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# **Overcoming the tragedy of climate change: An examination of a managerial rule of solidarity**

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## **Abstract**

Facing the increasing temperature of the earth, the rise of hazardous events with disastrous consequences on social and economic circumstances in a world where wealth is not equally distributed among countries or individuals, questions of solidarity are more than crucial today. Climate change mitigation proposals lack a macro perspective of actions that could be led. International negotiations are indeed in a dead end because the approach towards agreements is more about a priori rights and responsibility and does not take in account the potential of interdependencies underlying a mitigation action. By the exploration of a management principle issued from an ancient maritime rule called general average, the point of the PhD will be to change perspective and no longer focus on rights and responsibilities a priori but on the common potential of the action carried out in terms of solidarity.

*Key words: Commons, climate change, solidarity*

## **Introduction**

COP25's recent failure to provide new strong directions in climate change mitigation, the lack of concrete actions following the Paris Agreement (2015), and national crises such as the yellow vest movement in France show the difficulty to put in place efficient and acceptable policies to manage the climate change situation. By nature, climate change creates multiple interdependencies:

- Greenhouse gas (GHG) released in the atmosphere ignores boundaries and so, when one pollutes the other suffers and one mitigate others benefits from it.

- Globalized economy and multiple markets interdependencies cause competitive issues that can penalize countries making efforts in mitigation.

Economic theory has led to coordination mechanisms as tool for mitigation such as carbon tax or carbon markets. Those mechanisms were built using a cost-effectiveness approach and under classic economic hypothesis (perfect markets, etc.) and have been widely criticized for their lack of considerations on equity. The challenge to design in the context of climate change, simultaneously fair and effective rules, is big. Literature on international negotiations shows the difficulty to bring all countries to agree on the basis of “equity”. There is indeed a variety of potentially competing equity principles, such as a carbon tax that is based on polluter pays principle, or countries debating over historic responsibility principle. However, equity principles are disconnected from the collective action that is required to mitigate climate change, and which will lead by itself to distributional impacts that are difficult to apprehend in terms of equity. In the end, the division of scientific approaches between an economic one based on the cost-efficiency of global mechanisms and an equity one relying on international agreements leads to a practical and theoretical gap on the lack of contributions to deal with the global situation under the angle of collective action.

If the climate is a common good, combating climate change therefore has the characteristics of a global public good according to Kindleberger (1986) definition (Black, 1985)<sup>1</sup>. Climate change is a tragedy of the commons case; however, it is new that the commons to protect has a global scale, and it therefore requires an unprecedented framework for collective action. In our thesis work, we propose to reverse the reasoning, and not to start from general principles of equity, but on the contrary to start from the fundamental interdependence linking the actions (positive or negative) of each. For this, we propose to study rather the models of solidarity that must be designed to allow collective action in the face of climate change. In that purpose we will examine an old but efficient maritime rule that takes in account interdependencies between independents merchants facing a peril at the sea in a common maritime adventure. More generally, we will wonder if the general average rule can become a new basis for a solidarity model answering socio-economic issues raised by climate change and revise fundamentals of solidarity in management science.

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<sup>1</sup> Kindleberger (1986) defines global public goods as “all the goods accessible to all the countries which do not necessarily have an individual interest in producing them.”

## **Relevance of your dissertation**

Climate change results from the accumulation of GHG in the atmosphere. This accumulation is mostly correlated with the consumption of fossil fuels since centuries. To limit global warming, a huge reduction of GES emissions is necessary, but such an abatement is very costly for individuals as for countries who agree to do so. However, this mitigation and its associated costs are necessary to save everyone's wealth. As the emissions of ones endanger the others and the sobriety of ones beneficiates others, the situation contained very complex interdependencies. Recent updates such as COP25 failure to provide a concrete set of actions to mitigate emissions, and the history of international negotiations regarding this issue shows the difficulty of collective action in this particular situation. As developing countries claim their right to development and hope of similar standard of living than richer countries, developed countries do not seem to intend to diminish their wealth for the common good. Equity considerations are a key factor at international scale but also at smaller scale as shown by the yellow vests movement in France caused by the introduction of a carbon tax on fossil fuels. Policies and mechanisms already exist such as institutional regulation mechanisms, carbon taxes or markets. However existing mechanisms shows their limits in several ways, as they do not take in account interdependencies raised by the situation, their distributive effects are not satisfying leading to a poor acceptability. More than that, the non-globalization of those mechanisms leads to unwanted consequences such as carbon leakage. Failure of those systems to conjugate efficiency, equity and solidarity led to a fundamental management issue in modelling collective action.

