

The institutions for institutional transitions

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The greatest shift current societies may need to face is the “transition to sustainable systems”. Managing transition equates to the management of institutional change (Teisman & Edelenbos, 2011).

Multiple initiatives have emerged recently as global efforts towards new sustainability standards, looking to create and manage *mission-oriented sustainability institutions* (SMOI), such as *Urban Living Laboratories* (ULL).

This article presents and analyzes the institutional complexity factors related to the dynamics of ULLs, applying the Institutional Analysis and Development approach (Ostrom, 2009). One of the major challenges within the field of institutions' studies is their identification and detailing (Ostrom, 2011; Märker *et al.*, 2018)

The present paper will also explore the profile of institutions currently promoting transition, i.e. seeking to change institutional ensembles associated with the future governance of food, energy and water (FEW) systems.

An analytical framework seems to be the first step in understanding the complexity of transition processes as well as the role and dynamics of innovation, which is understood as prime-mover toward the transition of institutional ensembles.

The duality *institution-transition* will be applied as the unit of analysis for this institutional framework. Considering that both constructs present revolutionary and evolutionary characters, a multi-criteria approach to understand this relationship is presented. Thus, the article presents a matrix of institutional factors that can support *action situation* games: strategy, object, form, method and logic (Teisman & Edelenbos, 2011). “Strategy” conforms the action-oriented system through which the goal of sustainability is to be achieved; “object” points out the duality's formal structure, subjected to human behavior; “form” clarifies that the institutionality of the SMOIs can evolve gradually or by leaps; “method” defines that ULLs should promote change and desired future planning; and “logic” states that the transition is an actor-managed and policy-oriented process.

This practice can encourage the operationalization of ULLs as entities for policy design, within their nonlinear dynamics and socio-technical co-evolutionary character.

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1. Introduction

The greatest shift current societies may need to face is the “transition to sustainable systems”. Managing transition equates to the management of institutional change (Teisman & Edelenbos, 2011). Sustainability is a new civilization milestone. Amending the cumulative hazardous effects of current modes of production and consumption is presumably highly dependent on new systemic forms of governance, hence its *common-pool resources* frame (Ostrom *et al.*, 1994).

The present paper explores an institutional framework for such *sustainability challenge*, which configures a broad multi-dimensional problem, unsuitable to segmented or sectoral analytical approaches.

Following the idea that one of institutions' studies major challenges is their identification and detailing (Ostrom, 2011; Märker *et al.*, 2018), this paper explores the institutional complexity factors related to the dynamics of a rather new and special type of institution, designed to promote the transition to more sustainable human systems: the *mission-oriented sustainability* institutions (SMOI). A huge quantity as well as variety of initiatives and efforts involved in the sustainability challenge exist all over the world, in the form of national ministries, national and supranational commissions, national and supranational rules embedded in trade agreements, in social policy or national and transnational policies for environmental protection. Sustainability is demonstrably perceived as a permanent cross-section issue.

This paper is particularly concerned with the institutionality of SMOI, which specific function is to carry out sets of actions – such as public policies, regulatory contexts, laws, rules, routines, productive practices or education for sustainable consumption.

A very representative example of such institutions are the so-called “Urban Living Laboratories”, or ULLs. Since ULLs are essentially “innovation-driven institutions for sustainability,” their core mission is to specifically address a set of new social and environmental ensembles lowering the threshold for sustainability standards – whether at local, regional or global scale.

From the perspective of evolutionary economics, there is a great alliteration component in the usage of the terms “transition”, “change” and “evolution”. It is just as mandatory to point out the difference between *institutional change* and *changes derived from institutions' performance*, and even the level of rationality, intentionality and collective choice that led to these changes. Clarifying these issues is the starting point for further discussions on SMOI, a kind of institution that purposely wishes to promote transformations in human systems.

Institutions, themselves, evolve; the current challenge is to deliberately design institutions that could manage coordination systems for sustainability. Or yet, to use existing best practices to set the bar for institutional characteristics that could make such instances more efficient. Hence, the reason duality institution-transition is the unit of analysis of this exploratory institutional framework.

In other words, the main concerns constitute: “which are the *governance core competencies* (Penrose, 1971), *capabilities* (Teece & Pisano, 2003, *apud* 1997) and *profiles* of this kind of transition-oriented institutions, that are able to strengthen the role of institutions for sustainability”?

As Teece (1997) points out, to specify the nature and microfoundations of the capabilities necessary to sustain superior enterprise performance, in an open economy, with rapid

innovation and globally dispersed sources of invention, innovation, and manufacturing capability, is a great endeavor. In our case, the enterprise is the SMOI.

It is clear that the design of a sustainable future is being operated by a variety of efforts, by institutions, at the level of countries' political and social actions or from international initiatives that may be involved in rules, instruments of economic, environmental, and social policy. They can be directed and scaled in different ways, such as rules, behaviors, market dynamics or citizenship rights, for example. What kind of new constitutions and new commitments - in a similar approach to that of North & Weingast, 1989, for the 17th Century "Glorious Revolution"- should be taken into account in order to handle the maintenance of global human systems in the face of challenging new patterns of economic growth and development of markets? The diversity of local, regional, national and international variables, institutional factors, policy and political contexts presented by each transition horizon outlines the spectrum of challenges – on a global level - expected for any analysis on the role and forms of governance for these institutions.

Concerning all the factors explored by new institutional economics (NIE) over the last decades, questions on the main institutional capabilities of such *push-and-pull* institutions, as well as the main purpose of generating and carrying out new global rationales for natural and human resources, remain open.

