

Geoethical dilemmas as an ethical risk analysis tool in Human-Geosphere complex systems: a value-based geoethics pedagogy beyond natural resources management in our relation with the Geosphere

Framing the situation and the problem

The current global social and environmental challenges we are facing are not separate crises but, rather, one complex crisis that is both social and environmental (Francis, 2015); a “crisis of values” as put by the Iranian-American philosopher Seyyed Hossein Nasr.

Building on anthropocentrism values, the current ecological crisis is based on a “technocratic” development paradigm (Postman, 1993) that keeps seeing nature as a resource to exploit, and where technological-scientific solutions addressing ecological resilience to reduce pressure on natural resources falls short. In turn, transparency accountability and participation that are considered key in strengthening integrity in governance robustness are not enough to ensure credible and trustful solutions. Credibility, as a human socio-cultural ethical expression is to be considered one of the most important soft skills in the new ages to come (Knott et al., 2008, Anderies et al., 2004).

The anthropocene should push us towards further understanding of values-oriented solutions where ethics has a fundamental role to play in the Human-Geosphere relation. Therefore, it is necessary to reconsider the role of ethics in politics, corporate sector and civil society participatory process in policy making and management of natural resources, especially the so-called common pool resources (CPR) and derived land use. It is important to note CPR does not refer to intrinsic characteristics of the resources themselves but rather their management characteristics being accessibility and rivalry.

There is broad literature about the Tragedy of the Commons in CPR management as well as the collective action to overcome it (Anderies and Janssen, 2013; Ostrom, 1990), resulting in the depletion of the resources and the cooperative synergies between stakeholders to overcome the tragedy. However, management of CPR means that potential users “act” simultaneously on time and space over resource (material or environmental) with the main objective-value of “benefit”, either for profit or conservation. Furthermore, asymmetry of information is a characteristic of the tragedy, as exemplified by the well-known Prisoner's dilemma game. The conflict resolution approach to address these issues is frequently based on the use of socio-ecological systems modelling to enact participatory-negotiation processes and institutional reform considering social learning and adaptive management (Pahl-Wostl et al., 2007) and, ultimately, companion modelling (Etienne, 2010). From a more political ecology point of view, social power struggle and rights (sometimes dismissing nature rights) have been the way to approach these conflicts (Boelens et al., 2018).

Glenna (2010) points out “environmental” conflict resolution is possible when underlying competing theories of justice are addressed, contradicting “...the popular narrative that an environmental conflict can be resolved when competing parties come to the realization that natural ecosystems provide valuable service.” Furthermore, a value-based approach in natural resources management contributes to a broader concept of ecological justice beyond redistribution of resources benefits, or in terms of local populations appropriately compensated for environmental degradation, decline of bio-and geodiversity, and deterioration of population health (Nikitina, 2014) but on recognition of Nature manifestations (rivers, lakes, ...) as a common being (Bellaubi and Bustamante, 2018).

Objectives

Hereby, a value-based approach methodology is proposed to better understand the relationship of Humans with the Geosphere, meaning rivers, lakes, oceans, groundwater, mineral bodies, and soils as common beings, a relationship that is expressed through different land uses. Such a value-based approach contributes to the field of Geoethics as the moral basis of relationships, occurring at geological study and use of land, subsoil and its mineral resources (Nikitina, 2016).

The methodology builds on previous experiences analyzing environmental dilemmas (Gampel, 2005) and geoethical dilemmas (Nikitina, 2014) and constitutes a contribution in delving deeper into the understanding of these dilemmas considering the role of leadership and cultural geographic identities as carriers of ethical and spiritual values. The main goal is not to stand on a conflict resolution approach but view the situation in perspective taking a prospective vision on how Humans want to relate to the Geosphere. Therefore, it is not about an incommensurable values multi-criteria approach (Munda, 2004) on competing (land) uses for a natural resource “profit” but finding the different values in how to relate to the Geosphere to achieve a consensus value under a Solidarity Principle using the ecumenic strategy of dialogue (Kung, 1991). The formulation and understanding of geoethical dilemmas is used as a value-based pedagogic exploratory tool to bring Hope in an ecological act of justice. This “active acting” is done considering that values on Human relationships have an imp-“act” on the Geosphere and, in its turn, the Geosphere acts on humans in terms of geological risks. If the voice of the Geosphere needs to be “represented” on legal rights, it needs to be considered in the light of the geoethical dilemma exercise.

