of symmetrical anthropology". Why "symmetrical"? Because in our world the objects are hybrid. One cannot oppose Science (concepts) and Society (beliefs). Objects are described by science, but are also "actants", depending on spokespersons. Hence the idea of the necessary symmetry of causes and reasons.

The causes without reasons are positivism. There is a famous example in literature, Bazarov, a character in the Turgenev 's novel "Fathers and sons". He pays attention only to scientific facts (having recklessly observed an epidemy of typhus, he dies because he has been contaminated). At the opposite, reasons without causes are mysticism. One opposes Descartes, proponent of causes, to Pascal, knowing science but thinking that the knowledge of reasons (philosophy, reflection on God) is above. Pascal said on Descartes: "useless and vain". Nietzsche, preferring the reasons, has written that "science is only an accumulation of syllogisms without particular meaning".

Even at the time of Galilee, there was some symmetry between causes and reasons. The progress of the knowledge of causes was possible, notwithstanding the power of the Church. Otherwise, the society would not have been so creative. The higher clergy tolerated that one sets out and discusses heliocentrism. But the lower clergy held for the tradition and the geocentrism of Ptolemaeus. It was not recommended to challenge geocentrism. Galilee did it in his book. More, he gave wrong scientific arguments (on the sun spots, on tides which were caused by … the sun). Also, he was 70 years old. In these conditions he was vulnerable. His trial occurred and he was obliged to renounce. At this time, the Jesuits who were at the Court of the Emperor of China, in Peking, helped the Chinese astronomers, using … heliocentrism (Koestler,2010).

More accurately, one finds arguments (on the symmetry of causes and reasons) in the works of Castoriadis and Ostrom.

In "The imaginary institution of society" Castoriadis argues that there are always two ontologies "ensemblistidentitary" and "historical social". The first is about the tools of a society, meaning how to use them (with a quantitative aspect, since efficiency in using tools supposes to count many things, the tools themselves, hours of work, performances of workers, objects which are useful to production, materials …). The second concerns the myths through which a society represents itself (origin, characteristics, destiny, future …). Here also, there is some symmetry: according to Castoriadis, the "historical social" ontology is "propped up" in the "ensemblistidentitary" ontology. "Propped up" supposes a kind of support, the "ensemblistidentitary" ontology strengthens the "historical social" ontology (that is to say: contributes to its meaning). When something is propped up in some material, it benefits from the robustness of this material. A society with an "historical social" ontology not propped up in the "ensemblistidentitary" ontology will decline, being inefficient in production, hence a lack of trust in itself (besides the material decay).

In the works of Elinor Ostrom, there are cases of collective management of natural resources showing that: the "culture" (values) and the governance, in some society, can match or not. An accord of reasons (values) and collective action (managing the resources) is needed. Otherwise, there is no efficient production (including the stake of sustainability). In the works of Elinor Ostrom, there are "laws" (which are the consequence of "culture") and "rules" (which are used to manage the resources). And laws and efficient rules can coexist, or not. Of course, a well-known example is the holy cows in India. Another example concerns a hypothesis on the end of the Maya civilization: rich people had such a taste (reasons are concerned) for thick walls in stucco for their houses that too many trees were cut to make this stucco. Then erosion of land or dryness destroyed the agriculture.

A symmetry of the knowledge of the causes and the knowledge of the reasons is needed, so a society with its "culture" is efficient in production.

4 SUCCESSIVE VISIONS OF NATURE

At some time, there is a "vision of Nature", made up of knowledge of causes and knowledge of reasons. Here we find some inspiration in the George Sorel's works. He was a thinker obsessed by the aim of transmitting a "serious" thought, void of idealism, metaphysics, dogmatism or charlatanism to the working class.[2] Therefore, he studied the theories of the past and at his time (around 1900) to discriminate the

[2] His school has been called "revolutionary syndicalism". Indeed, he never had an important role in syndicates.

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"useful" ideas and the other, in the context of the time (the "usefulness" of ideas is a criterium for theories which have to be robust and pertinent, and comes from the American philosopher Williams James). He starts in the Antiquity but we are interested in Nature for people at the time of Renaissance and after. Sorel describes a "geometrical Nature" and an "artificial Nature":