As an intent to bring a new perspective on this particular issue, we propose to explore an ancient maritime rule called general average. Dated from antiquity, this rule was created to manage peril at the sea and imposes to participants in a maritime adventure to be economically united towards merchandises that the captain chose to jettison in order to save the journey. Once the cargo safely arrives, losses are shared by all participants in proportion to the value of their saved goods. This original justice principle allows the acceptance of the sacrifice. Therefore, the purpose of my research is to answer the following questions:

- Can we build on the basis of the general average rule a model of solidarity which responds to the socio-economic issues raised by carbon mitigation?
- Can such a model revise the fundamentals of solidarity from a theoretical point of view in management sciences?

## **Theoretical framework – key literature**

Thinking action toward climate change mitigation as a common should introduce a solidarity framework, but this approach has not been conceptualized from now and could have effects on several literature field such as economics, commons and distributive justice. Cooperation and solidarity issues surrounding the climate change problematic are mostly represented in politic economics, economics, policies and management literature. We will be particularly interested in fields of literature that have a solidarity or community approach. We will also explore considerably literature around the general average rule to perceive as precisely as possible concepts inherent to the rule.

### **Climate change: a tragedy of the common at global scale**

Climate change and policies associated with its mitigation are mostly assimilated to losses by countries (Elliot, 2018). Carbon mitigation can take to main forms: stopping polluting activities or integrating technologies that are less polluting. In both cases, mitigation measures have a cost: A loss due to the cessation of an activity or investments in new technologies. The perception of climate change mitigation as a loss leads the conception of policies toward a cost-effective approach. In addition, conflicts taking place during international meetings are widely related by literature and depends mostly on the perception of fairness of diverse countries regarding burden sharing (Cazorla and Toman, 2001). The two main questions resulting from the study of climate change negotiation literature are: How to build cost-efficient policies and how to share fairly the cost of those policies? (Page, 1997). Most literature aiming to answer those questions are about small adjustments of existing policies and do lack a new perspective.

As a promising framework, literature on the commons offers a good perspective on the management of common pooled resources. Atmosphere as a resource today can be considered as an open access one, its access is indeed not restricted and anyone can send GES in it, but the decline of its sink capacity that endangers environment, economy and society joins Hardin vision of the tragedy of the commons. However, the atmosphere meets the description of a common pool resource as exclusion from usage is costly and usage of sink capacity is subtractive but it is currently not governed as a “commons” because there is no common property regime in place. (Edenhofer et al., 2014). According to Edenhofer (2014), the two main characteristics of making the atmosphere a common resource will be to figure out how to

govern the atmospheric commons and the challenge of global cooperation. Atmosphere is indeed accessible to all countries, the community surrounding this common is so international. Governance of local commons have been widely treated by Ostrom's work which provides frameworks to analyze the robustness of markets and institutions that influences individual behavior and determinants of collective action (Ostrom, 1998, 2011). Even though extension of the local commons frameworks of Ostrom have been led by some scholars (See Stern, 2011) and the narrative of the commons have shifted in many ways (Laerhoven & Ostrom, 2007), the global commons are not only seen as resources but also as a negotiations of social and ecological relationships, a process, a way of thinking and a complex system.

In addition, it appears that knowledge created by the study of local commons is not enough to challenge the global commons and further research is needed in that direction (Chan et al., 2019). As Hardin's tragedy of the common is a demonstration by game theory that in a situation where agents enjoy the full returns from a resource without supporting its full cost of use that the resource will be overused. In climate change mitigation actions, countries have an interest in climate change being limited, but they would each prefer that the cost be incurred by the others, resulting de facto in free rider behavior. Ostrom opposed the introduction of institutional and market frameworks by empirical observations to show the impact on incentives of individual behavior that could lead to cooperation in governing those resources and avoid the tragedy. It turns out that cooperation is also one main condition of governing the commons.

Stern (2011) provides a cogent theoretical explanation for differences between cooperation in the global resource commons versus the local ones by differentiating them in terms of geographic scale, number of users, actor's awareness of degradation, distribution of interests, etc. (Araral, 2013). Theorization of commons suggests that institutionalized governance rules are needed to frame the preservation of common resources despite its use. However, it is exercised in a context where the depletion of the resource and its use is known and stable, and therefore where everyone's action is. From our perspective, collective action to manage GHG release in the atmosphere is to build and cannot exclusively rely on a burden sharing rule disconnected from concrete actions and so, management principles that takes interdependencies into account need to be studied.

