

Co-constructing Retrospective and Retroductive Global Problematiques Virtually with the Logosofia platform, in the context of the Climate Crisis

A report on the Gedanken-Experiment

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ABSTRACT

The original prospectus of the Club of Rome (CoR) on the Predicament of Mankind included a set of forty-nine Continuous Critical Problems (CCPs), conceptualized and articulated by Hasan Ozbekhan (Ozbekhan, 1970). This set of CCPs, on account of their strong interactions over time, have created a new entity, identified in the CoR prospectus as the Global Problematique. In this paper, we employed the virtual mode of the Logosofia platform that supports the methodology of Structured Dialogic Design (SDD), to perform a “Gedanken-experiment.” We engage a multinational group of SDD practitioners and advocates spread globally, in the co-construction of two Problematiques of the situational complexity corresponding to the global climate crisis, namely: (a) a Retrospective Problematique, co-constructed by the group by means of abductive reasoning retrospectively, i.e., “what **would** have happened during the last fifty years (1970 - 2020), if certain CCP’s had been ameliorated,” and (b) a Retroductive Problematique, co-constructed by the group by means of normative retroductive reasoning, i.e., “what **should** happen in the next thirty years (2020 - 2050), by the amelioration of certain CCPs.” The lessons learned from the co-construction of these two Global Problematiques are interpreted and compared. From the diagnosis emerging from the root source of the Retroductive Problematique, plausible corrective policy/actions are proposed for the amelioration of the climate crisis by the year 2050.

Key works: Club of Rome, Problematique, Structured Dialogic Design, Logosofia platform, situational complexity, intersubjectivity, Co-construction, Retroductive reasoning.

INTRODUCTION

This paper is dedicated to Hasan Ozbekhan, the great systems thinker and mentor, who conceptualized the original prospectus of the Club of Rome on the predicament of Mankind, and articulated the components of the Global Problematique fifty years ago. We are grateful to Hasan for his vision and ability to imagine a world that has never been. Ozbekhan and Christakis were close friends for forty-years, transcending the boundaries and stereotype of perpetual hostilities between Turks and Greeks.

The methodology of Structured Dialogic Design (SDD) has been developed and applied globally over the last fifty years with a variety of social and business systems design challenges, always with the inclusion of stakeholders. There exist testimonials of its beneficial impacts in effectively navigating situational complexity from a variety of organizational leaders, leading to consensus and progress in the definition and resolution of wicked problems.

The evolutionary origins of the SDD methodology can be traced to three milestone events that occurred early in the decade of the 1970s. These are:

1. The development of the science of human settlements, Ekistics, (Doxiadis, 1968);
2. The Club of Rome prospectus on the predicament of Mankind (Ozbekhan, 1970; Christakis, 1973, 1988, 2004), and;
3. The interdisciplinary experiment of designing a hypothetical city of one million people (Arnstein & Christakis, 1976; Warfield 1976).

These events have been discussed in the literature extensively (See Bibliography, for example Christakis and Bausch, 2006; Flanagan & Christakis, 2010, 2021; Trevino et al, 2013).

A marshaling event was the Club of Rome (CoR) prospectus on the “Predicament of Mankind” in 1970, in which the concept of the Global Problematique was defined for the first time. Some of the ontological constructs incorporated in the development of the SDD methodology described in this paper were also conceptualized in the CoR prospectus for the first time. For example, the construction of affinity clusters and influence trees of ideas were discussed by Ozbekhan in the CoR prospectus; however, at the time there was not a platform like Logosofia (Diedrich and Christakis, 2021), or the Interpretive Structural Modeling (ISM) method (Warfield, 1976) available to enable interdisciplinary teams to construct graphic representations by means of disciplined deliberations efficiently and effectively. Additionally, the CoR prospectus corresponds to a scientific revolution (Kuhn, 1970), because it includes the conceptualization of the deployment of appropriate methods for engaging stakeholders in defining the Global Problematique, resulting from the convergence and strong interactions among forty-nine Continuous Critical Problems identified by (Ozbekhan, 1970).

In Figure 1, we display graphically the variety, reusability, and robustness of the SDD methodology. For the last fifty years, it has been verified in the domains of Environmental and Natural Resource Stewardship; Social, Economic, Educational, Professional, and Cultural Development; Healthcare Systems, Biomedical Research, Development and Regulation; and Technology, Capital, and Knowledge Management. The applications of collaborative inquiry span a three-to-twenty-year planning horizon and include: Policy Development; Long-Range Strategic Planning; Research and Aggregate Program Planning and Decision Making; Enterprise and Information Systems Reengineering; and Process Design. In the past couple of decades it has become a methodology of choice for rapid launch of large-scale interorganizational, interagency initiatives involving scores of constituencies such as Future Scenarios for Regional Development, Formation and Redirection of Industrial Consortia (Jones 2018; Weigand, 2014), Stakeholder Driven Modernization of Regulatory Policy, formation of Cross-Sector Public-Private Partnerships, and bi-communal peace-building initiatives in Cyprus involving

Turkish and Greek Cypriots (Laouris & Christakis, 2007; Romm, 2010). Figure 1, shows graphically the variety of the applications of the methodology over the years world-wide.

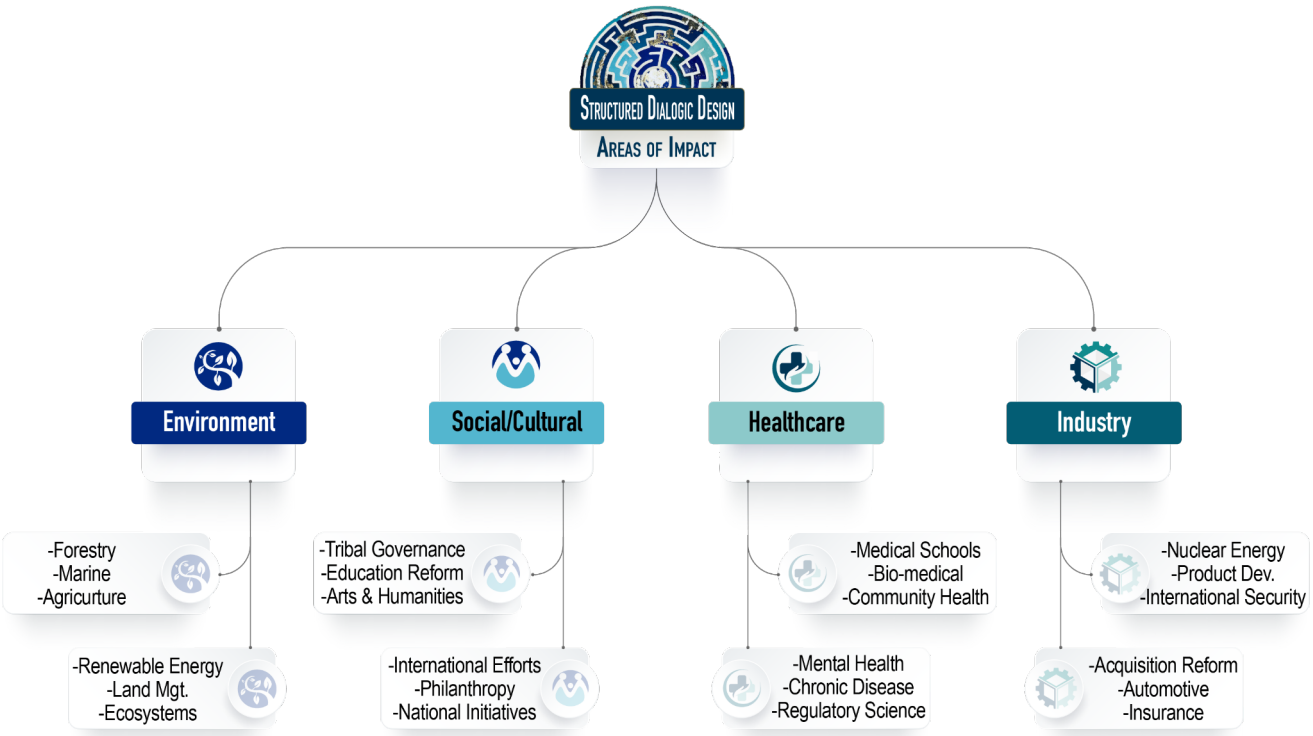


Figure 1: Representing the variety of applicability and reusability of the SDD methodology

In Figure 2, we display graphically the global distribution of SDD applications beginning with the year 1972, when the Academy for Contemporary Problems was established, where Warfield and Christakis collaborated as Fellows of the Academy, and started the development and application of the set of Consensus methods (Diedrich et al, 2022; Kakoulaki et al, 2022).

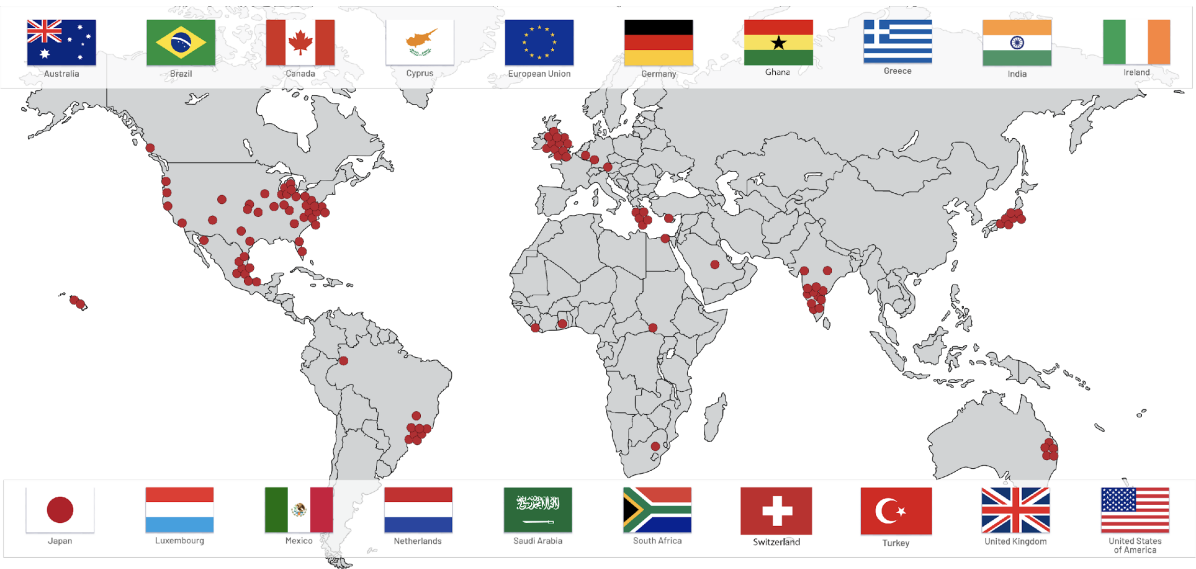


Figure 2: Global distribution of SDD applications since 1972.

In this paper we will focus primarily on the deployment of the Logosofia platform for the co-construction of two alternative Problematiques with a subset of the CCPs of the CoR prospectus, that are specifically relevant to the climate change crisis. The first Problematique is Retrospective, looking backwards for a period of fifty years from 1970 to 2020. The second Problematique is Retroductive, looking forwards to the period extending from 2020 to 2050. We will also review some of the principles that are based on the lessons learned from fifty years of applications of SDD in the arena of practice. More specifically, these lessons focus on the role of the Logosofia platform in the practice of systemic and ephemeral thinking by interdisciplinary, intersubjective, and cross-functional teams for achieving organizational excellence in planning and design.

THE GLOBAL PROBLEMATIQUE

The Concept of the Problematique

The idea of the Problematique was introduced in the CoR proposal as a way to draw a linguistic, and hence conceptual, distinction between the well-bounded problems that we are accustomed to perceive and articulate, and the meta-problem (or the enormous problem) that emerges as a result of the interactivity and interdependency among these problems.

It is the nature of our languages, hence our manner of perceiving reality, to see and call the dissonant elements in a situation "problems." Although it is true that there are certain problems (mostly within one discipline and usually in the field of engineering and physical sciences, where the construction of observations is designed to be observer-independent and hence by definition "objective"), that can be addressed in their own domains by applying conventional problem-solving techniques. However, it has become empirically evident over the last fifty years, starting with the urban development projects of the 1970s in the USA, that critical issues in the social arena are not capable of being resolved in their own specific domains.

When we consider the truly critical issues of our times, such as "climate change," "environmental pollution," "poverty," "homelessness," "criminality," "population explosion," "urban deterioration," "racial and cultural discrimination," "biodiversity reduction," etc., we recognize that it is virtually meaningless to view these as problems that exist in isolation of each other or independent of human intervention. The burning of Los Angeles in the summer of 1992, after the verdict on the Rodney King human rights trial, provides evidence that criminal justice cannot be divorced from race, poverty and slum living conditions. Thirty years later, the "Black Lives Matter" movement of 2020, is another manifestation of the racial discrimination injustice that has deep roots and connection to other issues such as educational inequalities, poverty, heritage, etc. Similarly, problems clustered under words such as "hunger" or "malnutrition" in Somalia cannot be separated from social, economic, and geopolitical problems on the global scale. Trying to solve any of these problems in isolation exacerbates the intensity of the Problematique, whose resolution is beyond the scope of the concepts and methods we have traditionally employed during most of the 20th century.

As a means to visualize the interactivity of problems it is useful to look at Figure 3. This Figure provides a graphic portrayal of the dynamic and interactive development of the Problematique in the 20th century. It shows problem areas in three frames with approximate dates. In each frame, a particular problem area is symbolized by differently shaped shaded areas. One sees that at the start of the 20th century (Frame A, Year 1900) each problem area is distanced from the others. Because each area is separated from the others it is meaningful to think and tackle these as independent problem areas. It is with reference to this type of situation that most of our problem-solving methods and approaches were developed and applied in the 20th century.

By the middle of the 20th century, the problem areas began to interact because of the escalation of the intensity of each problem area (Frame B, Year 1950). These interactivity trends continued at an accelerated rate during the next twenty years. The individual problem areas began to strongly interact and overlap in the 1970s (Frame C). The emergence of large-scale metropolitan areas (Megalopolis of Doxiadis, 1968), where it is meaningless to separate the transportation problem from the pollution problem, from the population explosion problem, and so on, provides an example of this interactivity as shown visually in Frame C (Year 1970).