Method

Geoethical dilemmas are not about the choice in allocating resources according to different values but understating the reason of a “value-choice” in the Human-Geosphere relationship (the “why” of this choice). It is not about solving those dilemmas but finding a way “to live” with them from an ecumenical dialogue perspective. In other words, under what values we relate to the Geosphere (“value-relation”). Geoethical dilemmas represent the moral stand that the Geosphere needs

stability for the Evolution of Life, a dynamic circular stability that links the historic generations (ancestors) with the future generations (Galleni and Scalfari, 2005).

Under this view, geoethical dilemmas are defined as the ethical choice when explicit values in normative rules or social norms (moral) “confront” the individual or community power implicit values, affecting the Human-Geosphere relationship and where equilibriums over time are achieved when human relationships meet a stable behavior (habit) and the Geosphere receives the payoff.

Geoethical dilemmas can be framed in terms of transparency of the values and accountability to influence the values in Human-Human relationships affecting the Geosphere, and observing how these relationships evolve in different equilibriums, which may have a Human Impact on the Geosphere and be manifested as Geological Risk on Humans.

The equilibrium leading to higher levels of ecological justice means human moral agents give up on another possible value-choice. This is not about the lesser evil principle but avoids this by proposing a Solidarity Principle; carrying part of the Other’s burdens meaning consciousness of the Other and, as a result, consciousness of the Geosphere in a way that the Geosphere impacts and geological risks decrease.

Geoethical dilemmas can be framed according to the following conditions:

- dilemmas refer to how human relationships have an impact on the Geosphere and, in turn, there is a geological risk on human activities.
- dilemmas confront individual/community values with values expressed by normative law or socio-cultural norms and customary rules.
- there is a tragedy equilibrium or ecological collapse and an ecological equilibrium based on a Solidarity Principle.
- the sum of the credibility of the involved stakeholders does not necessarily lead to the ecological equilibrium.

The formulation of geoethical dilemmas runs in different steps, as briefly defined below:

- 1) Context: Institutional integrity and power asymmetry.
The first step is to get a good overview of the existing legislation and normative framework as well as customary rights. It is also equally important to have a glimpse at how different social actors play an influencing role over others in terms of power asymmetry.
Eventually actors and relationships between actors may be represented using a Venn diagram identifying low integrity and influencing power).
This step is optional and is the visual representation of the previous steps in order to clarify relationships, influencing power and gaps in the integrity governance systems (see Bellaubi and Visscher, 2016).
- 2) Identify the dilemma and stakeholders involved.
With the previous information, it is necessary to identify the two main groups of actors or stakeholders involved in the dilemma as holding different values and the

third affected entity. From here, frame the dilemma in terms of societal questions: What can be done about it? How can it be solved? Why should we do something? In order to clearly identify the values and beliefs at stake, this is about rethinking the dilemma in terms of values identifying the values behind each stakeholder.

- 3) Formulation of antropocentric-ecocentric alternatives in terms of Impact-Risk represented in a payoff matrix (Impact-Risk payoff matrix). Once the dilemma is framed, the two main stakeholders around the dilemma set up their value-positions according to more anthropocentric and ecocentric values. One of these positions represents existing sociocultural (non-written) norms, normative law or customs for each of the stakeholders involved. Each position is crossed with the other stakeholder value-position to set up different alternatives. It is important these alternatives are framed in terms of Impacts and Risk. This means each alternative has an impact on the Geosphere and on the opposite there is a geological risk derived¹. An illustrative example is given from the well-known classic novel Romeo and Juliet by Shakespeare.

	Romeo follows socio-cultural/normative rule or custom	Romeo follows ethical values: love
Juliet follows socio-cultural/normative rule or custom	Alternative 1 for both and confrontation between the families	Alternative 3 Juliet quits, disgrace for Romeo
Juliet follows ethical values: love	Alternative 2 Romeo quits, disgrace for Juliet	Alternative 4 both die and reconciliation between the families

- 4) Calculation of Credibility_{stakeholder} and Credibility_{alternative} (Credibility payoff matrix).