The processes and the drivers of institutional transformation – or evolution – in terms of the collective rationality that ULLs must address, is a core theme within new institutional economics, and directly related to the discussion carried out by this paper.

In this context, based on the institutional diversity (Ostrom, 2005) of transition-driven efforts towards more sustainable practices, focusing on the representative case of ULLs this paper will analyze the duality *institution-transition* as the expected evolution of a "new" rationality for sustainable human systems; finally, using the Institutional Analysis and Development (IAD) approach, the paper presents an exploratory analysis of a set of institutional factors that must be taken into account, if ULLs are to be planned and implemented, reaching the expected level of sustainability governance for which they were designed.

Section 1. The diversity and roles of institutions for sustainability

The issue of institutional diversity is a transversal and permanent theme within NIE studies. For this paper, which aims to explore the role of institutions which specific mission is to operationalize the shift to more sustainable societies, it is essential to review such diversity.

Sustainability is, in itself, institutionally cross-cutting: it would be unthinkable to only strive for sustainability-oriented institutions, as this "entity" should be pursued by different initiatives in an iterative, sustained and comprehensive way. It must be for this reason that in the last three or four decades, and in parallel with the development of more systematic sustainability-oriented proceedings, there has been an intense flourishing of institutions² directly or indirectly dedicated to the topic. More than that, the sustainability challenge has been recognized as a trans-disciplinary agenda, which led to a wide range of transformations in the institutional sphere, as well as promotion of new kinds of sustainability-oriented practices. It is difficult to characterize and categorize the role of each individual institution in the restructuring of goals and within broad institutional dynamics. Analysing such

² The World Bank recently changed its mission: "to end extreme poverty and promote shared prosperity in a sustainable way". This case illustrates the cross-section character of sustainability demands, in terms of its institutionality.

institutional diversity, national environmental ministries, environmental protection institutes, sustainable production departments and NGOs concerned with forest protection and sustainable production are included. At the international level, they are exemplified by

- a) Political and scientific-political organizations, whose main objectives are to monitor, summarize and disseminate knowledge and practices on global climate change, pointing out its causes, effects and risks to humanity and environment, e.g. IPCC³, FAO⁴, Belmont Forum⁵
- b) Funding and policy making institutions, e.g. World Bank;
- c) Global NGOs, which were initially focused mainly on preservation issues, and nowadays also campaign for sustainable development, e.g. WWF⁶ and Greenpeace

There are clear overlapping effects on these institutional functions and efforts, in a continuum of combined goals and different levels of institutional mandates.

This paper specifically explores *sustainability-mission-oriented* institutions, such as the Belmont Forum, and associated initiatives (Urban Living Laboratories), in terms of the institution-transition role and of their expected forms of governance.

According to Ménard (2014), NIE has at least two main branches: the “institutional environment” (Davies & North, 1971) one, concerning social institutions that refer to *general rules that frame and constrain the behavior and domain of action of economic entities* (Ménard, 2014) - whose missions seem to be the maintenance and conservation of *status quo* - and the “institutional arrangements” one, also called “organizational arrangements”, represented by firms, NGO’s, strategic alliances and so forth. Ménard (2014) makes use of this differentiation to interrogate – grounded on industrial organizational’s theory - on the players’ structure and their transaction dynamics; the author calls these arrangements *meso-institutions*.

This paper argues that in the face of analytical and practical demands about institutions involved in the sharp promotion of sustainable transitions, within the emergence of new economic and social dynamics, and its expected and desired evolution, a third type of institution seems to be emerging: institutions for institutional change.

They are, in fact, *cross-structural institutions, playing a role as key prime-movers of change*.

This institutional role constitutes, in the view of this paper, an agenda for NIE, given:

- a) The size, complexity and long-term character of the presented challenge, since this adaptive and iterative process appears to have an assertive evolution, based on natural resources’ scarcity – that constrains the future behavior and domain of institutions.
- b) The potential need for structural change brought to both previously mentioned types of institutions by the sustainability challenge. New collective reasoning concerning rules, codes, behaviors and conventions would configure novel patterns of human relations.

Urban Living Laboratories as a *sustainability-mission-oriented* institution emerge from this agenda, and their definitions are so far diffuse. Understandings vary from the definition of an ecosystem for action - a theory grounded in urban development studies - to a tool for pilot services and an approach to experimental partnerships between researchers, citizens,

³ Intergovernmental Panel for Climate Change.

⁴ Food and Agriculture Organization, United Nations.

⁵ International partnership that mobilizes funding for environmental change research and accelerates delivery to remove critical barriers to sustainability.

⁶ World Wide Fund for Nature.

companies and local governments (Lerhmann *et al.*, 2015, Voytenko *et al.*, 2015, Keith & Headlam, 2017; Scozzi, Bellantuono, & Pontrandolfo, 2017). Interestingly, according to Lehrman *et al.* (2015), sectors involved in ULLs initiatives tend to have different conceptions of it. Government institutions generally perceive ULLs as a regional innovation platform, while the private sector considers it more of a method for innovation.

Moreover, the functional logic of such initiatives are multiple, so as their institutional settings, the time horizons and research functions (Keith & Headlam, 2017). ULLs can be established by local public administration, trying to find cost effective solutions for problems at city level, it could involve a neighbourhood or it could be part of a global initiative, as well as it can be a partnership between research institutions and a municipal government or a network of city stakeholders and industry. They may even be founded by companies looking to foster new products and services, e.g. gadgets for Smart Cities concept.