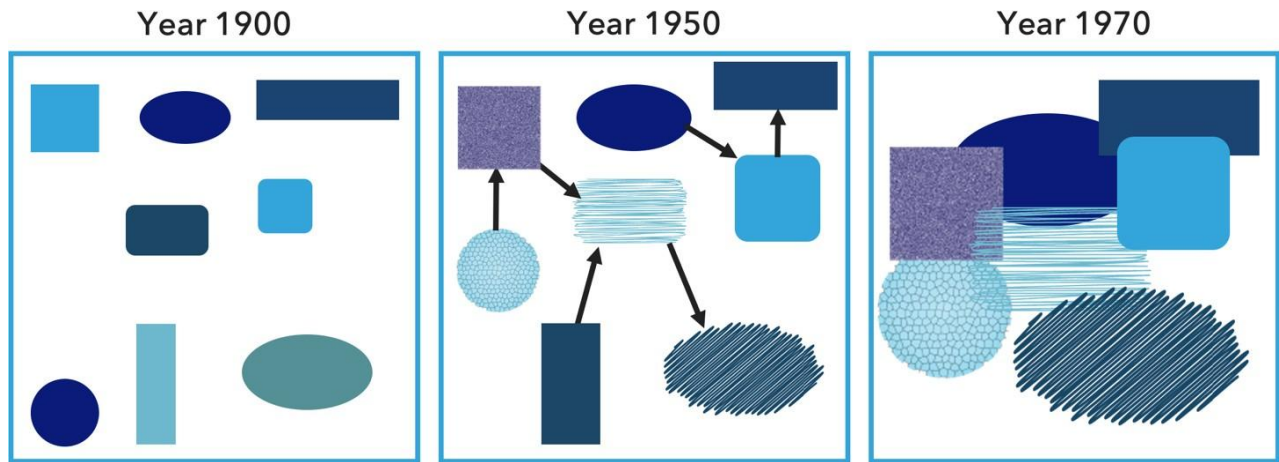


Figure 3: Dynamics of the Problematique for the 20th Century.

By 2021, the situational complexity appears to look more as an “enormous mess” that cannot any more be dealt with in terms of its individual problem areas but must be addressed in its entirety (Year 2021, in Figure 4), and preferably with the inclusion of stakeholders’ perspectives. Attempts at fragmentation of reality and non-inclusion of the voices of stakeholders have exacerbated the “situational complexity.” Over the previous five decades, Problematiques have contributed to serious social and technical disasters, such as the burning of Los Angeles in 1992, the escalation of the nuclear arms race in the 1980s, the mythology espoused by the World Bank of “trickle down” social and economic development of third world countries, the nuclear disasters at the Three Mile Island and the Chernobyl power plants in the 1980s, the COVID-19 pandemic crisis of 2020, and many more to come.

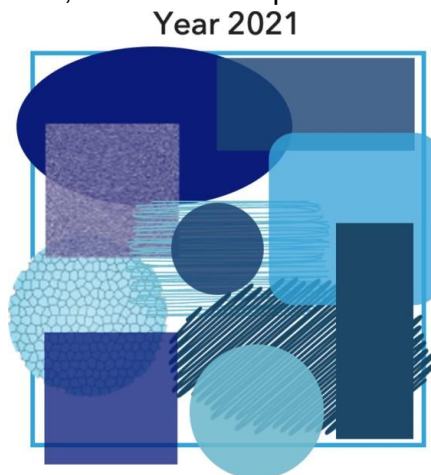


Figure 4: The morphology of the Problematique in the year 2021

By 2021, we are experiencing a situation whose morphology is drastically different because of the strength of interdependencies among the problem areas, giving rise to a composite core that needs to be co-constructed, explicated, and understood by all stakeholders for its own sake. In other words, the dynamic convergence of all these originally distinct problem areas has given rise to a new entity, namely the Problematique of the year 2021. The strength of couplings and overlaps is such that a new approach is required to navigate the situational complexity efficiently and effectively, as a single complex system of problems. The traditional means of breaking it apart in its component parts and assigning responsibility to various individuals or government departments with expertise in the separate areas would not be effective any longer. Such a systems approach, to be effective and meaningful, should be capable of engaging stakeholders in intersubjective deliberations for the purpose of articulating and internalizing the Problematique, and integrating their relevant knowledge and wisdom as a systemic representation. This systemic approach should also redefine the notion of “the expert” so that all the voices of the people affected by the Problematique will be heard, independent of their education, social status, or power (Kakoulaki & Christakis, 2018; Christakis & Kakoulaki, 2021).

The original conceptualization of the CoR prospectus advocated the position that any attempt to resolve the global Problematique founded on traditional elitists, exclusionary, and disciplinary approaches is doomed to failure. In 1993, Ozbekhan and Christakis conducted a structural inquiry of the Problematique as articulated in the CoR prospectus by means of forty-nine Continuous Critical Problems (CCPs), employing the CogniScope software, which was available at the time for supporting the application of SDD. The findings from this inquiry, twenty-three years after the CoR prospectus, indicated that no significant progress had been accomplished in terms of penetrating the core of the Problematique, which as discovered in this inquiry was the “value-base” (Christakis, 2004; See also “*Misleading Modelling of Global Crises*, by Anthony Judge: <https://www.laetusinpraesens.org/docs20s/modeling.php>). As mentioned, the Problematique was described in the prospectus by the articulation of forty-nine CCPs. The CCP that was determined by the structural inquiry of 1993 to be at its core is:

(CCP-18) GROWING IRRELEVANCE OF TRADITIONAL VALUES AND CONTINUING FAILURE TO
EVOLVE NEW VALUE SYSTEMS

The Role of the Value-Base

Even though the complexity of the Global Problematique demands that we avoid fragmenting complexity, the fragmentation of reality is inherent to our conceptual and linguistic make up. It is a limitation that applies to all natural languages. The challenge is to transcend this limitation by enabling stakeholders to use natural language to discover collectively, systemically, and collaboratively the systemic nature of the Problematique.

Having discovered the essence of the Problematique, the same or a different group of stakeholders depending on the situation, should be engaged in designing action plans for making progress toward resolving it. Ideally, in an authentic deliberative democracy the definition and resolution of the Problematique should not be the sole responsibility of disciplinary experts and politicians only. People, whose value-base and quality of life will be affected by the policies and decisions adopted, should be engaged if real progress is to be accomplished. It took approximately twenty years of research and testing in the arena of practice for a group of systems scientists to meet this challenge by developing the SDD approach (Warfield, 1994; Warfield & Cardenas, 1994; Christakis & Bausch, 2006; Flanagan & Christakis, 2010, 2021; Flanagan & Lindell, 2018).

The Demosofia paradigm, when implemented with the SDD methodology, represents the correct response to the role of the value-base in planning, as conceptualized by Ozbekhan in his seminal chapter titled “Toward a General Theory of Planning,” published in 1968, in “Perspectives of Planning,” edited by the distinguished systems scientist

named Erich Jantsch. Ozbekhan wrote in the chapter:

"In my view there is no more important question in planning discourse; it is truly the heart of the matter. Let me begin by saying. Yes, we can will the future, but only if change is caused to occur in values rather than an object's other attributes. What I mean is that any change that is not a fundamental change in values merely extends the present rather than creating the future. It seems to me that from this general postulate one can derive five statements which govern all planning:

- 1. Only change in the overall configuration of values can change the present situation;*
- 2. Only individual will can bring about such value changes;*
- 3. Value changes cannot be predicted;*
- 4. Value changes always occur as individual ideas, or responses, or insights concerning betterment, and when they become socialized over a large part of the system we have 'progress;'*
- 5. Planning is the organization of progress. Thus, the main subject of planning is the willed future."*

Navigating the Labyrinth of Situational Complexity

The variety of applications of SDD in terms of impact areas and world-wide distribution for a period of fifty years, starting with 1970, is shown graphically in Figures 1 and 2, respectively. From more than one thousand applications of the methodology, we have accumulated evidence validating six principles regarding the phenomenon of situational complexity, and how to navigate it with the support of the Logosofia platform, systemically, ephemerally, effectively, and effectively for achieving organizational excellence (Christakis et al, 2022). These six principles are:

Principle 1: Situational complexity

Situational complexity is a phenomenon that emerges when intersubjective teams of stakeholders attempt to collaboratively define/resolve wicked problems and/or design complex systems.

Historically, the most common criterion employed to decide on the relevance and applicability of Logosofia has been whether other methodologies when applied for navigating situational complexity have failed to make progress. For example, in 1987, a Comanche tribal leader named LaDonna Harris, the founder and President of Americans for Indian Opportunity (www.AIO.org), approached Christakis, when he was the Director of the Center for Interactive Management at George Mason University, and asked him to apply the methodology to issues of Tribal governance for the indigenous people. She shared with him the fact that all other approaches for consensus-building had failed. Christakis was initially reluctant to get involved with tribal governance issues, knowing how the Native American tribes have been culturally abused by interventions from the "White Man." He finally agreed to apply the methodology in close collaboration with LaDonna Harris. The first application project engaged fifteen tribal chiefs from a variety of tribes, focusing on defining the situational complexity of tribal governance (Broome & Christakis, 1988). This application contributed to a breakthrough in the design of strategies for emancipation (Alexander, 2002), in terms of supporting the governance of tribal affairs in the USA, and internationally (Christakis & Harris, 2004).

Something similar happened with the CEO of a pharmaceutical company, who was attempting to persuade a therapeutic team to discontinue the research and development of a drug, because he was convinced that it would not be cost-effective and competitive in the marketplace. He was reluctant to intervene with a directive to stop the project. He had applied a variety of approaches to make the team internalize the weaknesses of the drug. After

all methods had failed, he decided to engage the SDD consultancy of CWA Ltd in 1993. We will elaborate on this case later in this paper with the discussion of a Table with measurements of indices of situational complexity. This application of the methodology was so successful, that the CEO of the pharmaceutical company recommended its utilization to the regulators of the industry, namely the Food and Drug Administration (FDA) of the USA. The FDA adopted and applied SDD with interdisciplinary teams of the Center for Drug Evaluation and Research (CDER) for five years, culminating in the agency winning an innovation in Government award from the Kennedy Center of Harvard University in 1996.

Both these examples demonstrate that situational complexity is a phenomenon that requires a specially designed environment (i.e., a Situation Room), and an appropriate systemic methodology for navigating it effectively (Flanagan & Christakis, 2010).

Principle 2: Three types of observational complexity

Empirical evidence gathered from world-wide applications (see Figures 1 and 2), has demonstrated that situational complexity is the composite results of the superposition of three distinguishable observational complexities, namely:

- 1. **Objective**, which is “observer- independent” and all actions for improving the situation are not included;
- 2. **Subjective**, which is “observer-dependent,” and includes partially actions, and;
- 3. **Intersubjective**, which is “observer-interdependent,” and includes fully actions for improving the situation.

These three distinguishable observational complexities can be conceptually connected to the three phases of science as defined by (de Zeeuw, G., 1996), namely: (a) First Phase Science, (b) Second Phase Science, and (c)Third Phase Science, as shown in Figure 5.

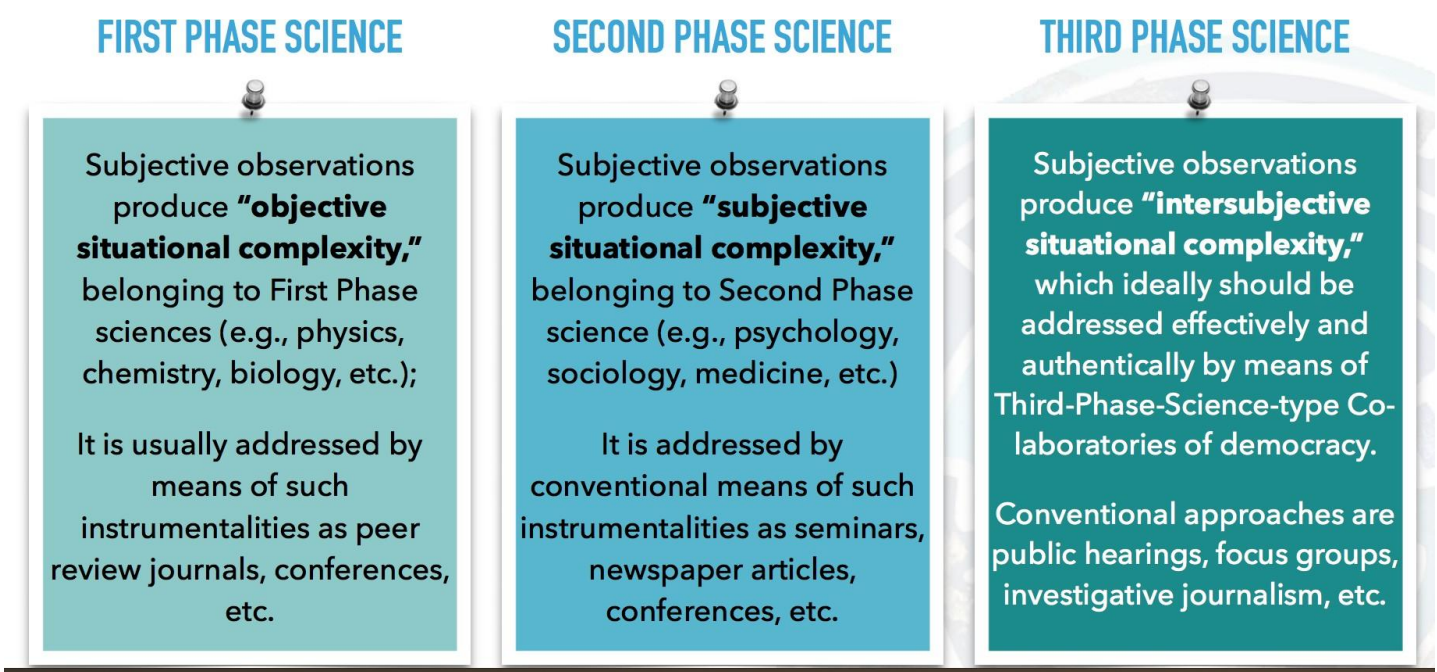


Figure 5: The three types of complexity and their relationship to the three phases of science.

We will elaborate on the distinctions among these three types of observational complexity as they relate to the three phases of science, shown in Figure 5. We take it as a given that all observations by human observers are by their very nature subjective (Christakis & Kakoulaki, 2021). We argue for the subjectivity of all observations

because our experience from the arena suggests that there is a predisposition by the majority of team members (observers) to claim, at the start of any group deliberations, that their observations correspond to “objective reality and universal truth.” We argue that this phenomenon is primarily due to: (a) the social conditioning of most observers to try to dominate the discourse, and (b) the quest for the “truth” in order to collaboratively improve the situation and the quality of life by designing consensual action plans.

We will elaborate below on the linkages among the types of observational complexity and the phases of science:

First Phase Science - Objective Complexity

Definition: Subjective observations produce “objective situational complexity,” belonging to First Phase sciences (e.g., physics, chemistry, engineering, biology, etc.); Actions for improving the situation are excluded from observations relevant to this type of complexity.

This type of observational complexity is usually addressed by conventional means of communications, such as peer review journals, lectures, conferences, seminars, etc. The advantage of First Phase Science is the objectivity and reproducibility of observations. For example, an apple falling from a tree in ancient Athens, and an apple falling from a tree in New York city today, will behave in accordance with the Law of Gravitation of Newton, and reports of this phenomenon by different observers will be identical. This type of complexity contributes to the emergence of situational complexity when it overlaps with the other two types in the context of group deliberations (see Figure 6 below). For example, if a group is focusing on the situational complexity of climate change, those observations brought to the deliberation of an intersubjective team by a meteorologist will become an integral component of the composite resulting from the superposition of the three distinct observational complexities, as shown in Figure 6.