In this step, the Impact/Risk payoff matrix is transformed into a credibility matrix. Credibility is a key factor in social actors' relationships and constitutes a carrier of values. For each stakeholder, a credibility is calculated for each alternative (credibility_{stakeholder_1}, credibility_{stakeholder_2}) and a total credibility of the alternative as the sum of both stakeholders' credibility involved (credibility_{alternative}). The resulting credibility of alternative can be translated in terms of impact/risk on the Geosphere.

Credibility_{stakeholder} and credibility_{alternative} are calculated as follows in relation to transparency and accountability definitions:

Transparency: how authentic is my attitude regarding my values in view of the existing rules (normative, custom). Scores are 1 or 0.

follow_values = 1

not_follow_values (but the rule = 0)

Accountability: how can my values be influenced or the power to influence (not to control). The capacity to influence with my attitude is defined by the degree of cultural identity in a specific community or social group involving a social cost if

¹Geological Risk = Natural Hazard + Socioeconomic Vulnerability

I follow ethics value (that rest on the attitude score) or a social gain if I follow the rules (that adds on the attitude score) (based on Bellaubi and Pahl-Wostl, 2017). Scores are 0 or 1.

The credibility of a stakeholder is calculated as,

$$\text{Credibility_stakeholder} = \text{Authentic Attitude} + \text{Capacity to influence}$$

where,

$$\begin{aligned} \text{Capacity_influence} &= f(\uparrow \text{social cost}, \uparrow \text{cultural identity}) \\ &\text{if follow_values} > - \text{social cost} \\ &\text{if not_follow_values} > + \text{social gain} \end{aligned}$$

and the credibility of the alternative,

$$\text{Credibility_alternative} = \text{Sum credibility_stakeholders}$$

An example is provided below.

- 5) Choice of the Max_credibility_alternative, “Tragedy Equilibrium” and “Solidarity Paradox” alternative.
We assume that stakeholders’ choice looks simultaneously with symmetry of information at maximization of the credibility (max_credibility) as a point of equilibrium.

	Romeo follows socio-cultural/normative rule or custom	Romeo follows ethical values: love
Juliet follows socio-cultural/normative rule or custom	<p>Alternative 1 tragedy disgrace for both and confrontation between the families</p> <p>Credibility Juliet = 0+1 = 1 Credibility Romeo = 0+1 = 1 (1,1)</p> <p>Credibility alternative = 2</p>	<p>Alternative 3 Juliet quits, disgrace for Romeo</p> <p>Credibility Juliet = 0+1 = 1 Credibility Romeo = 1-1 = 0 (1,0)</p> <p>Credibility alternative = 1</p>
Juliet follows ethical values: love	<p>Alternative 2 Romeo quits, disgrace for Juliet</p> <p>Credibility Juliet = 1-1 = 0 Credibility Romeo = 0+1 = 1 (0,1)</p> <p>Credibility alternative = 1</p>	<p>Alternative 4 solidarity both die and reconciliation between the families</p> <p>Credibility Juliet = 1-1 = 0 Credibility Romeo = 1-1 = 0 (0,0)</p> <p>Credibility alternative = 0</p>

Higher credibility represents a tragedy equilibrium; Romeo and Juliet will follow families’ advice, they will be unhappy and their families will remain confronted. Lower credibility represents a solidarity equilibrium. In this case, Romeo and Juliet

decide to give up part of their social gains and “to be loyal to the Others’ values” pay a social cost for it.

An interesting point is alternative 1 with higher credibility does not necessarily match with the solidarity principle of alternative 4 that represents less impact/risk and that is closer to an ecologically fair situation in the Human-Geosphere relation, thus framing a paradox (Solidarity Paradox). Solidarity equilibrium involves that stakeholders hold a “rebel” attitude by choosing their ethical values and not the ones expressed by the rule and, as a result, they pay a high social cost - rebels can lead change (Gino, 2018). At the same time, we can observe that “rebel” credibility generates a mimetic attitude with the stakeholder involved in the dilemma - Law of Innovation (Rogers, 1962). In the case of the example, Romeo and Juliet are very credible to each other but not to their respective families, paying a social cost for it. Under the solitary principle, their love to the other carries part of their social burdens: the loss of the family love (that represents the third part involved in the dilemma).