A central point in harvesting the notion of ULLs is to find a common ground of realistic environment, which means that living labs will typically organize a combination of field experimentation and innovation methods that allow for the translation of long term visions into more concrete and operational services, and in this way, provide a more suitable environment for behavior change in users (Voytenko *et al.*, 2016; Blühdorn, 2015). The employment of a service that is understood can shed light on how new behaviors and new ideas are supported by existing institutions. In environmental analysis, for example, institutions and adaptive capacity are deeply linked. According to Wise *et al.* (2013) the prevalence of changes and responses that cross spatial scales, sectors and jurisdictional boundaries, can lead to threshold effects. That is why cooperative interdisciplinarity in the form of ULLs is such an important tool to tackle the transition to sustainable systems. ULLs are not only isolated cases of institutions for institutional transition. Their structure and dynamics can be adopted as an institutional model for transition planning and management. A preliminary survey of scientific production between 2008 and 2018 on ULLs, revealed it to be an emergent topic. Using scientometrics methods⁷ (Glänzel, 2002), this paper adapted a fuzzy, nonetheless cohesive procedure of social network analysis (Otte & Rousseau, 2002), co-occurrence analysis and cluster analysis, based on the following procedure:

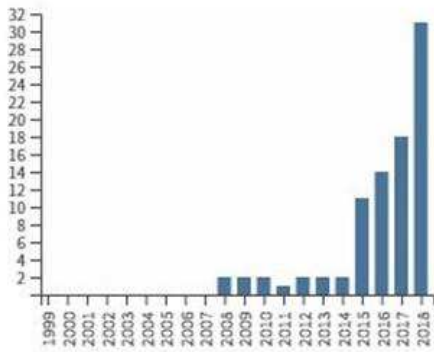
- a) Search for certificated literature topic: query (urban and living and lab) OR topic: (urban and living and laboratory or laboratories) AND topic: (sustainability);
- b) Source: Web of Science;
- c) Tools: The Vantage Point for scientometrics search; VoS Viewer for co-authorship network design; Pajek, network analysis.
- d) Timespan: 2008-2018. Indexes: SCI-EXPANDED, SSCI, A&H, HCI, ESCI;
- e) Results: shown below.

Table 1. Literature scientometrics profile on ULLs - 2008-2018. The Vantage Point.

Number of papers	87
Sum of the Times Cited	676
Average Citations per Item	7,77
h-index	14

⁷ This is not a full scientometrics study. It is presented to generally demonstrate the emergence of the ULL theme among scholars.

Graph 1. Total Publications by Year; 2008-2018. The Vantage Point.



Graph 2. Papers citations; 2008-2018. The Vantage Point

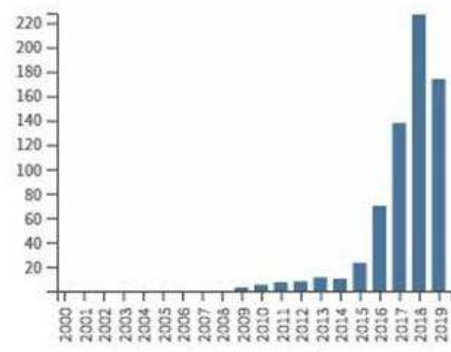


Figure 1. Co-authorship map by country (from co-occurrence matrix) – ULLs – 2008-2018 Source: authors' elaboration; from Pajek for Large Networks Analysis.