Second Phase Science - Subjective Complexity

Definition: Subjective observations produce “subjective situational complexity,” belonging to Second Phase sciences (e.g., psychology, anthropology, journalism, medicine, etc.). It is addressed by conventional means of communications, such as seminars, psychotherapy, newspaper articles, conferences, etc. Actions for improving the situation are partially included in these observations.

A good example of this type of complexity is the so-called “white coat” phenomenon that is observed when a doctor measures the blood pressure of a patient. The presence of the doctor influences the measurement of the blood pressure. Another example of subjective complexity appears when we are diagnosed with a serious illness. We usually want to get a second opinion, recognizing that medicine is not a First Phase Science like physics or chemistry. It is conceivable that two different doctors will prescribe two alternative therapies for a patient, in which case he/she is confronted with the dilemma of which therapeutic regimen to adopt for treatment. For example, in the case of an interdisciplinary team addressing the situational complexity of the coronavirus pandemic of 2021, there will be divergence of observational viewpoints among epidemiologists, which can only be resolved by successive approximations and iterations in task force deliberations.

Third Phase Science - Intersubjective Complexity

Definition: Subjective observations produce “intersubjective situational complexity,” which in many instances should be addressed effectively and authentically by means of Third-Phase Science-type Co-laboratories (Diedrich & Christakis, 2021) for consensus-building through deliberative dialogue. Conventional approaches are interdisciplinary teams, public hearings, focus groups, investigative journalism, etc.

For this type of observational complexity, especially because of the full inclusion of actions for improving the situation, it appears desirable to apply SDD with Logosofia for building consensus especially in order to objectify

intersubjectivity through inclusion (Christakis & Kakoulaki, 2021). The ideal environment for navigating this type of observational complexity is the availability of a Situation Room in the context of a Co-laboratory of Democracy, as described in the next section.

It is also important to realize that the phenomenon of situational complexity emerges in the context of intersubjective team work, i.e., when the three types of observational complexity overlap as a result of the interaction and deliberation of a group of stakeholders participating at a Co-laboratory dialogue. We often seek a single, static solution to address objective and even subjective complexity, while ignoring the intersubjective component of situational complexity. Intersubjective complexity is a major source for espousing an ephemeral, dynamic approach for the definition and resolution of “wicked problems.” Ignoring the ephemeral nature of intersubjective complexity perpetuates the current situation and reduces the plausibility of conscious evolution and normative planning for an organization.



Figure 6: Showing graphically the emergence of situational complexity as the composite of the overlap of the three distinct types of observational complexity, resulting from the interactions and deliberations among the members of an intersubjective team of stakeholders

The Co-laboratory of Democracy

The Co-laboratory of Democracy applies the SDD methodology for engaging a group of participants in an authentic, effective, efficient, and democratic deliberation. This approach to deliberative dialogue emulates the Agora of the Athenian democracy in 600 BC, and is based on four distinct and overlapping steps, namely: (a) Generation and clarification of ideas in response to a Triggering Question (TQ) that has been framed during the Discovery phase (Diedrich & Christakis, 2021), (b) Evaluation of the ideas proposed, by asking participants to vote on the relative saliency of the ideas at various points during the deliberation, (c) Clustering the set of ideas into affinity groups by employing the similarity relationship, and (d) Mapping a priority subset of ideas by exploring pairwise relationships of influence among them, and producing a tree-pattern displaying their influences (digraph). These four steps are shown graphically below as a function of the time allocated to each step during the Co-laboratory (see Figure 7). The two indices plotted in the graph display the percentage of: (a) the Divergence (D),

which is a measure of the variety of perspective and ideas contributed by the participants, and (b) the Consensus, which is a measure of the degree of consensus obtained by the participants to the deliberations as a function of Co-laboratory time. Notice that the two indices in the graph of Figure 7, cross at approximately fifty percent each at four-and-one-half hours from the start of the deliberations. Also notice that about eighty percent consensus is attained after about eight hours of group work.

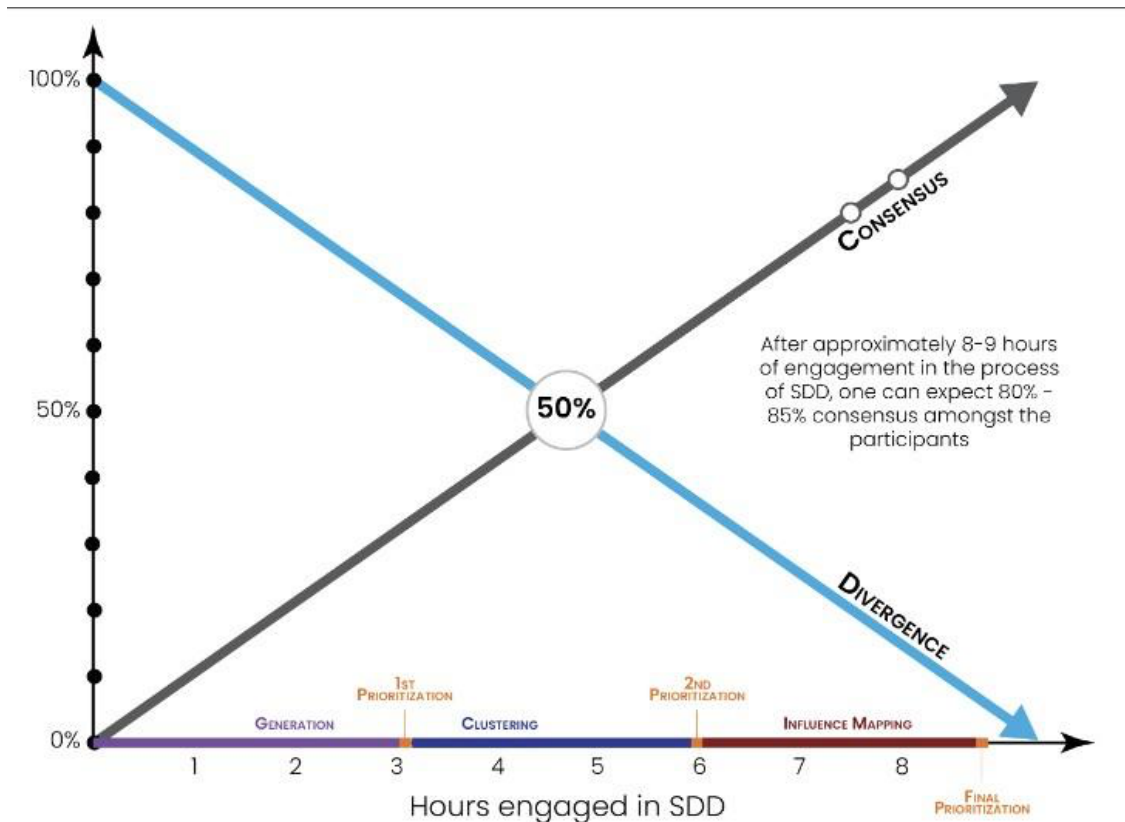


Figure 7: Displaying graphically as a function of colab time the evolution of the two indices of Divergence (D) and Consensus during a team colab.

Each colab starts by presenting and clarifying to the team the TQ that they are asked to address. For more details regarding the design and conduct of colabs the interested readers should consult (Christakis & Bausch, 2006; Diedrich & Christakis, 2021).

Principle 3: The challenge of Intersubjectivity

The challenge of our era is to objectify intersubjectivity through inclusion for a scientific revolution (paradigm shift). Meeting this challenge implies embracing “conscious evolution” instead of “evolutionary consciousness” (Banathy, 1996). Conscious evolution means creating the future instead of extrapolating the data base of the current situation.

We have all experienced the benefits of dialogue when we openly and thoughtfully confront complexity. We have also experienced the frustration of interminable discussion that does not lead to progress. The application of the Logosofia platform leverages the use of the SDD methodology in conducting Co-laboratories, and efficiently enables intersubjective teams to dialogue and to navigate the Labyrinth of situational complexity. It accomplishes this by ensuring that the six laws of the science (Variety, Parsimony, Saliency Authenticity, Meaning, and

Evolutionary learning) are implemented, especially respecting the authenticity and protecting the cognitive limitations of every participant during the deliberations (Christakis & Bausch, 2006). Co-laboratories empower teams of stakeholders to objectify the intersubjective-type complexity, by building consensus. By enforcing the six laws of the theory of the science of dialogic design, the colab participants are emancipated (Alexander, 2002), and are enabled to converge to a consensual universality that encompasses all three types of observational complexity, namely objective, subjective, and intersubjective (see Figure 6). Furthermore, the futures-creative Archetype Co-laboratory enables groups of stakeholders to create alternative futures that are drastically different from those obtained by extrapolating the data base of the present situation.

Principle 4: Ephemeralization

The methodology of Structured Dialogic Design supports the co-construction of high-quality observations by espousing ephemeralization of thought and structure; It engages team members in authentic, inclusive, and disciplined deliberations.

The generic property of SDD (Warfield & Cardenas, 1994), is significantly enhanced by the capability built in the Logosofia platform for replicability and reusability. Specifically, the Interpretive Structural Modeling (SM) consensus method (Warfield, 1976), enables intersubjective teams to co-construct graphic representations of the relationships among a set of observations in one fifth of the time required to do it without the ISM algorithm. If a team decides, after the completion of a colab, to reconvene in order to amend, augment, or address the emergence of a new situation resulting from an intervention, the Logosofia platform makes this possible efficiently and effectively. For example, the co-construction of a map displaying the connection among a set of twenty ideas takes on the average three hours as compared to more than ten hours that will be required without the support of Logosofia (see Figure 7).

Principle 5: Systems thinking and design (Connecting the dots)

The Logosofia platform has been developed so that intersubjective teams of stakeholders become systems thinkers and designers, enabling them to co-construct, by means of successive approximations and iterations, ephemeral graphic representations (snapshots) of the situational complexity.



Logosofia represents the latest generation of software to support the process of SDD. While sharing similarities with the previous generation, "Cogniscope 2", Logosofia is a cloud-based application, providing numerous advantages, flexibilities, and enhancements. Major advantages to cloud-based software include centralized

management of the software, allowing for efficient research across many Co-laboratories; user levels to control degrees of access to the software; greater flexibility in the outputs produced throughout the process, and; extensibility - ability to make continual enhancements and push updates.

Logosofia tracks the votes and uses the Interpretive Structural Modeling (ISM) algorithm to improve the efficiency of “connecting the dots” (ideas); however, the final product of the colab deliberation is totally dependent of the judgments of the team and not on any artificial intelligence algorithm. The reduction in the number of pairwise queries posed to the participants can reach up to a factor of five, which means that instead of a team having to spend fifteen hours to construct a systemic representation, it can do it in as little as three hours. The influence map often demonstrates that the top priority ideas, resulting from the voting on relative saliency, are not necessarily the most effective in terms of exerting leverage on other ideas of the subset included in the map. This phenomenon has been called the Erroneous Priority Effect, which has major implications in terms of prioritizing problems and actions (Christakis and Bausch, 2006). Unfortunately, most public and private organizations determine their priorities on the basis of saliency judgments without considering the leverage and effectiveness in attaining the objectives or resolving the situation.

One of the unique and powerful capabilities of the Logosofia platform is the availability of a dashboard displaying indices that are very useful for guiding the Facilitator in navigating the group work efficiently and effectively. These indices have been developed primarily to measure the Situational Complexity Index (SCI) relevant to a specific application of the methodology (Christakis & Kakoulaki, 2021).

The SCI is calculated by using the following formula (Christakis & Kakoulaki, 2021; Christakis & Diedrich, 2022):

$$SCI = (N-7)[(V-5)/(V^{\max}-5)][K/(R(R-1)-K)] \quad (1)$$

Where:

N = The number of ideas/observations proposed by the group of Co-laboratory participants in response to the TQ;

V = The number of ideas/observations receiving one or more votes of relative saliency/priority from the group at various points during the colab;

P = The number of participants in the colab;

$V^{\max}$ = The number of participants (P) multiplied by five (5). The value of $V^{\max}$ to be entered in the formula should be smaller or equal to the value of N. If $V^{\max}$ is larger than N, then the value of N should be entered;

R = The number of ideas/observations selected for inclusion in the influence map displaying the network of connections; and

K = The number of distinct connections among the ideas/observations selected for inclusion in the map.

The formula for the SCI can be reconfigured and simplified, by identifying three additional indices that are of particular interest to the SDD Facilitator in monitoring the progress of the team deliberations during the colab. These three indices are:

1) The Divergence (D), which is:

$$D = (V-5)/(V^{\max}-5) \quad (2)$$

2) The Consensus Index (CI), which is:

$$CI = (V^{\max}-V)/(V^{\max}-5) \quad (3)$$

Notice that when $V = 5$, the divergence is zero, and the Demosensus is one (1), which means that there is one hundred percent consensus among the participants in terms of the relative saliency of their ideas. In this case the team has converged to the five most salient ideas. On the other hand, when $V = V^{\max}$, the DCI is zero, and the divergence D is maximum (100 percent).

3) The Priority Effectiveness Index (PEI), which is:

$$PEI = K/[R(R-1)-K] \quad (4)$$

With the use of Equations (2) and (4), the SCI (Equation 1) reads:

$$SCI = (N - 7)D(PEI) \quad (5)$$

From Equation (5), we can derive two other formulas that are very useful for measuring and comparing SCI at the various steps of the process shown in Figure 3, these are:

1) The formula for measuring SCI following the completion of the generation of ideas in response to the Triggering Question when the divergence $D = 1$, which is:

$$SCI = (N - 7)(N - 1) \quad (6)$$

2) The formula for measuring the maximum value of SCI before the mapping step of Figure 3, which is:

$$SCI = (N - 7)D(R - 1) \quad (7)$$

We will use these two formulas later in this report, when we compare the emergent value of SCI at the start of the colab, with the value of SCI obtained before the mapping step and at the completion of the group work with the support of SDD and Logosofia. We will see that the gains obtained by applying the methodology in terms of the capacity of an intersubjective team to navigate situational complexity are of the order of ninety-five percent, which is a non-trivial accomplishment.

Studying equation (5), we see that the SCI is proportional to: (a) the number of ideas generated by the team (N), (b) the Divergence (D), which is a function of the number of ideas receiving one or more saliency votes (V), and the number of participants in the colab (P), which impacts the value of ($V^{\max}$), and (c) the Priority Effectiveness Index (PEI), which is a function of (K) the number of distinct connections in the map, and (R), the number of ideas included in the map. It follows that the boundary condition of SCI being equal to zero occurs when: (a) the number of ideas generated ($N = 7$), (b) when the divergence ($D = 0$), which occurs when ($V = 5$), and (c) when ($PEI = 0$). which happens when ($K = 0$), i.e., there are no connections among the ideas included in the map. Measurements for K and PEI cannot be obtained until the mapping step of the colab is implemented (see Figure 3), which typically happens about five hours from the start of the team work. On the other hand, the measurement of the divergence (D) occurs from the start of the colab and continues until the end. Usually, the generation of ideas in response to the TQ is completed about one hour from the start of the colab, at which point the values of N and $V^{\max}$ become available, and hence the initial value of the divergence (D) can be calculated in accordance with the voting of relative saliency by the participants.