In this case, Romeo and Juliet share the same value, the true love, but what happens when values between stakeholders are different? This situation is shown in the example in the next section.

6) Reflecting on key variables and defining a prospective-strategic vision through consensus.

The final step is about reflecting on the role the different variables play in geoethical dilemmas. Credibility is a value-carrier variable that includes leadership as attitude and cultural identity as an influencer through social cost/gain.

This step can be formulated by a number of questions that should help on the basis of an ecumenical dialogue to find an agreed common value having the Solidarity Principle in the Human-Geosphere relationship as a starting point. The way to settle this dialogue is through a pedagogic process: pedagogy of geoethics. By pedagogy, it does not mean the formal education teacher-student relationship but the accompanying and advising of “social services” to a community, corporate sector or politicians. Pedagogy plays an important role in paving the way for change and innovation as a politically contested act (Freire, 1970; Postman, 1993) for ecologic justice. Furthermore, it contributes to sustainable learning establishing communities of practice (Tàbara and Pahl-Wostl, 2007)

The concept “pedagogy of geoethics”, as used here, refers to critically reflecting on the credibility of our choice resulting when facing geoethical dilemmas. As ethics must converge in universal values for a better world (Camps, 2013), pedagogy of geoethics has a clearer purpose but, rather than seeing ecocentrism as the way to ecological justice (Washington et al., 2017), we need other humans to fulfill our relationship with Nature on a Solidarity Principle.

An illustration of the method

Based on a compilation of environmental ethics dilemmas (Burgui and Chuvieco, 2017), an example of the application of the above described method is presented below.

The geoethical dilemma refers to the occupation of the Ebro river bank (in the middle course of the river) by groups of farmers who traditionally cultivate these lands. The stakeholders involved are the regional government and the ecologist groups. The farmers represent the 3rd entity involved. In years where the river flows, yields are bigger than average, the banks are flooded with the subsequent economical loss for the farmers. Farmers claim the administration should dredge the river bed to allow to evacuate the surplus flow, whist the ecologist groups point out that this will result in the subsequent loss of flora and fauna and increase sedimentation. The geoethical dilemma example focuses in the Impact/Risk matrix and the credibility matrix as well as the subsequent questions that arise for understanding the dilemma.

The matrix below represents the 4 possible alternatives to the geoethical dilemma; the stakeholder credibility for each alternative and the alternative credibility.

<p>Dilemma: Using the riverbanks. Stakeholders involved environmentalists vs government, farmers 3rd party</p>	<p>The environmental groups accept partial dredging and safety strips in the river banks</p>	<p>The environmental groups are positioned against the dredging and use of the river banks</p>
<p>The government accepts to dredge the channels and allows the use of the river banks</p>	<p>Alternative 1</p> <p>Affects the ecosystem, erosion. Increases the risk of economic losses</p> <p>credibility government = $1-0= 1$ credibility ecologists = $0+1 = 1$ (1,1) Credibility Alternative 1 = 2</p>	<p>Alternative 2</p> <p>Riverbanks conservation. Open confrontation due to land occupation</p> <p>credibility government = $1-0 = 1$ credibility ecologists = $1-1 = 0$ (1,0) Credibility Alternative 2 = 1</p>
<p>The government takes environmental groups and EU regulations into account</p>	<p>Alternative 3</p> <p>Areas partially occupied illegally. Political cost of elections</p> <p>credibility government n = $0+0 = 0$ credibility ecologists = $0+1 = 1$ (0,1) Credibility Alternative 3 = 1</p>	<p>Alternative 4</p> <p>Fertilization soil, freatic recharge. Economic losses due to soil protection</p> <p>credibility government = $0+0 = 0$ credibility ecologists = $1-1 = 0$ (0,0) Credibility Alternative 4 = 0</p>

In alternative 1, the regional government chose to dredge the river beds, meaning attitude score 1 with no social cost (score 0) as this is the preferred option of the farmers. The credibility of the regional government is 1. The ecologist groups partially

accept this choice with security zones in the river banks (attitude score 0 and social gain 1 as the ecologists do not directly oppose the farmers). The credibility of the ecologist scores 1. The impact of this alternative is the erosion and the economic losses through flooding although both to a lesser degree than in previous events. The total alternative credibility is 2.