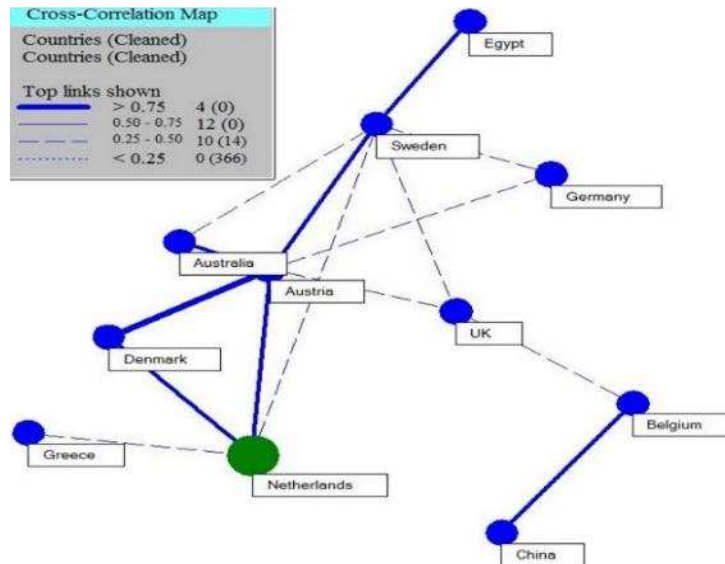
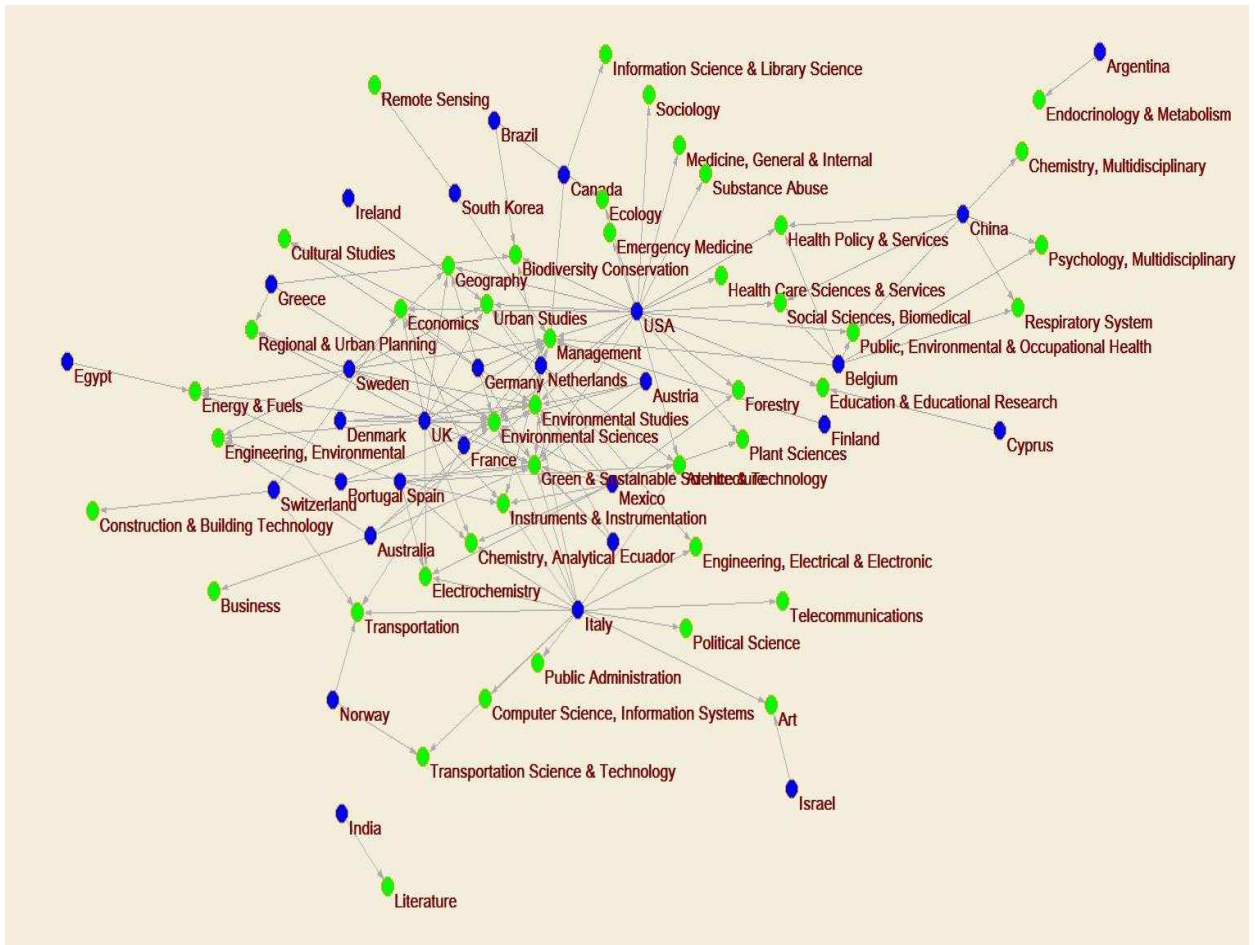


Figure 2. Bipartite analysis of ULLs – 2008-2018; Countries (blue) and Scientific Areas (green); from Pajek for Networks Analysis.



Two main clusters (from the VoS Viewer tool, linglog modularity) of scientific collaboration have been extracted from the primary data, according to Figure 3.:

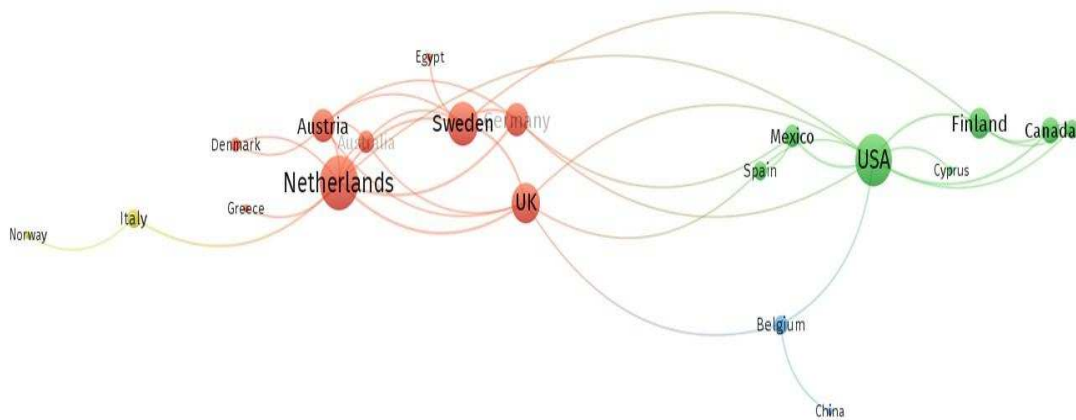


Figure 3. Clusters of science collaboration hubs – Netherlands and USA and partners; from Pajek for Networks Analysis; from Pajek for Networks Analysis; 2008-2018

This brief ULLs knowledge-based scenario indicates three findings:

1. Publications profile: this is an emergent scientific area (over the last 3 years);
2. Bipartite analysis: this is a strongly interdisciplinary area, spanning between dozens of knowledge areas such as chemistry, engineering, social sciences and environmental sciences;
3. Countries' co-authorship collaboration indicators and science collaboration hubs: this is a *small world network* (Newman *et al.*, 2006), performed by high income countries with dynamic economies.

At this point, two different meanings for the SMOI covered by this paper have to be considered.

The first one is the traditional NIE *ex post* view of institutions and evolutionary theory of economic change (Nelson & Winter, 1982), stressing (*apud* Harper, 2018) that *any innovation is always technological, organizational, and institutional*; similarly, the search for the effects of agency and power in historical institutionalism and the focus on rational-choice presented in the thoughts if institutionalists are found in the broad issues about institutions and economic growth (Acemoglu, 2004) and the gradual changes of institutions (Mahoney & Thelen, 2010). NIE has been putting efforts to understand all institutional dimensions of innovation, looking into different kinds of institutional rules and policy solutions to solve innovation-associated problems (Harper, 2018).