Just as an airplane pilot utilizes a dashboard to navigate the plane, the Logosofia platform offers the SDD Facilitators the capability of employing a dashboard that enables them to navigate the colab by monitoring all the indices presented. The availability of the dashboard, as shown in Figure 8, makes the job of the Facilitator easier and more reliable, because it reduces the risk of bad piloting. For example, after approximately four hours of group work, the Facilitator should be able to look at the dashboard and see that the values of D and DCI are converging to around 50 percent for each (see Figure 7).

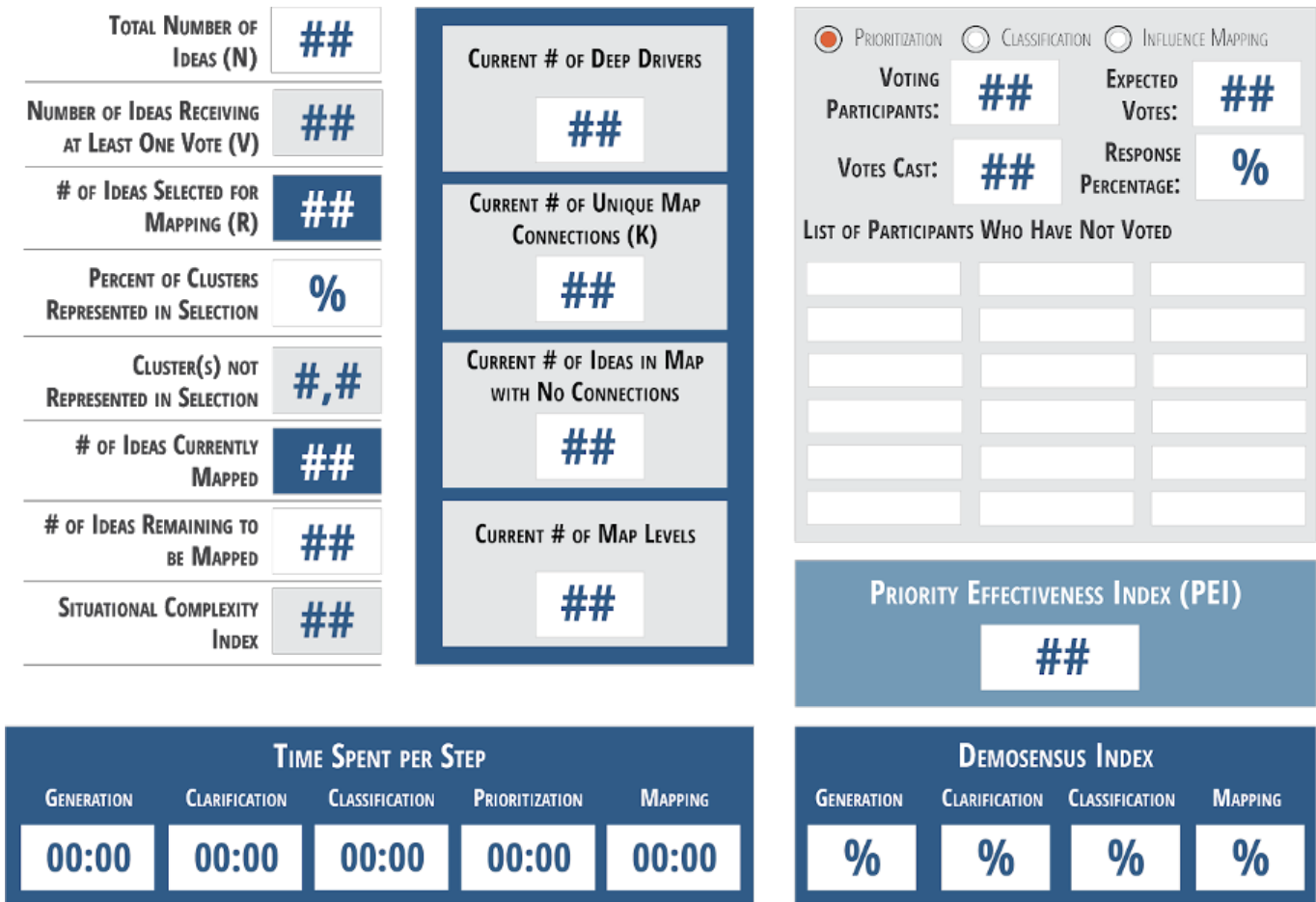


Figure 8: Showing a picture of the Logosofia Dashboard that supports the SDD Facilitator during the conduct of a colab.

Principle 6: The Labyrinth of situational complexity

Navigating effectively the situational complexity of social systems and knowledge-based enterprises, demands the commitment by enlightened leaders to the implementation by intersubjective teams of inclusive, authentic, and co-creative deliberative dialogue.

Because, as illustrated in Figures 9, and 10, below:

- the implementation of deliberative dialogue is dependent on the application of STRUCTURED DELIBERATION methodology, and;
- the application of such methodology is affected by the organizational (social system) commitment to deliberative dialogue.

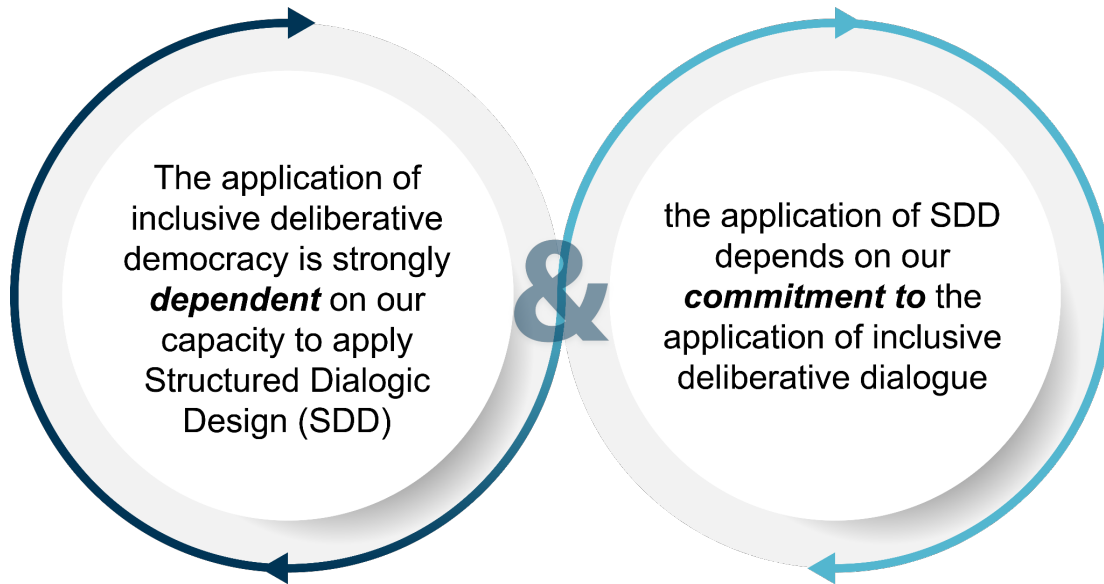


Figure 9: The vicious cycle of organizations for navigating the Labyrinth of situational complexity.

Hence, as illustrated in Figure 10, intersubjective teams of stakeholders are caught in a vicious cycle (a Labyrinth), which they need to navigate to attain organizational excellence.



Figure 10: Showing graphically the Labyrinth of organizational situational complexity and the need for deliberative dialogue in order to navigate it.

Our experience, which we have tried to convey in this chapter, tells us that those knowledge-based enterprises that learn to promote deliberative dialogue coupled to the capacity to balance standardization with ephemeralization of thought and structure will prosper and achieve excellence.

The Labyrinth Thread

Employing Logosofia we constructed a Tree of influence among the six principles by responding to a generic question that read: Does the appreciation of Principle (X), significantly support the appreciation of Principle (Y), in the context of navigating the Labyrinth of situational complexity?

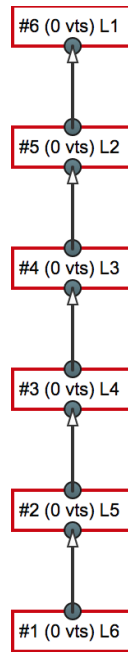


Figure 11: Displaying graphically the links among the six principles for navigating the Labyrinth of situational complexity.

It becomes apparent from Figure 11, that in order for communities of stakeholders (intersubjective teams) to navigate the Labyrinth of situational complexity (Principle # 6), all the other five principles must be adopted. Principle #5 (systemic thinking), which is supported during the conduct of a col by the Logosofia platform, is positioned at Level 2, and is supported by the three principals at lower levels. Systemic thinking and the capacity of people from all walks of life to connect the dots is necessary, but unfortunately not sufficient (see Figure 9), on account of political elites or the lack of enlightened leaders that compromise authentic democracy, for the navigation of the Labyrinth. More specifically, the interpretation of Figure 11 reads:

- The phenomenon of situational complexity emerges when groups of stakeholders (intersubjective teams) are engaged in assaulting wicked problems or designing social systems (Principle # 1, at Level 6);
- This phenomenon is the composite of three distinguishable observational complexities, namely objective, subjective, and intersubjective (Principle # 2, at Level 5);
- The challenge of our era is to objectify intersubjective observational complexity by means of a methodology for disciplined deliberative democracy (Principle # 3, at Level 4);
- This challenge requires the capacity to co-construct efficiently ephemeral graphic representations (maps) of thoughts and feelings emerging in stakeholder interactions and deliberations in a properly designed learning environment (Principle # 4, at Level 3);
- The deliberations need the support of a methodology (e.g., SDD), a Situation Room, and a platform that enable people from all walks of life to think systemically and connect the dots (Principle # 5, at Level 2);
- Adopting and implementing all these five principles will contribute significantly to the capacity of intersubjective teams to navigate the Labyrinth of situational complexity (Principle # 6, at Level 1).

We should, however, recognize that all five principles, though necessary, are not sufficient in navigating the Labyrinth of situation complexity shown in Figure 9, without the commitment to deliberative democracy by enlightened political and organizational leaders.

REVISITING THE PROBLEMATIQUE AFTER FIFTY YEARS

Fifty years after the conceptualization of the forty-nine CCPs included in the original prospectus of the CoR, we (the authors) thought it would be interesting to revisit the Problematique in light of our experience with the application of structured deliberation methodology in the arena (see Figures 1 and 2). We decided to perform two structural inquiries utilizing a subset of twenty-three CCPs. We first organize all forty-nine CCPs into thirteen affinity clusters, shown in Table 1. We used the clustering of the CCPs in order to guide us in the selection of the subset that is particularly relevant to the climate crisis. Those CCPs that have been selected for inclusion in the construction of alternative climate crisis Problematiques are distinguished in Table 1 by the color red.

Table 1: Classification of CCPs into affinity clusters with the support of Logosofia.

Triggering Question: What are the most critical challenges of civilization that, if addressed today, will yield the most impact on the global problematique by 2030?

Cluster 1: POPULATION & POLLUTION

#	Statement
1	Explosive population growth with consequent escalation of social, economic & other problems
14	Generalized environmental deterioration
21	Accelerating wastage and exhaustion of natural resources
22	Growing environmental pollution
24	Major disturbances of the world's physical ecology
27	Unbalanced population distribution
35	Irrational agricultural practices

Cluster 2: SOCIAL DEVELOPMENT

#	Statement
2	Widespread poverty around the world
5	Generalized and growing malnutrition
8	Growing inequalities in the distribution of wealth throughout the world
20	Obsolete and discriminatory income distribution systems
31	Widespread unemployment and generalized underemployment
38	Fragmented International monetary system

39	Growing technological gaps and lags between developed and developing areas
48	Irrational practices in resource investment

Cluster 3: MILITARY WARS

#	Statement
3	Increase in the Production, destructive capacity, and accessibility of all weapons of war
33	Polarization of military power and psychological impacts of the policy of deterrence
40	New modes of localized war

Cluster 4: URBAN SPRAWL

#	Statement
4	Uncontrolled (unsustainable) Urban sprawl
17	Continuing deterioration of inner-cities
19	Inadequate shelter and access to land

Cluster 5: EDUCATION

#	Statement
6	Persistence of widespread illiteracy
13	Anachronistic and irrelevant education

Cluster 6: POLITICAL OBSOLESCENCE

#	Statement
7	Expanding mechanization, digitization and bureaucratization of almost all human activity
25	Generally inadequate and obsolete institutional arrangements
34	Fast obsolescing of political structures and processes
45	Obsolete system of world trade
46	Ill-conceived use of international agencies for national or sectoral ends
47	Insufficient authority of international agencies

Cluster 7: HEALTH & DRUGS

#	Statement
9	Fragmented and poorly organized system for supporting good health

36	Irresponsible use of pesticides, chemical additives, insufficiently tested drugs
----	--

Cluster 8: RACISM

#	Statement
10	Hardening discrimination against minorities (& differing religious faiths)
11	Hardening prejudices against different cultures

Cluster 9: AFFLUENCE CONSEQUENCES

#	Statement
12	Affluence and its unknown consequences

Cluster 10: VALUE-BASE

#	Statement
15	Generalized lack of agreed-on alternatives to present trends
16	Widespread failure to stimulate man's creative capacity to confront the future
18	Growing irrelevance of traditional values and continuing failure to evolve new value systems
26	Limited understanding of what is feasible in the way of corrective measures
28	Ideological fragmentation & semantic barriers to communication between individuals, groups, and nations
37	Growing use of distorted information to influence and manipulate people
41	Inadequate participation of people at large in public decisions
42	Unimaginative conceptions of world-order and of the rule of law
43	Irrational distribution of industry supported by policies that will strengthen incumbents
49	Insufficient understanding of Continuous Critical Problems, of their nature, their interactions, and of the future consequences both they and current solutions to them are generating

Cluster 11: DISCONTENT

#	Statement
23	Generalized alienation of youth
29	Increasing a-social and anti-social behavior and consequent rise in criminality
32	Spreading "discontent" throughout most classes of society

Cluster 12: LAW ENFORCEMENT

#	Statement
30	Inadequate and obsolete law enforcement & correctional practices

Cluster 13: TECHNOLOGY POLICY

#	Statement
44	Growing tendency to be satisfied with technological solutions for every type of problem

Construction of Problematiques

Employing the same subset of CCPs, shown in red color in Table 1, we constructed two Problematiques for different planning horizons, corresponding to two distinct generic questions, namely (a) a retrospective, and (b) a retroductive. Both questions are focusing on an anticipatory perspective.

The clarifications for the subset of CCPs selected for mapping in the context of the climate crisis are being provided by Alexander Christakis. They are based on his understanding of the intent of Hasan Özbekhan, the original author of the CCPs, and the deep friendship they shared.

Table 2: List of CCPs selected from mapping in the context of the climate crisis, with clarification.

Continuous Critical Problem Statements:

1) Explosive population growth with consequent escalation of social, economic & other problems

The Explosive population growth on a planetary scale is having short- and long-term consequences on environmental pollution, resource depletion, starvation of the poor nations, farm land and biodiversity reduction and many more. Also, the process of social and economic development is aggravated by the population growth in poor nations.