- Geometrical Nature is born from the progress of astronomy and Newtonism (mechanics). This appeared in the Kant's works since he wanted to make the synthesis of two "marvels", Newtonism in science and the Christian morals (Sorel, 2019). The geometrical Nature is homogeneous, infinite, regular (the phenomena obeys laws), deterministic. All the phenomena in the universe interact. There are mathematical laws of the universe. Concerning Man 's action, the perspectives are good: astronomy developed, the techniques for navigation upgraded etc. The geometrical Nature is intelligible. Hence the optimism.
- Artificial Nature is born with industry. It is completely different from geometrical Nature. According to Reuleaux (a German engineer who was also a theorist of industry) one can consider "machinic systems" (sets of machines which are operated together) which do not interact, are isolated one from the other (if there is enough distance between them). And probabilities are involved, because of the friction of the parts of the machines, which cannot be described accurately, but there is an average of the effects appearing. Hence wear and waste of energy and a limit of the performance of the machinic systems. Indeed, Reuleaux himself invented a gear, using geometry in a new way, to mitigate friction. The main science is thermodynamics. Man is in a struggle with Nature, will is needed because of this obstacle: dissipation of energy. Man creates an artificial Nature, made up of artefacts, the machines. And he forgets all in Nature that is not artificial Nature: it is "natural Nature". So, industry grows, artificial Nature is more and more known and mastered, while natural Nature remains forgotten. There is no interest for it, and it is neglected by science.

Of course, Sorel appears today as a productivist. Political ecology did not exist at his time. But he had a clear understanding of the "vision of Nature" needed by industry. Geometrical Nature became obsolete and used to "save the phenomena" at the beginning of the 19 th century. And artificial Nature have become obsolete because natural Nature can no more be neglected, forgotten. We have understood that natural Nature (that is to say environment, the Planet) is necessary to human life and that there is a terrible impact of industry on it. Therefore, a new vision of Nature has appeared and has developed, sustainable Nature.

In the vision of "sustainable Nature" the impact of human activity on environment has to be watched, and known. The new main sciences are scientific ecology, climatology, studies on pollution of waters, soil, air … We have become aware of the complexity of the ecosystems. Therefore, the impact of human activity on the ecosystems is uneasy to assess. The "will" (at the time of artificial Nature) is replaced by caution: we have to take into account how ecosystems which are not well known are impacted by human activities. Here the idea is to imagine the worse. Then one takes measures to avoid it. It is the precautionary principle.

5 THE INFORMATION THEORY AND ITS CONTRIBUTION TO THE TRANSITION

The Information Theory is kin to the artificial Nature. The "will", to struggle against dissipation of energy, is replaced by struggle against cluttering (the cluttering triggered by the signs of which a message is made up). The probabilities are everywhere: definition of the unit (the bit), definition of the goal (to mitigate the average distortion of the transmitted message), "noise" (the definition is modelled on thermodynamics). The deterioration of the transmitted message is studied according to the model of thermodynamics (dissipation of energy).

We have understood during the recent pandemic that Information Technologies provide great service thanks to telework. Also, they provide interesting services in the smart city: a traffic more fluid, less moves for the workers or technicians in charge of maintenance (IoT, Internet of Things, remote meter reading), gains in security … However there remain all the other problems: global warming, pollution of air, water, soil, declining biodiversity etc.

The kinship between Information Theory and artificial Nature leads to this question: and if Information Technologies allowed some "extractivism"? The answer concerns a possible "intellectual extractivism". Here the resource which is exploited is "attention". It has been studied by "attention economy". The attention of the web users is measured thanks to the hyperlinks, which are more or less used. Algorithms allow a

profiling of a web user, hence specific offers to him (her), supposed to take into account his (her) tastes. The main notion is "popularity" and is measured thanks to the number of times a site is visited (the number of hyperlinks leading to it). The outcome is a constant pressure on the web user, requested to buy what is in accordance with his (her) tastes, guessed by the algorithms … The data on the attention of the web users have a value and are sold … Even, there is a mathematical support, the Perron Frobenius theorem, concerning the Markov chains, justifying the calculation of popularity. The algorithm used by Google, PageRank, is based on it (Cardon, 2013).

It is criticized from two points of view: (1) it is a violation of the autonomy of the individual (2) it leads to more and more consumption. Here the idea is: it is not the more popular products (services) which should be more and more consumed, but those which are compatible with a safe environment.

6 THE PRECAUTIONARY PRINCIPLE

The precautionary principle can be justified by three arguments, as a consequence of models, as a strategy, and as opposed to a myth, the myth of the "corrective action":