The second meaning is the policy making dimension of this transition. Public policies - as a response to demands of systemic relations between institutions and society, and as fundamental mechanisms to optimize the efficiency of social, technological and organizational innovations - are essential for any transition in market structures. For the last four decades, the theoretical and practical incursions about sustainable policy making – concerning the development and diffusion of sustainable innovation - have been explored. Transition management policy⁸, assumes the technological regime as a system in which problems and opportunities arise, as internal or external demands originating from socio-political situations. These heuristic approach is known as Multi-level Perspective (Geels, & Schot, 2008), and relates values, scientific action and establishment of a niche market to the emergence of a new technological paradigm.

These policy approaches present strong theoretical links to the concepts of *technological paradigm* (Dosi, 1984), an explanatory principle of inclusion and exclusion processes in a technological trajectory (Nelson & Winter, 1982) and of *socio technical regimes*, a helpful middle level concept to understand transitions, which account for the stability of existing large-scale systems.

Of course, all of these academic discussions on the role and dynamics of institutions for economic change continue to be part of the analysis of sustainable futures. However, in the face of the challenges caused by a systemic change, due in a relatively short time frame, we are already dealing with an *ex ante approach towards institutional evolution*, one that is to be given by the institutions that are being tailored to foster transitions. Facing the phenomenon of this ongoing institutional change, it is necessary to advance in understanding and designing institutional structures that can best support that evolution. From an evolutionary perspective, a lot of institutional learning and re-designing will be mandatory, demanding complex and gradual processes.

⁸ This debate has been originated by the European Union clean policies programme, based on the Strategic Niche Management concept. The broad outlines were published by Kemp, Schot and Hoogma (Kemp *et al.*, 1998).

The IAD framework was developed to analyze complex governance of resource systems, tackling *action situations* (Ostrom, 2005) and *involving collective choice and social interactions* (Märker *et al.*, 2018). It provides us with a very pertinent context for the analysis of the current institutional structure.

Section 2. The expected evolution of a new rationality for sustainable human systems

The unit of analysis for this framework is the duality institution-transition. It is based on the assumption that humanity will proceed to a more sustainable future.

Nonetheless, defining who gives and rules the patterns of what constitutes “sustainable” remains an open question. Institutional values do not exist in a vacuum, but result from sets of social relations that legitimate and support the interests of groups with a stake in existing constraints and that have the resources to make them dominant (Matthews & Sydneysmith, 2010; North, 1990, Blühdorn, 2015).

Who are the prime-movers and agents of such transition processes? What kind of governance ensemble is expected for a more sustainable world – since global scenarios are collective, beyond a national development perspective, and deeply asymmetric?

Those are not questions to be answered by this paper, but rather necessary to overcome the broad sustainability challenge; the “collective irrational choice” concerning the use of current natural resources by humanity may be a starting point for this discussion.

NIE has been struggling with the bounded or unbounded rationality, although in this paper’s case, the issue seems to be the unbounded irrationality concerning global modes of production and consumption.

Clearly, this is a *common-pool resources* issue (Ostrom *et al.*, 1994), and maybe the most complex civilization will have to tackle for a long time.

The “adaptation governance” (Bisaro & Hinkel, 2016) or, as this paper approaches it, the governance of transition, is a pillar of the discussion about the *reasons institutions emerge and how they enable or constrain adaptation*. This literature branch understands the term “adaptation” as a semantic approach quite present in the technical literature on climate change, e.g. IPCC reports⁹.

The NIE approach has been using the term “transition” as a correlate of the “adaptation process” that permeates the technical literature. IPCC AR5 cites the governance concept 36 times; in 21 of them, the relationship between governance and institutionality are expressed in the following 5 groups of related constructs:

- a) Common enabling factors and constraints for adaptation responses: *institutions, governance* and innovations;
- b) Building adaptative capacity: complex challenges that demand *governance* structures, new *institutions* and new *institutional arrangements*;
- c) Adaptation and mitigation are constrained by the inertia of global and regional trends in economic development: *institutions*, as well as improving *governance* coordination and cooperation can help overcome constraints;
- d) Policy coordination and actors capabilities for adaptation depend on *institutional arrangements*

⁹ IPCC AR5 Report - <https://archive.ipcc.ch/report/ar5/syr/>

- e) International *fora* have been focused on addressing climate change with nearly universal participation: a growing number of *institutions* have been organized at different levels of *governance*, that have resulted in the diversification of international cooperation on climate change.

In order to understand the potential mechanisms of transition and its governance challenge, it is fundamental to explore the ways in which attitudes and norms, as well as individual behaviors express the outcomes of social dilemmas (Borjesson, 2016). Social dilemmas occur when society or group members find themselves in conflict over creating or using shared public goods. Although each individual would be better off fulfilling their own private interest and denying socially cooperative choice, it is a fact that all individuals, as a group, are better off if all of them cooperate (Dawes, 1980; Gifford, 2006). This is a basic question of rational and irrational decision making. Putting it another way, we could ask, as has Blühdorn (2013), why, if the ecological discourse and urgency of culture change and structural transformation was never so widely accepted as today, have efforts of many activist movements and academics, as well as some government agencies, from local to global level, still not achieved *de facto* change in the development trajectory of modern societies? One reason may be centered in contemporary societies’“(…) ever expanding needs in terms of mobility, technology or shopping opportunities having become essentially non-negotiable” (Blühdorn, 2011, 2013).