3) Increase in the Production, destructive capacity, and accessibility of all weapons of war

The military industrial complex, as articulated more than fifty years ago by then President Eisenhower, still is continuing its production of all kinds of weapons of war at the expense of the utilisation of scarce resources for human development and the preservation and protection of the planet.

4) Uncontrolled (unsustainable) Urban sprawl

The lack of land use planning and the uncontrolled urban sprawl is destroying farmland and contributing to environmental pollution because of the extensive utilisation of the automobile. This trend started initially in the USA and has now spread in many other nations around the world with the use of the automobile.

12) Affluence and its unknown consequences

The unknown consequences of affluence, as conceptualized by Özbekhan in 1970, are more visible today such as depression, waste of valuable resources, disrespect for the preservation of other species, and many more.

13) Anachronistic and irrelevant education

Education was designed during a different time and for a different purpose. The world has changed significantly since this original design yet we continue with the antiquated model. The consequences of perpetuating the current mode (both content and process) are dire to democracy and humankind.

14) Generalized environmental deterioration

I think this is clearly evident today with oil spills, reduction of biodiversity, the climate crisis, and so on. The Limits to Growth study of MIT, published in 1972, and funded by the Club of Rome, was very successful in the extrapolation of this trend all the way to the year 2050.

15) Generalized lack of agreed-on alternatives to present trends

The dominance of the extrapolation of the present trend into the future, and our inability to conceptualize a database that is drastically different from the extrapolated future, was a fundamental concept of the original Club of Rome prospectus. This is connected with the concept and our ability to defactualize and design collaborative alternative futures.

18) Growing irrelevance of traditional values and continuing failure to evolve new value systems

In Özbekhan's chapter in a book edited by Erich Jantsch ("Perspective of Planning" published by OECD in 1968; Özbekhan was acclaimed by Peter Drucker to be one of the greatest system thinkers of the twentieth century), Hasan advocates that the driver to change and to the design of alternative futures is the value-base. We cannot will alternative futures, which are desirable and equitable to humankind, without the co-construction of an appropriate value-base.

21) Accelerating wastage and exhaustion of natural resources

I think this is self-evident and does not require any additional clarification.

22) Growing environmental pollution

This is self-evident from the clarification of previous CCPs.

24) Major disturbances of the world's physical ecology

I think we have already clarified this CCP in the previous statements of clarification. This CCP is particularly relevant in the context of the climate change crisis.

25) Generally inadequate and obsolete institutional arrangements

I think that what Hasan had in mind here is the institutional arrangement between national and international organizations. For example, in the case of the pandemic that we are experiencing now, what is the authority of WHO or the UN vis-à-vis the authority of national governments.

28) Ideological fragmentation & semantic barriers to communication between individuals, groups, and nations

This is the challenge that led a group of researchers, starting with 1970, to develop a research program, initially at the Academy for Contemporary Problems, where Warfield and Christakis served as Fellows, and later at the Universities of Virginia and George Mason, to develop a set of Consensus Methods practiced initially at the Center for Interactive Management, and eventually the Structured Dialogic Design methodology, which is the foundation of the Logosofia platform. John Warfield played a leadership role in this endeavor, which began immediately after the failure of the original prospectus of the Club of Rome as conceptualized by Özbekhan.

34) Fast obsolescing of political structures and processes

We are experiencing today this phenomenon in the USA, with the assault on the US Capitol, and the general backsliding of democracy at both national and global scales. Also, the prevalent apathy of the young towards political parties and processes is an example of this phenomenon.

35) Irrational agricultural practices

This refers to the destruction of farmland by the use of pesticides, and the use of chemicals for the increased production of food by the farmers around the world to compete with large scale agribusiness the village of Archanes in Crete and watch family members using poisonous chemicals to preserve their farm products.

36) Irresponsible use of pesticides, chemical additives, insufficiently tested drug

This is self-evident.

37) Growing use of distorted information to influence and manipulate people

This is referring to the media, advertising, and political propaganda to influence the general public in terms of their voting and other choices across the board.

39) Growing technological gaps and lags between developed and developing areas

This concept was very well developed by the book of Aurelio Peccei, the Italian who was the originator of the Club of Rome, in his book titled "The Chasm Ahead." In this book Peccei discusses the gap and the lag between the developed and the less developed countries and warns about the disastrous consequences of this trend.

41) Inadequate participation of people at large in public decisions

This corresponds to the backsliding of democracy and the political apathy of the general population, and especially of the young people. This challenge provides the rationale for the development of SDD and the Demoscopic capability, i.e., the place, the space, and the methodological mix for people from all walks of life to congregate and deliberate about their alternative futures. This concept was originally advanced by Professor

Harold Lasswell, who was a board member of the Academy for Contemporary Problems and a friend of Warfield and Christakis in the 1970s.

42) Unimaginative conceptions of world-order and of the rule of law

For example, the conceptualization of the role of the World Health Organization in addressing the challenge of the pandemic of the 21st century.

44) Growing tendency to be satisfied with technological solutions for every type of problem

This refers to our earlier explanation of the "Triumph of Technology and that the Can implies the Ought to do." There was a movement called "Technology Assessment" in the 1970s, which was killed by President Reagan

after his election in 1980.

47) Insufficient authority of international agencies

The example of the WHO in the context of the pandemic is relevant here. Also the role of the UN in the resolution of conflict situations, such as the one between the Greek and Turkish Cypriots is another example.

49) Insufficient understanding of Continuous Critical Problems, of their nature, their interactions, and of the future consequences both they and current solutions to them are generating

In his General Theory of Planning chapter, Ozbekhan argues that we can *will* the future only if we change behavior to act. Such a change can only happen if we address and come to a consensus on the "value-base." The co-construction of an alternative value-base presupposes understanding, which can only be the result of deliberation and group learning. This has been the drive for the development and evolution of SDD.

Generic Questions for Problematique Co-construction

In accordance with Figure 7, showing the steps of the SDD process, the step corresponding to engaging a group in co-constructing a map displaying graphically the linkages among a set of ideas, requires the utilization of a generic question. The retrospective generic question we employed for conducting the structural inquiry is:

1) For the Retrospective Problematique (What would have happened, If):

Suppose that, during the last fifty years (1970 to 2020), humankind in anticipation of the climate crisis, implemented policies for the amelioration of CCP (X), would these policies have had a SIGNIFICANT impact on ameliorating CCP (Y)?

This generic question requires participants to focus on a pair of CCPs at a time, and respond by means of **abducted retrospective reasoning**.

2) For the Retroductive (what should happen, if):

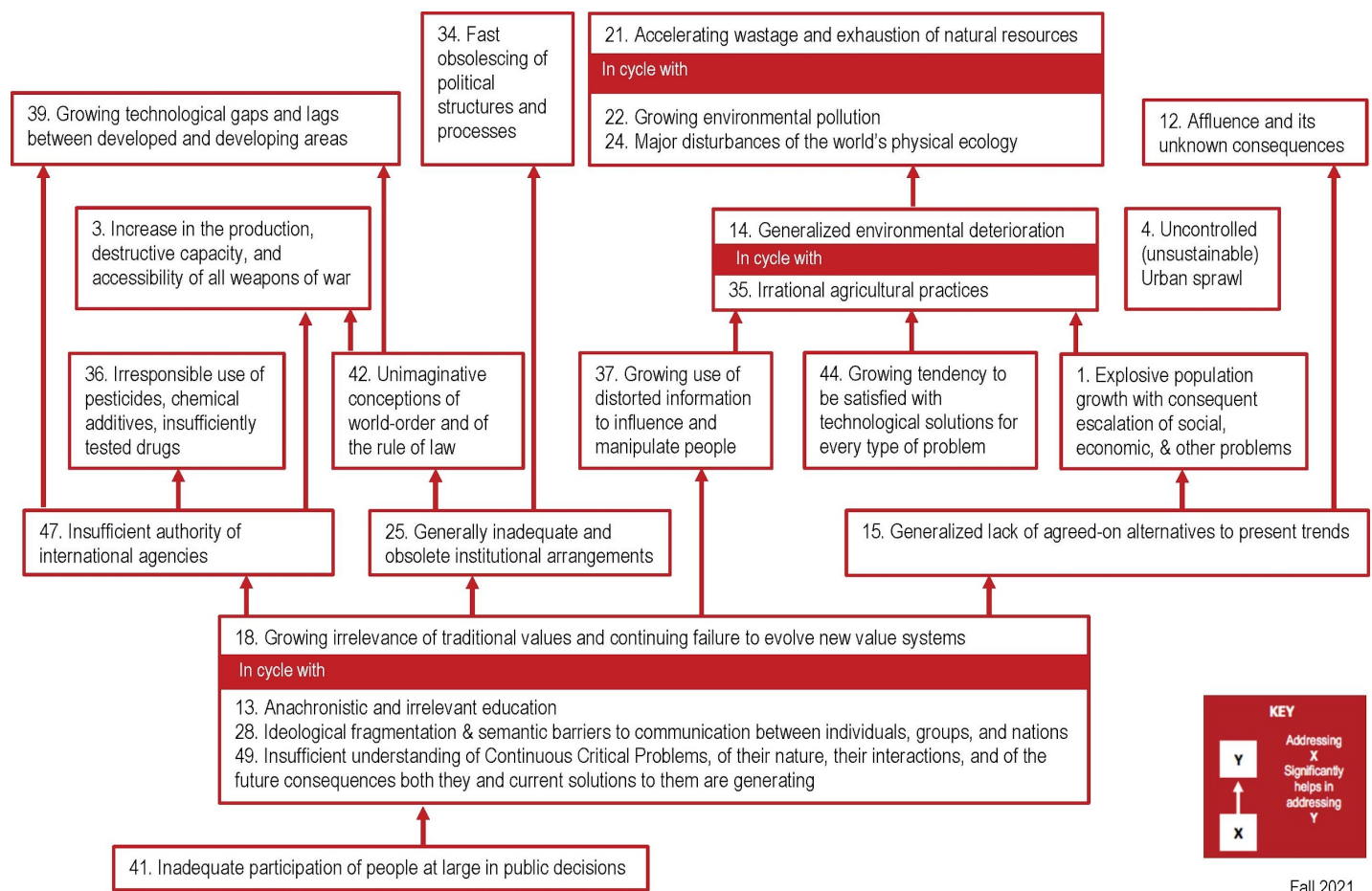
Should humankind, during the next thirty years (2020 to 2050), in anticipation of the climate crisis, implement policies for ameliorating CCP (X), in order to have a SIGNIFICANT impact on ameliorating CCP (Y)?

This generic question requires participants to focus on a pair of CCPs at a time, and respond by means of **normative retroductive reasoning**.

The insertion of the "should " in the second generic question, implies that we think retroactively, which means not forward but backward in time. It implies that we should implement policies in addressing CCP (X) in order to ameliorate CCP (Y). The "should " implies that we **defactualize completely, both in terms of the CCPs database of the past, but also about the historical linkages among the CCPs**. We know that this is extremely hard to do, but this is the meaning of retroductive. This is what Hasan intended to do with the original prospectus of the Club of Rome.

Retrospective Problematique (By Christakis)

The structure of the Global Problematique in the context of the climate crisis, as constructed by Christakis employing the Logosofia platform, is shown in Figure 12.



Fall 2021

Figure 12: Retrospective Problematique for the period 1970 to 2020 for the climate change situation (constructed by Christakis).

Interpretive comments on the Retrospective Problematique of Figure 12:

There are six levels of depth in this influence map;

- CCP # 41 (Inadequate participation of people at large in public decisions) is the deep driver, i.e., it is located at the sixth level and has maximum leverage because it impacts every single one of the remaining twenty-two CCPs in the map;
- At Level 5, there is a cycle containing four CCPs of mutual influence, namely: CCP # 13, 18, 28, and 49. These four CCPs are focusing on our inability to change the paradigm by boundary spanning deliberative dialogue that makes humankind aware of its predicament, and the existential threat we are facing by the climate crisis situation;
- We have six CCPs located at Level 1, corresponding to the goals to be achieved by means of ameliorating all the other CCPs positioned at the lower levels. Most of these six CCPs are quantifiable, and observer-independent, and belong to the First Phase Science type of observational complexity. The fundamental point to be appreciated from the mapping of the Global Problematique is that, unless the deeper levels CCPs, such as Levels 5 and 6, are ameliorated effectively the likelihood of ameliorating the Level 1 CCPs is not high. It is important to appreciate that all the deep level CCPs (# 41, 13, 28, and 49) belong to the intersubjective type of observational complexity. Conventional policy decisions focus on the amelioration

of CCPs located at Level 1, i.e., the quantifiable (First Phase Science) CCPs, disregarding the deep level intersubjective complexity CCPs.

- From the graphic representation of the Retrospective Problematique (Figure 12), it appears reasonable to argue that if humankind had anticipated and had implemented actions for the amelioration of the eight CCPs at Levels 4, 5, and 6, during the last five decades, the climate crisis manifested by the Level 1 CCPs at the year 2020, would have been probably avoided. The subset of eight high leverage CCPs at the three lower levels are:

- 41. Inadequate participation of people at large in public decisions.
- 18. Growing irrelevance of traditional values and continuing failure to evolve new value systems.
- 13. Anachronistic and irrelevant education.
- 28. Ideological fragmentation & semantic barriers to communication between individuals, groups, and nations.
- 49. Insufficient understanding of Continuous Critical Problems, of their nature, their interactions, and of the future consequences both they and current solutions to them are generating.
- 47. Insufficient authority of international agencies.
- 25. Generally inadequate and obsolete institutional arrangements.
- 15. Generalized lack of agreed-on alternatives to present trends.

Retroductive Problematique (By Christakis)

This “lesson learned” from the inquiry focusing on the Retrospective Problematique should inform the construction of the Retroductive Problematique. It should be pointed out, however, that both of these inquiries result in the graphic representation of the mental model of one single observer (Christakis), and consequently are only of academic utility and not relevant to decision making and action in the arena. The reason for this is that the intersubjective component of situational complexity can only be addressed meaningfully by engaging an intersubjective team of stakeholders, as will be presented at a later section of this report. Such a task implies the utilization of a structured deliberations methodology in a properly designed Situation Room and the support of the Logosofia platform in an effort to objectify intersubjectivity (Christakis & Kakoulaki, 2021).

As mentioned previously, the retroductive generic question reads:

Should humankind, during the next thirty years (2020 to 2050), in anticipation of the climate crisis, implement policies for ameliorating CCP (X), in order to have a SIGNIFICANT impact on ameliorating CCP (Y)?