- The precautionary principle as a consequence of models. The methodology of our time is modelling thanks to the use of computers. But these models, even the most sophisticated, are not always as accurate as wished (Taleb, 2013). But they remain interesting: when several of these models suggest (indicate) some risk, one a has kind of alert. If one model is not very accurate (predictions are concerned) the convergence of several models allows an alert: some risk is probable. One uses to express it the words "imprecise information": the probability of some catastrophe is in a fork (between 95 % and 100 %, for instance). This justifies prudence when some decision (concerning production of energy, technologies used in agriculture, industry etc.) has to be taken. The models will become more and more accurate, since "natural Nature" is no more neglected, but, at the opposite, studied. But the ecosystems and their evolution are a very complex topic. For some time, the precautionary principle should remain a good choice.
- The precautionary principle as a minimax strategy. In game theory, a minimax strategy is that of a player who maximizes his gain, considering the worse occurrences (for him). So, one imagines a game "Society against Nature": One supposes that Nature inflicts the maximal loss, in each alternative. And Society chooses the smaller loss. For instance, an alternative can involve the possibility of a "black swan" (Taleb, 2013). A "black swan" is an event with a very small probability of occurrence, but huge effects if it occurs. If another alternative does not involve a "black swan" (a negative "black swan", in other words a possible catastrophe) this second alternative should be preferred to the first. To choose a minimax strategy means that the player making this choice is prudent. Considering the possible losses, he minimizes them.
- The precautionary principle, as opposed to the myth of corrective action. The efficiency of corrective action has existed, at the time of "artificial Nature". As it is explained by George Sorel, engineers conceived machines which were manufactured by fabricants then sold to entrepreneurs. These entrepreneurs wanted to carry out economies of cost. The goal was to minimize the consequences of wear. In case of breakdown, the machine should be repaired quickly. Spare parts were available. This was theorized by Reuleaux. Finally, breakdowns were not so serious. Corrective action was possible. But concerning ecosystems which are damaged, it is an illusion. For instance, the Aral Sea, which has dried up, cannot (probably) be restored. It is the same for the wet zones (rich in biodiversity and carbon wells). Even concerning forests, decades are needed for having a forest in the same state than before the destruction. Etc.

Again, our imperfect knowledge of ecosystems leads to the precautionary principle. Some ecosystems on which the humanity depends could be destroyed, if we are reckless. And possibly, it would be irreversible.

7 CONCLUSION

The transition (to an eco-compatible society) will be long-lasting and complex, and also global. Global, for two reasons, the threat itself (on environment, on the Planet) is global, and from an intellectual point of view, the "vision of Nature" has to change:

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- the threat is global. Around 1900, at the time of John Muir (the founder of the Sierra Club) and the President of the USA Theodore Roosevelt (a preservationist), it was only an intuition: all the Nature was under threat because of industry. But now it has become a certainty. Almost every day, we are informed that environment is destroyed in some new field: biodiversity, then the waters of oceans, then glaciers (which have begun to melt), Antarctic continent etc. Some negative effect triggers another negative effect: global warming triggers acidification of oceans. There are cumulative processes: global warming triggers the melting of the permafrost, which strengthens global warming, hence more melting of the permafrost etc. Some researchers have spoken of a no-return point …
- we have to pass from a vision of Nature, made up of knowledge of causes and knowledge of reasons, in symmetry, to another one. Namely, we have to pass from "artificial Nature" to "sustainable Nature". This explains that the process will be long-lasting and complex. The five Rs evoked in the introduction are concerned. There are breakthroughs and steps back. Is it that the Opinion is a "magma" à la Castoriadis (that is to say a magma of representations which are ever changing in an unpredictable way)? Probably not, since there is this argument: there is a slow (perhaps too slow …) evolution of Opinion towards awareness on the necessity to take measures to save the Planet.

One shall conclude on the topic of ecology in cities. In History, the city has shown remarkable flexibility. So, one finds cities generated by the need of knowledge of the causes or knowledge of reasons:

- In the Antiquity, many scientists were in Alexandria. In the Middle Ages, a few renowned universities were located in some cities. Sometimes, a city was created for the purpose of knowledge of causes and …a need of secret. The king Henry of Portugal gathered in Sagres scientists (geographers, astronomers, navigators …) with the mission of mapping the universe (at least the maritime routes which were of interest for the Portuguese). Los Alamos (New Mexico, in the USA) where was carried out the Manhattan project (making the first atomic bomb) is also famous. Of course, today there are the technopoles.
- The most famous pilgrimage cities were generated by the knowledge of reasons.

One can propose a classification of cities (or places in cities) relying on knowledge of causes, knowledge of reasons and their symmetry. One finds criteria in the studies on Internet and the search engines like Google. These studies question the working of the search engines and the algorithms. They are used to measure popularity. But does popularity mean authority? It is the question of the "wisdom of the crowds". Let us retain the two criteria: popularity and authority (Cardon, 2013). Popularity corresponds to the knowledge of reasons. Authority corresponds to the knowledge of causes. Cities where a symmetry between causes and reasons exists, are more aware of the ecological stakes. There people are preoccupied with quality of life.

This classification appears in this table:

	Reasons	Causes	Symmetry between causes and reasons
Characteristics of he places	Popularity Visibility	Authority	Quality
Kinds of places Examples	Cinema: Hollywood Religion: Medugorje (Croatia) Feasts: carnivals (Rio), festivals (Cannes) Tourism: Venice Game: Las vegas	Technopoles Silicon Valley Shenzhen	Midsized cities reconciling economic dynamism and preservation of cultural and environmental heritage Annecy (France)

Annecy (France) is given as an example of quality. An ecologist municipal team has been elected in 2020.

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