Assuming that well-being and quality of life urges must be found to meet those expanding needs, how can it be that at the same time, society is being overflowed by awareness and campaigns on the crucial role of sustainability? One pathway may be understanding that such consumer traditions are not to be seen as obstacles to progress, but as new information. References to paradigm shifts, old and new theories and methods have always coexist (Lara, 2015; Borjesson, 2016). The opportunity is thus to develop further knowledge on societal rationality. People do have a tendency to leave things behind as old, and not necessarily return to them and this enchantment towards novelty is “(…) one driving force in the mismanagement of our resources and not least in the creation of waste” (Borjesson, 2016).

A serious analysis must take into account the reconfiguration of modern societies concerning principles of individual freedom, choice and self-realization. Those principles appear in conflict with the sustainability discourse as they are much “(…) based on accelerated consumption; highly complex, flexible and open to internal contradiction in ways that are incompatible with any notion of ecological virtues or an ethics of ecological duty or responsibility” (Blühdorn, 2013). In essence, this is the social dilemma, the conflict shown by Hardin’s “tragedy of the commons”, in which he stated that each person in society was locked into a system that compels him to increase his win without limit, in a world that is limited (Dawes, 1980). However, to acknowledge and manage this constant influence of non-rationality will be necessary in order to develop transition methodologies.

According to the founders of the concept of “wicked problem”, i.e. one with a very complex solution, Rittel and Webber (1973), the most burdensome problem is actually defining what a specific problem is (to distinguish an observed condition from a desired condition) and locating where, within a complex network, the problem really lies. Hence, the challenge is how to address rationality within the sustainability debate. Unlike rational choice theory, which assumes that the individual has unlimited analytical capability and perfect information in hands, Elinor Ostrom states that human beings have a bounded rationality, that is, a limited and adaptive one (Lara, 2015). In line with that statement, policy approaches directly determined by citizens and also looking to respond to their demands, may well imply in even less sustainability (Blühdorn, 2013). The social dilemma research acknowledges that

decision-makers do not all make the same choices because choices arise from the individual's experience of interacting with the world and patterns of influence filtering, as well as shared culture and preferences, or shared mental models (Lara, 2015; Gifford, 2006; Garcia-Parpet, 2013). Hence, the presence of incomplete information combined with limited and selective analytical ability to identify problems, all its possible solutions and consequences, individuals sometimes will probably come up with irrational decisions (Lara, 2015).

Irrational problems are not “wicked”, but they ask for novel approaches that acknowledge irrationality, according to Blühdorn (2013), by addressing the mechanisms that enable unsustainability to be sustained and their social and ecological implications managed.

Again, facing such alliteration fences – among “complex systems governance”, or “wicked systems” of the collective irrationality that permeates the recent modes of production and consumption, and “adaptive” or “evolutionary” terms used to understand the transition challenge towards sustainability, the scope and success of action for institutional change seems to be strongly linked to the learning concept (Hodgson, 2017)¹⁰, especially *collective learning* processes.

Section 3. Understanding Institutional Development Analysis for sustainable human future systems

This section offers an institutional framework for the management of *sustainability-mission-oriented institutions* (SMOI), based on the following assumptions:

- a) SMOI are essentially innovation-driven institutions, which performances are measured by social, technological, organizational and institutional innovation (Geels, & Schot, 2008; Kemp *et al.*, 1998); policy-making dynamics is a main issue for the diffusion of sustainable ensembles;
- b) SMOI are supposed to be structured as adaptive learning institutions, demanding iterative and interactive behaviors, such as networking, learning-by-doing and learning-by-interacting within cooperative and interorganizational contexts (Cohen & Levinthal, 1989, 1990; Sabel, 1993), as well as presenting strong absorptive capacity to understand and act on new sustainable demands (Mowery and Rosenberg, 1989; Arora and Gambardella, 1990 and 1994).
- c) SMOI are responses to demands currently unanswered by the huge plethora of institutional constructs: rules, incentives, laws, behaviors, expectations (Hodgson, 2017).

Integrated with these assumptions, the present work is based on the analytical structure of socio-ecological systems, as pointed out by Ostrom (2011), in order to operationalize the rule prioritization using the IAD conceptual framework. In IAD, each rule is classified according to the impact it has on the analyzed “action situation” and patterns resulting from interactions can be defined and evaluated.

¹⁰ “It is necessary to dismantle the rationality assumption underlying economic theory in order to approach constructively the nature of human learning. History demonstrates that ideas, ideologies, myths, dogmas, and prejudices matter...”(Hodgson, 2017, “Institutional Economics”, in “Rethinking Economics - An Introduction to Pluralist Economics, ed. Liliann Fischer, Joe Hasell, J. Christopher Proctor, David Uwakwe, Zach Ward Perkins, Catriona Watson Eds. Francis & Taylor, 2017).

The option for IAD approach is given by its intrinsic rationale and relevance to the SMOI challenge:

- It provides a systematic approach to analyzing the institutions that govern actions and outcomes in collective arrangements (Ostrom, 2007), just as represented by the nature of SMOI – the planned goal of achieving rational transition and collective decision making demands;
- SMOI goals are highly dependent on interactive and iterative processes, and, just as IAD perspective, institutions are defined as a set of prescriptions that people use to organize all forms of structured and repetitive interactions, such as rules and norms (Ostrom, 2005);
- The operational spectrum of the IAD approach – in which analysis of problems can take place at multiple levels – translates well into SMOI's perspective of collective decision making, focused on operational rules or, on the constitutional level, where rules, incentives or any other collective constraints represent collective choice, based on individuals' daily life options,
- The analytical focus of IAD is the *action arena*, composed of actors who perform *action situations*, involving choices of social or individual order, from which patterns of interaction derive; and a new pattern of interaction, concerning the sustainable future, is expected.