For alternative 2, the regional government keeps on dredging the river bed so has the same credibility score as alternative 1, whilst the ecologists clearly stand against it as well as against the river banks' occupation. The ecologist credibility is 0 as their attitude is 1 but that has a social cost (score 1) in front of the farmers. The impact of this alternative is almost nil but from a socioeconomic point of view creates an open conflict between stakeholder ecologists, regional government and farmers. The credibility of the alternative is 1.

In alternative 3, the regional government follows the EU normative and the ecologists' opinions, to not completely dredge the river bed. In this case attitude scores 0 and they have no social gain (this option is against farmers' views). The credibility is 0. In turn, the credibility of the ecologists remains as in alternative 1. In this alternative, we can expect that some farmers may occupy some lots illegally with the same consequences as in alternative 1. In this case, the geological risk acts on the socio vulnerability side meaning there is a political cost of the unpopular decision taking by the regional government. The alternative credibility is 1.

In alternative 4, the credibility of the local government stands as alternative 3 and credibility of the ecologist groups is the same as in alternative 2. In this alternative, the impact is almost nil; there is recharge of the river aquifers and preservation of the river banks' ecologic system. However, from a geological risk point of view, if possible, economic loss from flooding events is reduced and the farmers' livelihood production system is drastically reduced. The credibility of the alternative is 0.

There are two possible equilibriums:

Alternative 1 is the most credible but leads to a tragedy equilibrium from an ecological justice point of view as it represents the alternative with higher impact on the Geosphere and a considerable geological risk.

The less credible alternative 4 overcomes the tragedy under a solidarity principle (Solidarity Paradox). However, in this example both stakeholders have different values and only one player makes an ethical choice (only one player shows solidarity by bearing a social cost, partial solidarity equilibrium). Regarding the previous example of Romeo and Juliet, a rebel attitude does not generate a similar attitude from the peer and an interesting question arises: is leadership a key variable of change only when similar values are shared between social actors?

The understanding of the dilemma poses different questions for an ecumenical dialogue and a pedagogic political process in how credibility can enhance the solidarity principle alternative.

Farmers are perceived as anti-ecological invading the riverbanks with production activities. However, they are the true protectors of the environment; they know well the dynamics of the river but at the same time they are subject to great losses when floods occur.

The administration is in a delicate situation where it has to measure the consequences of its actions. The ecologists are clearly pro-conservationists and oppose any anthropic action on the environment.

The main two questions to engage the ecumenical dialogue are:

- 1) Is it possible for the farmers to receive some kind of economic benefit for their environmental service of protecting the riverbanks?
- 2) How can the administration be committed to play a double role by respecting the EU normative at the same time as supporting the farmers (without compromising votes)?

Further steps

The above-described method, Transparency-Accountability-Values (TAV), has several interesting points in understanding and exploring geoethical dilemmas.

The method presented allows a better understanding of geoethical dilemmas as a values-based approach beyond natural resources management in our relation with the Geosphere, enhancing robustness in the Human-Geosphere relation and having a holistic approach to Ecological Justice.

The method formalizes the analysis of geoethical dilemmas with an Ethics Risk Analysis tool to explore the role of leadership and cultural geographic identity as factors defining credibility to shift towards a “Solidarity” equilibrium (path of change).

The understanding of geoethical dilemmas as described follows a pedagogic approach where pedagogy is seen as a companion eco-political process.

The method needs further refinement and be applied to different geoethical dilemmas in order to answer the following two questions:

1. How can leadership and identity positively affect Impact and Risk on the Geosphere?
2. How can participatory processes influence values shift in the rules?

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