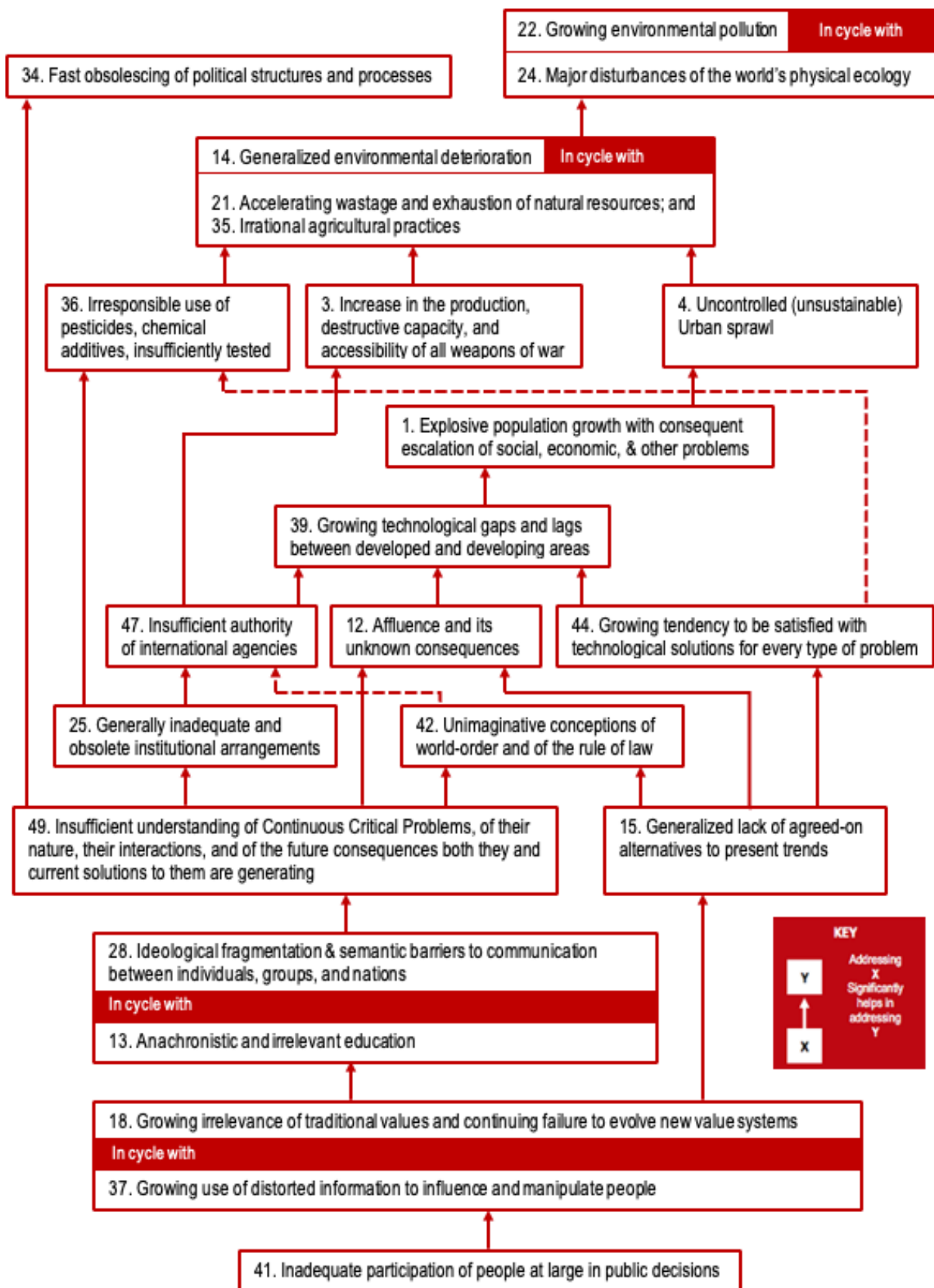


Figure 13: Retroductive Problematique for the period 2020 to 2050 for the climate change situation (constructed by Christakis).

Interpretive comments on the Retroductive Problematique (Figure 13):

- There are eleven levels of influence in the Problematique map;
- CCP # 41 (Inadequate participation of people at large in public decisions), is the deep driver, i.e., it is located at the deepest level and has maximum leverage because it impacts every one of the other twenty-two CCPs in the map;
- At Level 10, there is a cycle containing two CCPs of mutual influence, namely CCP # 18, and 37. CCP # 18, is focusing on our inability to evolve new value systems, while CCP #37, is focusing on the impact of propaganda in the evolution of value systems. In the context of the normative retroductive reasoning of this Problematique, it appears reasonable to invoke that these two CCPs **should be** in a cycle of mutual influence. The vicious cycle of these two CCPs can only be broken by the influence of the CCP focusing on public participation in decisions (CCP # 41), which is located at Level 11. We are witnessing again the strong leverage of CCP #41, as also identified in the retrospective Problematique previously (Figure 12);
- At Levels 1, and 2, we have five CCPs located, corresponding to the goals to be achieved by means of addressing all the other CCPs located at the lower levels of the map. All of these five CCPs at Levels 1 and 2, are quantifiable and belong to the First Phase Science type of observer-independent complexity. Four of the five, are in two separate cycles of mutual influence and are dealing with environmental and ecology management issues. Again, the point to be appreciated from the mapping of the Retroductive Problematique is that, unless the deeper level CCPs, such as Levels 10 and 11, are addressed effectively the likelihood of resolving the Levels 1 and 2 CCPs is not plausible. It is important also to appreciate that all the deep level CCPs (#41, 18, 37, 13, and 28) belong to the intersubjective observational complexity. Historically, without the legitimacy of Third Phase Science (Christakis & Kakoulaki, 2021,) conventional public policy places emphasis on the higher level CCPs, which even though they are symptomatic they are empirically observable, belonging to First Phase Science objective type of observational complexity.
- From the graphic representation of this academic climate crisis Problematique, it appears reasonable to argue that unless the five CCPs at Levels 9, 10, and 11, are ameliorated effectively it is very unlikely that the Levels 1 and 2 CCPs will be resolved to prevent the destruction of the planet. The group of five at the three lower levels are:

41. Inadequate participation of people at large in public decisions.

18. Growing irrelevance of traditional values and continuing failure to evolve new value systems.

37. Growing use of distorted information to influence and manipulate people.

13. Anachronistic and irrelevant education.

28. Ideological fragmentation & semantic barriers to communication between individuals, groups, and nations.

Comparative analysis of the two Problematique maps:

- The Retroductive Problematique is longer (has more levels) than the Retrospective;
- The number of distinct connections among the CCPs in the Retroductive Problematique (K) is equal to 177, while in the Retrospective it is equal to 216. This means that the Retrospective Problematique is of higher complexity than the Retroductive because of the larger numbers of linkages;
- Four of the five deep rooted CCPs of the Retroductive Problematique are also in the set of the seven deep rooted CCPs of the Retrospective Problematique. The only one that is not included is CCP #37,

dealing with the impact of propaganda, which is located in a cycle with CCP #18 (Growing irrelevance of traditional values and continuing failure to evolve new value systems).

- In both Problematiques, the higher level CCPs focus on issues of environment and ecology, which are measurable, observer-independent, and directly relevant to the amelioration of the climate crisis situation. However, those measurable objectives cannot be addressed effectively in order to prevent the climate existential threat unless the lower lever CCPs are ameliorated.
- The similarities between the patterns of the two Problematiques are interesting, because they indicate that unless humankind takes drastic measures in the time period from 2020 to 2050, the scenario for the next thirty years will not be different from the scenario of the past fifty years (1970 to 2020).

The Pilot Group Problematiques

During the winter and spring of 2022, we decided to design and conduct a conceptual “Gedanken-experiment” with a pilot group of SDD practitioners and advocates geographically distributed in Europe, USA, Mexico, Greece, Cyprus, South Africa, and Australia (see Appendix A). The group of approximately eleven participants and eight observers, interacted virtually with sessions that lasted one-and-a-half hours over a period of four months, and co-constructed two Problematiques **(a)** a Retrospective corresponding to the last fifty years (1970 to 2020), and **(b)** a Retroductive corresponding to a time horizon of thirty years (2020 to 2050). We will present and interpret these two Problematiques in the discussion that follows. We will subsequently compare the group results to those constructed by the authors and presented in Figures 12 and 13.

The goals of the experiment with the pilot group were identified at the outset and included:

- To construct two Problematiques (influence maps) using a subset of Continuous Critical Problems (CCPs) from the Club of Rome: The predicament of Mankind prospectus;
- To understand the meaning and the prophetic conceptualization of the CCPs by Hasan Ozbekhan, more than fifty years ago;
- To appreciate the distinction between “Abductive Retrospective reasoning” and “Normative Retroductive,” in the co-construction of the CoR Global Problematiques;
- To learn together as a pilot group of SDD practitioners and advocates;
- To inform future presentations;
- To discover the applicability of this experiment with more diverse communities of stakeholders;
- Potentially publish an article regarding the outcomes of the experiment;
- Other(s) yet to be determined.

Retrospective Problematique

The generic question employed by the group reads:

Suppose that, during the last fifty years (1970 to 2020), humankind in anticipation of the climate crisis, implemented policies for the amelioration of CCP (X), would these policies have had a SIGNIFICANT impact on ameliorating CCP (Y)?

The structure of the Global Problematique in the context of the climate crisis, as constructed by the authors employing the Logosofia platform, is shown in Figure 14.

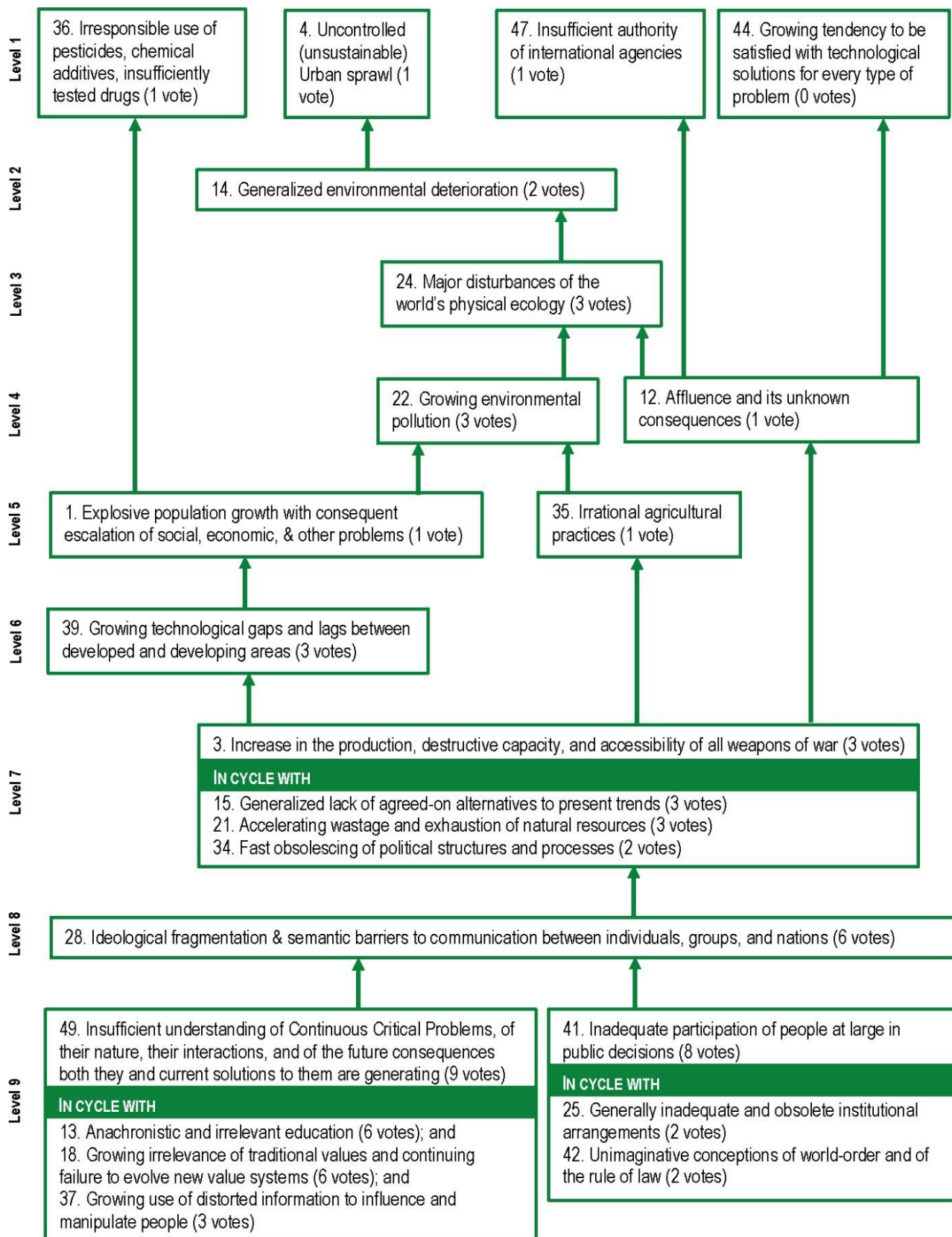


Figure 14 The retrospective Problematique co-constructed by the pilot group virtually with the support of Logosofia.

Interpretation of the Map:

The co-construction of the Retrospective Problematique by the pilot group is shown graphically in Figure 14, above. We should consider the Map as a snapshot of the situational complexity emerging from the structured deliberations of the pilot group. The interpretation of the pattern shown in Figure 14 is in some ways equivalent to the interpretation of an X-Ray of a patient by a group of doctors. However, in this case the members of the pilot group are the doctors interpreting their own chess X-Ray, namely the Global Problematique they co-constructed and own. The interpretation offered below is that of the authors and was presented and discussed with the pilot group:

Overall, we observe:

- It is a directed graph (digraph) with nine levels of depth;
- It is composed of a subset of 23 CCPs, out of the total of 49, included in the original CoR prospectus;
- Half of the CCPs are in three cycles of mutual influence located at Levels 7 and 9;
- There are two pathways of strong influence originating at Level 9, and propagating upwards: (a) the one on the left will be labeled “Propaganda,” and (b) the other will be labeled “Deliberative democracy.” These two are the deep-rooted drivers of the structure. The amelioration of these two cycles would have propagated upwards and have had a positive impact on all the remaining CCPs.
- As we will see in Table 3, the maximum possible value of the Situational Complexity Index (SCI) that could be obtained in this case from the construction of a map with 23 elements (CCPs), is equal to 357. The actual SCI obtained at the completion of the map is equal to 13.5, which corresponds to more than a 95% reduction in the SCI, on account of the group work with the support of Logosofia. The significant reduction in the SCI implies that there is more clarity now in how to navigate the Retrospective Problematique situational complexity,

In interpreting the map of Figure 14, we have chosen to split it into two distinct domains: (a) the deeper three levels domain, which contains a subset of twelve CCPs. and (b) the upper levels domain, which contains eleven CCPs. Each domain contains about half of the total number of twenty-three CCPs included in the map.