The *action situation*, as a conceptual unit, and as social space in which people interact and make trade, can be used to describe, analyze and explain behaviors within an institutional arrangement. Actors within the *action situation* may consider assumptions regarding variables that are directly related to the issue of sustainability governance: *i) the resources* actors bring to the action situation; *ii) the channels* actors use to obtain and maintain information about the problem they are involved with; *iii) the state of the art* and the state of the world and actions actors bring to the *situation* and *iv) the path* of the action actors choose.

Considering that the institution-transition construct presents a revolutionary and evolutionary characters, a multi-criteria approach is designed, linking IAD's three dimensions – physical/material conditions, attributes of community and rules-in-use to 5 institutional governance factors.

The governance institutional factors are: strategy, object, form, method and logic (Treisman & Edelenbos, 2011). “Strategy” is the action-oriented system through which sustainability goals will be achieved; “object” refers to the formal structure and dynamics of the duality institution-transition, subjected to human behavior; “form” is the structured evolution expected for SMOI; “method” refers to tools by which the SMOI should promote change regarding the desired future; and “logic” is the transition phenomenon as an actor-managed and policy-oriented process.

This seems to be a very comprehensive matrix of factors to be taken into account, especially by displaying SMOI's *core competences* (Penrose, 1971), based on the scope of actions for institutional change.

Table 1. Matrix of SMOI sustainability governance factors and IAD dimensions

SMOI Governance factors/ IAD Dimensions	Attributes of Community	Rules in Use	Physical and Material Conditions
<p>Strategy: action-orientation to achieve sustainability.</p>	<p>Promoting collective values, since a community's main attribute in achieving transition is the awareness of a given issue (Geels & Schot, 2008).</p> <p>Motivating local and regional skills and capabilities for sustainable practices and markets (Wieczorek <i>et al.</i>, 2015), which means scaling up agroecological or other sustainable approaches for the production and distribution chains.</p> <p>Fostering micro-adaptive capacity and resilient capabilities exhibited by small farmers and native people, since they are of strategic importance in coping with climate change.</p> <p>Fostering meso-adaptative capacity and resilient capabilities by scaling up industrial agribusiness and any other industrial activities.</p> <p>Fostering network and producers' cooperatives formation and network effects (Katz & Shapiro, 1993), for the low diversity of smallholder production may have little value in isolation, but generate higher value when combined with others, in structured business.</p> <p>Promoting iterative experiments of sustainable production and consumption – at the level of city or district scales, to foster new arrangements, by facilitating the engagement of stakeholders, generating trust and legitimacy in the implemented actions (Madsen & Hansen, 2019; Coutard & Rutherford, 2010; McCormick <i>et al.</i>, 2013); the evolution of these arrangements is essential to understand the possibilities of: <i>a)</i> the collective learning processes to make</p>	<p>Applying permanent efforts to understand the cognitive rules transition process (Greif & Mokyry, 2016), because the orientation of the action, regarding the new rules for sustainable ensembles, depend on a framework of informal rules that are internalized in the community (Greif & Mokyry, 2016; Ostrom, 2005).</p> <p>Performing permanent and strong actions for sustainable policy analysis, policy decision-making and policy frameworks proposals (Geels, 2011; Hill, 1993; Lindblom, 1978; Polski & Ostrom, 1998).</p> <p>Adopting and addressing public choice approach for public policy demands on circular economy (Geissdoerfer, 2017; Meira, 2014; Dagnino, 2012), concerning social diversity and modes of production and consumption chains.</p>	<p>Search and follow policy making and its implementation from collective constrains and mechanisms for sustainable innovation diffusion. (Kemp <i>et al.</i>, 1998; Kemp, 2010; Ostrom <i>et al.</i>, 1994).</p> <p>Incentive innovative sustainable systems (Scotchmer, 2004) through property rights and patent policies, regulation, social norms in production chains and consumption systems, reduction of transation costs for sustainable systems chains, tax incentives for sustainable innovation.</p> <p>Conceptual use and adaptation of the national innovation systems, its elements and relationships that interact in the production, diffusion and use of new useful knowledge (Lundvall, 1992; Nelson & Rosenberg, 1993), for sustainable future.</p> <p>Policy making to foster and keep prevalence of complex and diversified modes of production, as traditional knowledge based cropping systems and alternative uses of biodiversity.</p> <p>Policy making for environmental sustainability – as natural biomass and</p>