### **An Economic literature mostly focused on efficiency**

Economic contributions regarding the climate change situation are numerous. Most of mechanisms in place are indeed based on economic hypothesis. Carbon markets and taxes are

indeed based on the principle of carbon pricing: a carbon tax fixes a price on carbon and expects a change in behavior based on the incentive of agents to reduce their costs by reducing emissions if it is less expensive than paying the tax (Pigouvian taxes theory, 1920) while a carbon market fixes the quantities available in a market expecting the price to stabilize at an optimal rate because of offer and demand laws (Perfect market hypothesis of Coase, 1960). The economically efficient approach is difficult to combine with considerations of equity (Page T. 1997, Zhou et Whang, 2019) and both appear to be the main decision factors (Marklund & Samakovlis, 2007). There are many equity principles focusing on historic responsibility or current wealth. The usual rationality reasoning shows countries have an interest in free riding. As the effort of one beneficiates the others, climate change mitigation should be studied from its interdependencies, extending considerations of equity to matters of solidarity.

### **A new field of solidarity: The general average rule**

➤ *A rule with great potential in general and in management science*

General average is a practical and efficient rule of solidarity that survived through history. The first written proof of its existence are in the Lex Rhodia de Jactu in the Justinian Digesta and are from 6 century BC. After the fall of Roman empire, maritime law falls into disuse in Europe, but the general average principle was a priori maintained practically during this period of time. Next mention of the rule during the middle age are in the rules of Oleron, authoritative rules in numerous European parts. In 1890, The York and Antwerp rules present the first official international codification of the general average rule. (UNCTAD report, 1991) Those rules are still applied today even if they have been slightly modified through time, the last amendment was in 2016, showing a remaining interest to this rule. This rule went through time despite the setup of maritime insurance and its high management costs. The UNCTAD conference of 1991 launched by a request to justify maintaining the rule, concluded that the underlying equity principle of the rule and the fairness of the system justifies its high administrative costs. The international applying of this rule and its survival through history shows a great potential as a community unifying principle.

Secondly, this rule has already questions scholars about its applicability in management science. The oldest contribution identified is Scott in 1986 who used a comparison between bankruptcy situation and general average, two following publications (Jackson & Scott, 1989; Iwicki, 1990) extend the general average model under agency theory to justify a different approach in solving bankruptcy cases. This contribution is particularly interesting because it aims to modify the

order and types of actions conducted facing a bankruptcy situation in order to save the company, showing the role this rule can play in collective action. Another contribution in 2011 by Segrestin et Hatchuel uses the general average rule to justify a need for rule of law to enforce efficient and equal logics and more collaborative behavior in shareholders' decisions. The last contribution found is a comparison between social care products and general average in the Polish health system insurance (Kownacki, 2013). While there are only a few contributions using a parallel with this rule, their existence and the distance between domains treated and maritime law shows the potential of the underlying concepts of this rule to other situations.

Its different properties and similarities with the climate change situation, its survival through the years and its contributions to management science in various domain show a great potential to the concept of general average in the management of atmosphere.

➤ *A rule with original characteristics*

The rule can be described as follow. Different agents with different economic interests for the travel to be safe are part of a maritime adventure: the ship owner, merchants and the captain who receive a bonus if the trip goes smoothly. If the ship faces a particular and unpredictable event (such as a fire or a storm) that jeopardizes the entire adventure, the captain is considered to be a sufficient management authority to decide the quantity and sort of merchandises or equipment to sacrifice to save the journey. Once the ship arrive safely, losses are calculated based on the value that they should have if they were no sacrifice. The contribution of each participant to losses is then calculated on the value of goods that actually arrive at destination.

This rule presents many inherent properties that show interesting perspective as a management principle:

- An efficient rule

The economic efficiency of the general average rule results in the decision-making latitude of the captain (Segrestin and Hatchuel, 2011). Firstly, the captain's authority is accepted if he is qualified to make the right choice when sacrificing goods, he is most likely the most qualified person to take a decision to save the journey. This latitude is a condition of collective efficiency: There is no predefined order to jettison goods, the captain can sacrifice merchandises directly useful to save the ship. If merchants or ship owner could bias the jettison, there will be a prioritization in the choice of goods to sacrifice. If in order to save the ship, it needs to be ballasted but the prioritization forced by influence of participants put heaviest merchandises at



the bottom of jettison's list, it is easy to understand the diminution of efficiency of the throw. Does the captain have an interest in making the most efficient jettison? As he receives a bonus if the trip goes smoothly, he has to contribute to the loss in proportion to his bonus. He is then contributing to losses like other participants and has some personal interests to minimize losses in order to maximize his bonus ratio (Scott, 1986). Captain authority allows to save the journey and to minimize the collective damage.