The three deep levels domain is shown below in Figure 15:

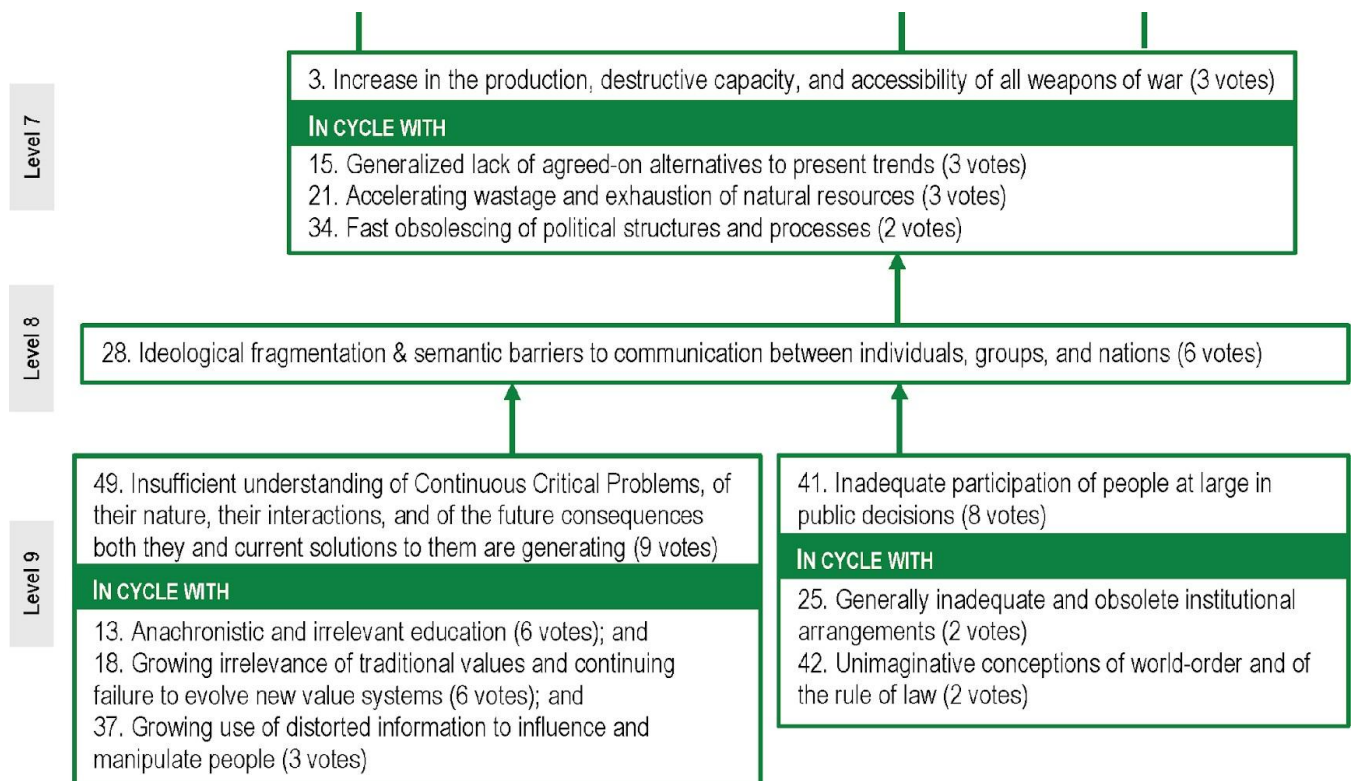


Figure 15: The three deep-levels domain of primarily intersubjective global situation complexity

The first thing to observe in Figure 15, is the existence of three very interesting cycles. One cycle contains CCP #49 (Insufficient understanding of CCPs.), which is in a cycle of mutual influence with CCPs # 13, 18, and 37. We can call this cycle "the propaganda manipulation of the value base." Interestingly enough, this cycle contains almost fifty percent of the total saliency votes of the pilot group. In other words, the propaganda cycle of the map is both extremely leveraging and of high saliency, in accordance with the priority voting of the group. From the mapping results, it appears reasonable to make the supposition that without the capacity to launch an effective assault on this cycle it is very unlikely to address the climate crisis Problematique. This did not take place in the last fifty years; in fact, the opposite happened at a global scale.

The other cycle of interest in this domain is the one containing CCP # 41 (Inadequate participation of people.), which is in a cycle with CCPs #25 and 42, corresponding to institutional obsolescence and the rule of law. This cycle also contains twelve saliency votes, i.e., about twenty percent of the total.

These two cycles correspond to two fundamental pathways that influence all the other CCPs at higher levels. These are the two pathways that humanity must focus in order to effectively launch an assault on the climate change crisis. This is a lesson that we can transfer in the construction of the Retroductive Problematique.

The two influential pathways feed into CCP #28 (Ideological fragmentation and semantic barrier). This particular CCP (# 28), provides the rationale for the development and evolution of the SDD methodology over the years, and also for the need to establish Demoscopio-type capabilities for engaging citizens in deliberative democracy. CCP # 28, feeds into another cycle of three CCPs, (# 3, 15, and 34), dealing with waste and depletion of natural resources at a global scale, with the production of weapons of war, among other irrelevant utilization of scarce resources. As we mentioned earlier, all twelve CCPs belonging to the deep level domain, correspond to the intersubjective type of observational complexity, demanding the authentic engagement of stakeholder communities in deliberative dialogue of the type practiced in Co-laboratories of democracy. All these twelve

CCPs fully include actions at the Global scale for their resolution; that is one of the reasons that they are classified as intersubjective observational complexity (see Figures 5 and 6).

The second domain of the Retrospective Problematique (shown in Figure 14) contains a subset of CCP that can be classified as regional, corresponding to a mix of objective and subjective observational complexity, and hence requiring partial action for their amelioration. The SCI generated by this domain is about 25% of the total. Unfortunately, this is the domain that historically receives more attention in public policy deliberations because it belongs to First Phase Science, and as a consequence is easier to talk about “objectively.” However, according to the overall Global Problematique mapping of the pilot group, the inability to address and deal effectively with the deeper levels domain, has made it impossible to launch an effective assault on the situational complexity covered by this domain of the map (see Figure 16).

Retrospective Influence Mapping of a subset of CCPs in the context of the Climate Crisis

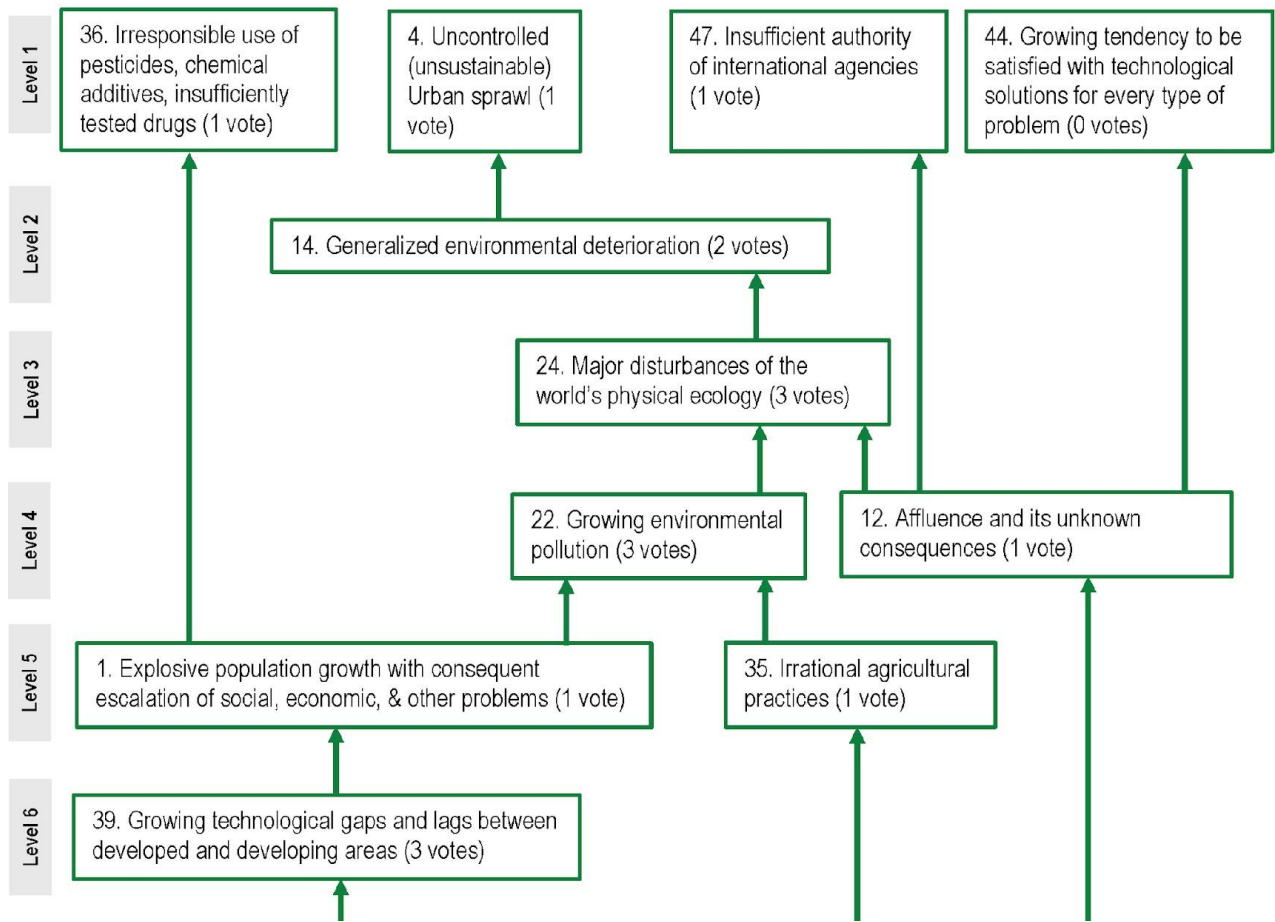


Figure 16: The regional objective/subjective observational complexity of the overall map.

Table 3 below, displays some of the metrics captured by the Logosofia platform during the group work, which are helpful in supporting the analysis and the interpretation of the map of Figure 14.

P	11	Total Number of Participants
U	5	Number of Prioritization Votes per Participant
N	49	Total Number of Ideas Generated
V	22	Number of Ideas receiving at least one prioritization vote after clustering
VMax	49	Maximum Number of Ideas that could receive a vote
R	23	Number of Ideas in a relational pattern (currently mapped)
K	229	Number of distinct interconnections in the influence map
KMax	484	Maximum number of distinct interconnections in the influence map
KOpt	253	Optimal number of distinct interconnections in the influence map
D	0.39	Divergence = $(V - U) / (V_{Max} - U)$
PEI	0.83	Priority Effectiveness Index = $K / (R * (R - 1) - K)$
PEI _{Max}	22	Priority Effectiveness Index Maximum = $R - 1$
PEI _{Opt}	1	Priority Effectiveness Index Optimal = 1
SCI _{Opt}	16.23	Situational Complexity Index optimal = $D * (N - 7) * PEI_{Opt}$
SCI _{Max}	357	Situational Complexity Index maximum = $D * (N - 7) * PEI_{Max}$
SCI _(emergent)	2016	$SCI_{(emergent)} = (N-7)(N-1)$
SCI	13.42	Situational Complexity Index = $D * (N - 7) * PEI$
CI	0.61	Consensus Index = $(V_{Max} - V) / (V_{Max} - 5)$
RV	26.44	Requisite Variety = $(N - 7) * ((V - 5) / (V_{Max} - V))$

Table 3: Metrics of the indices corresponding to Figure 4, as derived from Logosofia.

Studying Table 3, in conjunction with Figures 13 and 14, one sees that the maximum number of distinct connections (K) are concentrated at the twelve CCPs of the deep three-levels map (Figure 13). Approximately twenty connections are discerned at the upper domain map (Figure 14), and the remaining two hundred belong to the lower domain map. This means that the lower domain map is responsible for more than eighty-five percent of the overall situational complexity. Furthermore, the lower domain map contains all the CCPs that correspond

to the intersubjective type of observational complexity, which makes it even more challenging to assault as compared to the objective and subjective observational complexities (see Figures 5 and 6). This is the domain that demands public engagement deliberations for making progress. To repeat, without making progress in the lower domain map it is not plausible to anticipate the amelioration of the CCP located in the upper domain map. Making progress in the lower domain map implies launching an effective assault on the two deep level cycles, namely the propaganda and the deliberative democracy. For example, the SCI of the domain of the map that contains a subset of CCPs connected to the intersubjective component of the overall situational complexity is most likely 80% of the total SCI. This implies that unless this type of complexity is addressed effectively, which we know has not happened in the retrospective Global Problematique, it is implausible to launch an assault on the climate crisis.

The reason the pilot group constructed the retrospective Problematique in the Gedanken-experiment is to learn how to avoid repeating the same mistakes in the Retroductive Problematique.

The Retroductive Problematique

The Generic Question employed for the construction of the Retroductive Problematique reads:

Should humankind adopt, in the short term, policy/actions for the amelioration of CCP X in an effort to anticipate a SIGNIFICANT impact on the amelioration in the long-term of CCP Y in the context of the climate crisis by the year 2050?

The structure of the Global Problematique in the context of the climate crisis, as constructed by the the authors employing the Logosofia platform, is shown in Figure 17.

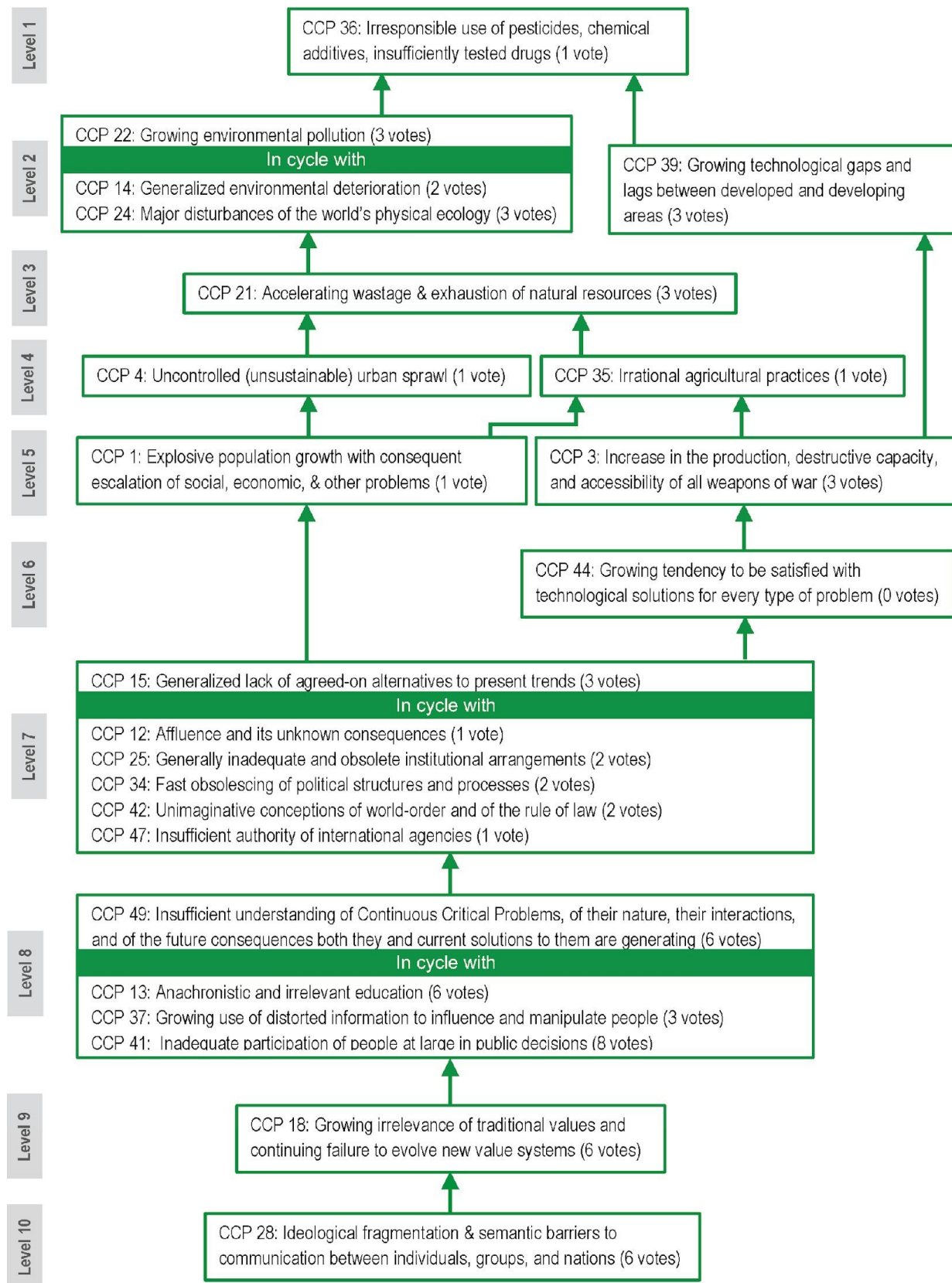


Figure 17: The Retroductive Problematique co-constructed by the pilot group virtually with the support of Logosofia.