	<p>sustainable markets viable; <i>b</i>) transaction cost reduction and best governance for resilient sustainable market structures (Williamson, 1993).</p> <p>Creating <i>integration capabilities</i>, because the mission to monitor the change depends on the ability to integrate new actors, groups and demands, in addition to new institutions arising during the process (Giddens, 1984; Nelson, 2008).</p> <p>Paying attention to science’s forms of communicating and its links with what may or may not be perceived as truth (Wynne, 1989).</p>		<p>biodiversity preservation and their sustainable use, combined with social and economic development.</p> <p>Include traditional and local knowledge in global standards of sustainability and sustainable best practices (Perez-Aleman, 2012).</p>
<p>Object: of the transition goals.</p>	<p>Adopting transition oriented long term perspective (Ostrom, 2011).</p> <p>Monitoring the <i>transition for sustainability concept evolution</i>, concerning its policy and political dimensions (Kemp & Rotmans, 2005; Kemp <i>et al.</i>, 2007; Geels, 2011).</p> <p>Promoting education, skills and communication for transition: from linear economy of the “take-make-use-dispose” model of production, distribution and consumption (Andrews, 2015), as a planned obsolescence market rational (Coase, 1972; Waldman, 1993) to a regenerative approach of resources use (Ellen McArthur Foundation, 2016).</p>	<p>Strong performance on <i>sustainable prescriptions</i> (North, 1990; Ostrom, 2005), in order to keep rules for the desired transition clear.</p> <p>Defining and implementing planned rational transition goals (Nill & Kemp, 2009).</p> <p>Promoting the rule of law from a <i>sustainable future perspective</i>, at national and international levels, according to the United Nations Development Goals, upward and downward accountability in institutions, enhanced participation, freedoms and capabilities, in order to bring up the baseline for developing countries and poorer global populations (Gupta & Vegelin, 2016).</p>	<p>Keep strong and permanent attention at sustainable governance indicators, data and reports as national and international climate change investigation initiatives and their impacts in countries, sustainability efforts or counterfactual efforts (Schmidt-Traub <i>et al.</i>, 2017).</p>
<p>Form: the structure and evolution of mission oriented institutions.</p>	<p>Promoting the creation of transition oriented institutions networks, as meso-level initiatives – from global to country’s dimension - expanding actor networks and mechanisms for making lessons mobile and accessible to other places and making knowledge</p>	<p>Adopting an exemplar model to understand and follow the diffusion processes of clean or ecoinnovation. Diffusion of clean technology, as the diffusion of any innovation, is governed by endogenous mechanisms, like epidemic learning and learning economies; and by</p>	<p>Foster technological, social, environmental and organizational sustainable innovation solutions under ecological economics perspective (Romeiro, 2012) and eco-innovation perspective (Kemp, 2010; Rennings, 2000).</p>

	<p>spillovers (Wieczorek <i>et al.</i>, 2015; Dawes, 1980; Gifford, 2006).</p> <p>Performing strong and permanent efforts in modelling complex systems: mapping the nexus among resources uses in order to propose the reduction of its dysfunctionalities (Bazilian <i>et al.</i>, 2011).</p> <p>Searching and following global processes of targeted capacity building to enable effective participation of a broad diversity of stakeholders (Gupta & Vegelin, 2016).</p>	<p>exogenous mechanisms (Kemp & Volpi, 2008).</p> <p>Searching and following transnational coalitions and coordinated efforts toward sustainability - in the form of international agreements, such as pool resources and coordinated state policies, that provide cooperative gains for global sustainability patterns (Böhmelt e Butkutè, 2018; Roggero <i>et al.</i>, 2019); this procedure can guide the evolution of new SMOI forms.</p>	<p>Understand and perform the integration of new actors as a “polycentric political system” (Ostrom, 2005; Ostrom <i>et al.</i>, 1961; Hagedorn, 2002), once the sustainability collective problem <i>should be able to address that problem in whatever way they best see fit</i> (McGinnis, 2005).</p>
<p>Methods: the prime-movers for the promotion of transition</p>	<p>Performing education for sustainability initiatives (Vare & Scott, 2007) at the local, regional, national and international levels.</p>	<p>Searching and following public regulation and self-regulation arrangement provisions, by business actors, and public-private or private-private partnerships, through several certifications, codes of conduct and standards (Fuchs, 2007; Benites-Lazaro <i>et al.</i>, 2018).</p> <p>Creating markets to upscale new green technologies (Sengers, 2019).</p> <p>Implementing tax exemptions in order to create economic incentives to move towards more sustainable production ventures, (Madsen & Hansen, 2019).</p> <p>Deregulating highly negative environmental impact industries, exposing this sector to new pressures, leading to the emergence of more sustainable alternative technologies, more sustainable organizational and resources innovative modes of production and natural resource uses (Berkhout <i>et al.</i>, 2009).</p> <p>Keeping attention on “operational rules”, the regulatory dimension of the</p>	<p>Decision-making methods based on environmental monitoring techniques, as satellite and earth monitoring systems for climate change and scientific production analysis.</p> <p>Use the existing tools and methods and create new ones of technological, social and organizational foresight, in order to understand the evolution of the transition complex systems through sustainability (Martin, 1995).</p>

		<p>management methods, the main promoters of the transition, since agents need to take into consideration that if changes in social values occur, they are usually operating on a system of participatory governance with associated collective decisions and empowerment of stakeholders (Kemp <i>et al.</i>, 1998). Because of the role of collective choices, center to the co-creation and development of innovations, they are fundamental to make about changes.</p> <p>Searching, testing and validating instruments related to the comprehension of transition process, since goals to end poverty and build shared prosperity translate into sustainability (World Bank Agenda, 2030; Gupta & Vegelin, 2016).</p>	
<p>Logic: actor management for sustainable policy processes.</p>	<p>Searching and understanding sustainability's multiple narratives, epistemes, and paradigms from the political perspective: governance, rational choice, agency and institutionalist approaches (Bevir & Rhodes, 2001; Thaler, 2000; Etzoni, 1996; Ostrom, 2000).</p> <p>Adopting an exemplar model to understand and follow diffusion processes of clean or ecoinnovation. Diffusion of clean technology, as the diffusion of any innovation, is governed by endogenous mechanisms, like epidemic learning and learning economies; and by exogenous mechanisms. (Kemp & Volpi, 2008).</p>	<p>Searching and understanding collective governance processes (Ostrom, 1990).</p>	<p>Foster regulatory, legal and tax advantages for sustainable production, and environmental services (Gómez-Baggethun <i>et al.</i>, 2010).</p> <p>Include “social technology” and “solidary economy” concepts (Dagnino, 2012; Meira, 2014, Rodrigues & Barbieri, 2008), as channels to strengthen small users-oriented innovations.</p>

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