- An acceptable rule

One of the main advantage of this rule resides in the interest of all agent to accept it before the ship's departure. If agents had to choose the optimal response to a peril at the sea, they will collectively agree to give the necessary authority to the captain to jettison whatever needed and then share the losses among them. At the point where danger become imminent, all participants will consent to sacrifice a part of their merchandises to save the rest and agree to compensate losses with saved goods (Scott, 1986). The ex-ante equity principle allows the captain to take the decision knowing losses will be shared. In addition, the distribution rule implies the share of losses at pro-rata of their saved goods while losses are also estimated on their potential value at arrival. This consideration of potential value guarantees that saved merchandises are enough to contribute to losses and the equivalence of efforts for each agent. In addition, a differentiation of general average (losses for a common salvation) and petty average (losses due to a mismanagement of goods, for example expiration of goods) prevent the participants to pay for other losses than the one resulting from the preventive action to save the ship.

- Creation of a community with independent interests' agents

When peril at the sea occurs, captain action knowing the ex-ante distribution principle creates a cooperation between merchants who have a priori divergent interests. The creation of this community allows each participant to be insured against an unforeseeable risk at minimum cost.

- Potential wealth

In cases of general average applying, losses are estimated upon the value they were supposed to have if they survived the journey. Similarly, contributions are calculated on the basis of pro-rata saved wealth of agents. This interesting concept could provide a new vision of contributions. Segrestin and Hatchuel (2011) showed that if the journey is non reproducible and merchants are risk-averse, a pro-rata contribution based on potential value is preferable to one based on initial values.

## **Methodological approaches and methods used**

The methodological approach of my research will be in four phases.

First phase will consist on an analysis of literature on climate change policies and negotiations to identify the role and considerations of interdependencies in climate change action and to deepen the comprehension of the climate change agreements deadlock.

General average and climate change situations face similarities: General average situation can be characterized as a real and important peril that allows an extraordinary sacrifice or spending that is volunteer and reasonable for common benefit or salvation. Global warming mainly caused by GES concentration in the atmosphere presents a peril (risks and impacts are not really predictable but supposed to be important), slowing the process will require spending in either reducing or capturing emissions or even adapting ourselves to new environment, that need to be reasonable (at least economically efficient) and limiting climate change will be beneficial for all citizens of the world. The general average rule exists for more than 2500 years and is used exclusively in the maritime domain, the second phase will therefore consist on a better understanding of the rule by a genealogical approach to understand the importance of the rule and an empirical study of law cases of application of the rule and outcomes. The objective is firstly to build a model upon a solidarity rule, that is different than the usual approach through cost-efficiency and equity and then, deepen the parallel with the climate change situation to apprehend the originality of its structure and observe if there is interesting effects regarding collective action.

A third phase of simulation on real data and comparison of the general average rule effects compared to other mechanisms such as carbon market and carbon tax and an exploration of existing tool comparing policies will then be conducted. The purpose of that faces will be to observe the different interdependencies taking in account in different mechanisms and that scholars already use to compare those policies.

A final phase will be to meet interesting actors to understand implications for policy makers of the research conducted before.

## **Expected Empirical findings and implications for future research and for practitioners**

First results from research conducted until now shows a particular property of general average model to separate more effectively than other mechanisms efficiency and equity considerations and different parameters for potential wealth shows the difference between the equity principle underlying the rule and other equity principles used in climate change negotiations.

We aim to show more robustly the potential of the rule in combining more effectively than other models efficiency and equity. We then expect to explore new models of collective action that the general average rule can offer for climate change solidarity mechanisms and management.

Regarding theoretical results, we expect to contribute to the literature on commons by extending governance rules to action principles with a special focus on managing authority and implications of considering potential, meaning not only today's commons but also the potential commons of tomorrow. We also think that the general approach could lead to new perspective in adaptive governance and distributive justice fields.

## **Questions to focus upon the doctoral colloquium**

A first issue that could be discussed at the doctoral colloquium is about the pertinent literature fields to explore regarding the objective of the research and the use of the general average rule. Another question might be about the good academic community and appropriate journal to share my research.

In addition, we could use some help on ideas for data collection, what data could I use to simulate the effect of the rule? How could we picture potential wealth in a climate change situation? What tools could be pertinent for simulations?

NGOs, climate associations and politic community are actors we can think of to understand implications for policy makers, we could also use some help with other ideas on communities to better understand implications of our work.

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