Interpretation of the Map:

The co-construction of the Retroductive Problematique by the pilot group is shown graphically in Figure 17. We should consider the Map as a snapshot of the situational complexity emerging from the structured deliberations of the pilot group in the spring of 2022. The mapping process started before the Russian invasion of Ukraine. The same group would probably construct a different map in light of the turbulence produced by the invasion. This is one of the reasons that Logosofia must be capable of implementing the principle of ephemeralization of thought and structure discussed earlier. As mentioned previously, the interpretation of the pattern shown in Figure 17 is in some sense equivalent to the interpretation of an X-Ray of a patient by a group of doctors. However, in this case, the members of the pilot group are the doctors interpreting their own map, namely the Global Problematique they co-constructed and own. The graphic is meant to be a situational and ephemeral snapshot emerging from the cybernetic embedding of this particular group of stakeholders of the Global Problematique. Another group of stakeholders, will most likely co-construct a different snapshot capturing their perception of the Retroductive Problematique. In other words, these maps are functions of time, space, and the group engaged in the cybernetic embedding created in the virtual space Situation Room with the support of Logosofia (Flanagan & Christakis, 2010, 2021). From the experience with the Gedanken-experiment it appears that the cybernetic embedding created in the virtual “Situation Room” is inferior to the one experienced by groups in face-to-face settings. The advantage of the virtual space is the cost reduction in bringing groups together, convenience in scheduling.

Furthermore, the co-construction of the map should not be considered as the most valuable outcome of the stakeholder engagement. The learning that occurs during the process of deliberation among the participants is equally if not more valuable (See the poem by Kavafis below):

<https://www.youtube.com/watch?v=1n3n2Ox4Yfk>

Overall, we observe:

- It is a directed graph (digraph) with ten levels of depth;
- It is composed of a subset of 23 CCPs, out of the total of 49, included in the original CoR prospectus;
- Ten of the 23 CCPs are in two cycles of mutual influence located at Levels 7, and 8;
- The pattern of the map appears to be approximately linear with two CCPs acting as deep drivers, i.e., with the strongest leverage on all the others, namely: **CCP 28: Ideological fragmentation and semantic barriers to communicate between individual, groups, and nationis**, at Level 10, and **CCP18: Growing irrelevance of traditional values and continuing failure to evolve new value systems**.
- These two drivers influence two cycles: (a) the first at Level 8 with four CCPs dealing with such social and policy issues as anachronistic education, propaganda, and lack of public participation, and (b) the second with six CCPs focusing on the perpetuation and extrapolation of present trends and the inability to create a new database for the future,
- As we will see in Table 4, the maximum possible value of the Situational Complexity Index (SCI) that could be obtained in this case from the construction of a map with 23 elements, is equal to 357. The actual SCI obtained at the completion of the map is equal to 17.8, which corresponds to a 95% reduction in the SCI, on account of the group work with the support of Logosofia. Such a reduction of the SCI is clearly non-trivial.

In interpreting the map of Figure 17, we have chosen again, like we did with the Retrospective Problematique (see Figure 14), to split it into two distinct domains: (a) the deeper five levels domain, which contains a subset

of thirteen CCPs. and (b) the upper five levels domain, which contains ten CCPs. Each domain contains about half of the total number of twenty-three CCPs included in the map.

The five deep levels domain is shown below in Figure 18:

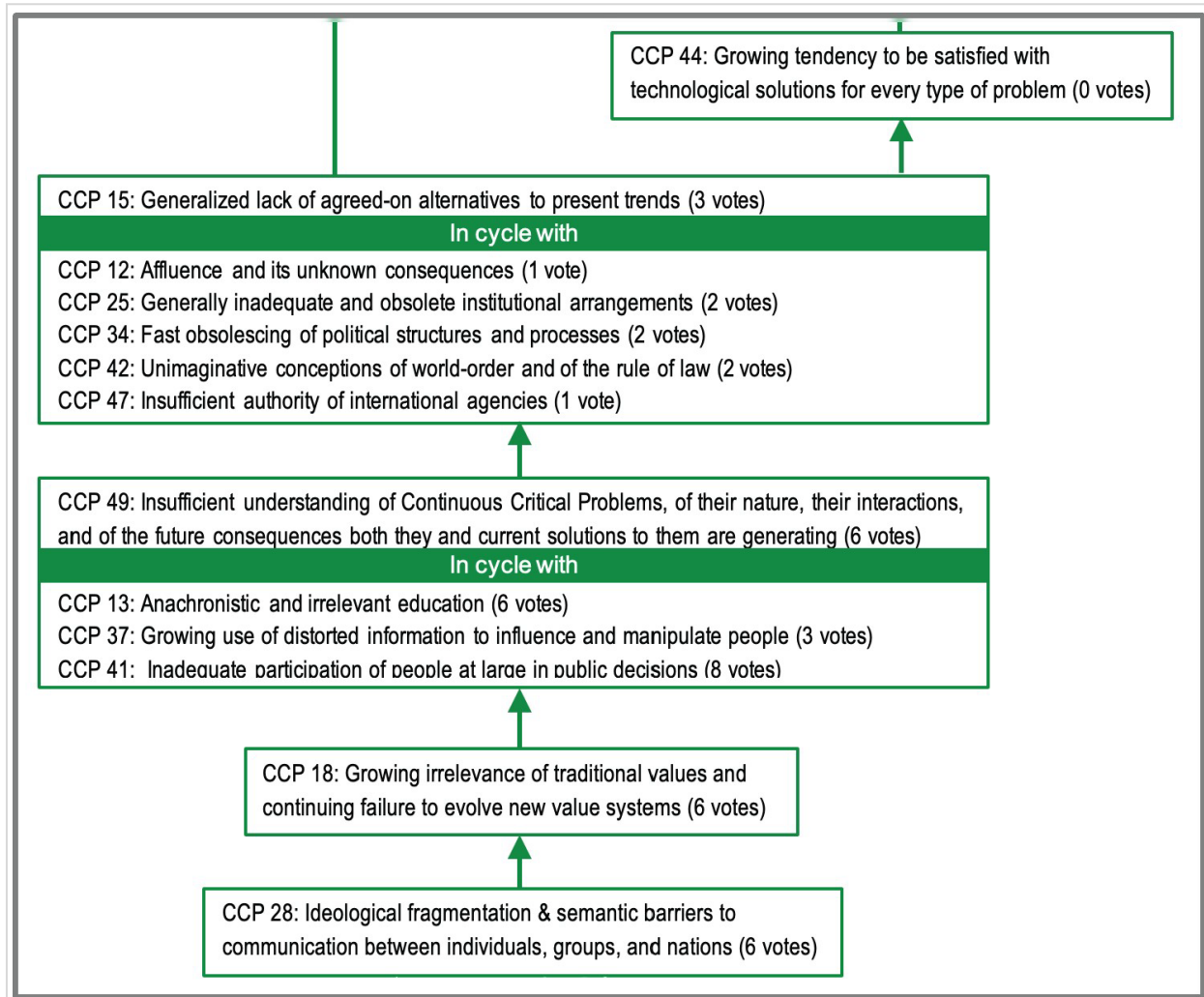


Figure 18: The five deep-levels domains of primarily intersubjective observational complexity.

The first thing to observe in Figure 18, is the existence of two very interesting cycles. One cycle contains CCP #49 (Insufficient understanding of CCPs), which is in a cycle of mutual influence with CCPs # 13, 41, and 37. We can call this cycle "the propaganda manipulation of the value base." Interestingly enough, this cycle contains almost fifty percent of the total saliency votes of the pilot group. In other words, the propaganda cycle of the map is both extremely leveraging and of high saliency. It appears reasonable to make the supposition that without the capacity to launch an effective assault on this cycle it is very unlikely to navigate the climate crisis Problematique. It appears relevant to mention that the same propaganda cycle of high saliency and leverage was found in the Retrospective Problematique map (see figures 14 and 15).

The other cycle of interest in this domain is the one containing CCP # 15 (the perpetuation of the data base of the present), which is in a cycle with CCPs #12, 25, 34, 42 and 47, corresponding to institutional obsolescence and the rule of law. This cycle also contains eleven saliency votes, i.e., about twenty percent of the total. The two influential cycles feed into CCP #44 (Growing tendency to be satisfied with technological solutions).

This deepest driver, i.e., CCP (# 28), provides the rationale for the development and evolution of the SDD methodology over the years, and also for the need to establish Demoscopio-type capabilities for engaging citizens in deliberative democracy (Kakoulaki & Christakis, 2018). CCP # 28 feeds into all the CCPs of the Retroductive Problematique, and hence demonstrates the power of establishing capabilities for people to congregate and deliberate for the definition and resolution of local and Global Problematiques, such as the preservation of the climate.

The second domain of the Retroductive Problematique (shown in Figure 19) contains a subset of CCP that can be classified as regional, corresponding to a mix of objective and subjective observational complexity, and hence requiring partial action for their amelioration. The SCI generated by this domain is about 25% of the total. Again, just like the Retrospective Map of Figure 14, this is the domain that historically receives more attention in public policy deliberations because it belongs to First Phase Science, and as a consequence is easier to talk about “objectively.” However, according to the overall Global Problematique mapping, the inability to navigate effectively with the deeper levels’ domain of Figure 18, makes it implausible to launch an effective assault on the situational complexity covered by the higher levels’ domain of the overall map. The higher-level domain is also the one that the “Limits to Growth study” of MIT, funded by the Club of Rome, focused in dealing with the Global Problematique in their study of 1972.

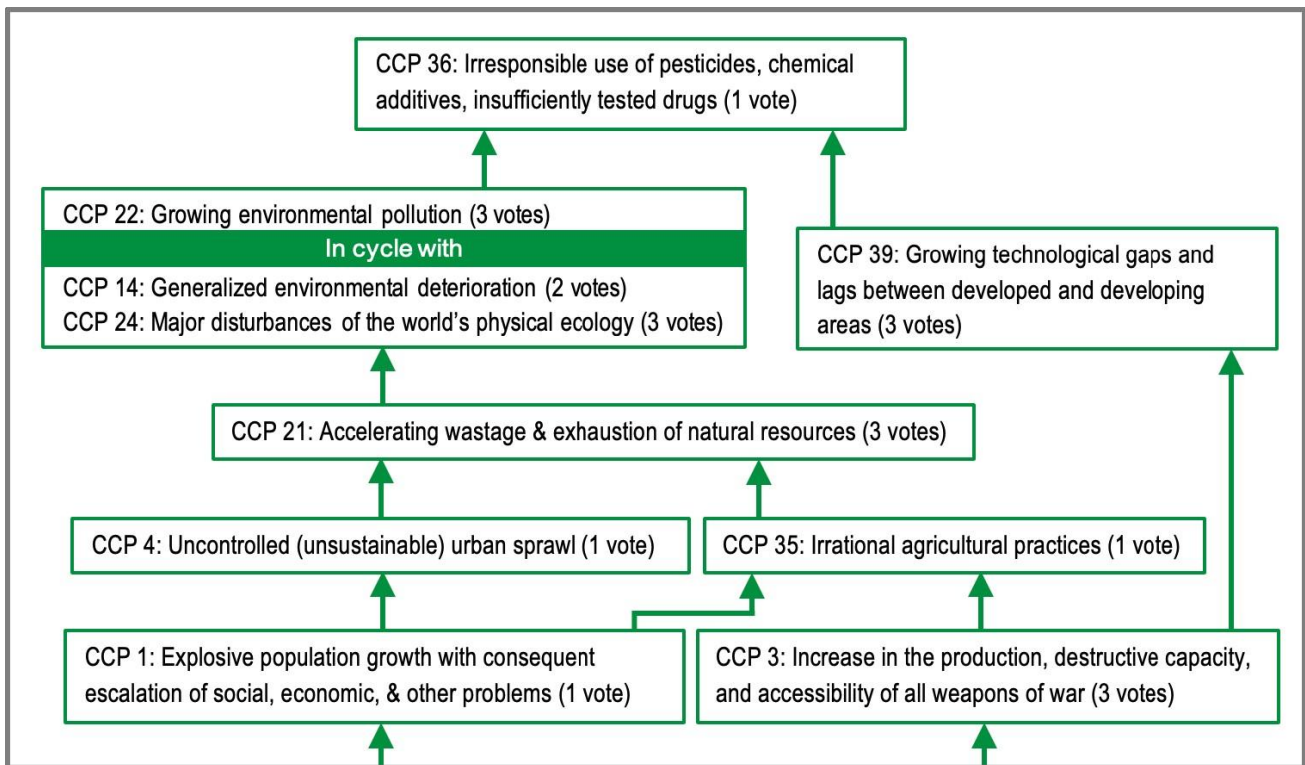


Figure 19: The objective/subjective observational complexity domain of the overall map.

We provide below the metrics as calculated by the Logosofia platform for the Retroductive Problematique. The only difference from the metrics obtained from the Retrospective Problematique is in the number of distinct connections (K), which is equal to 265, (as compared to 229 for the Retrospective), and hence giving rise to slightly higher SCI for this case, i.e., 17.84, as compared to 13.42.

Table 4: Metrics of the indices as derived from Logosofia.

CoLab Metrics

P	11	Total Number of Participants
U	5	Number of Prioritization Votes per Participant
N	49	Total Number of Ideas Generated
V	22	Number of Ideas receiving at least one prioritization vote after clustering
V_{Max}	49	Maximum Number of Ideas that could receive a vote
R	23	Number of Ideas in a relational pattern (currently mapped)
K	265	Number of distinct interconnections in the influence map
K_{Max}	484	Maximum number of distinct interconnections in the influence map
K_{Opt}	253	Optimal number of distinct interconnections in the influence map
D	0.39	Divergence = $(V - U) / (V^{Max} - U)$
PEI	1.1	Priority Effectiveness Index = $K / (R * (R - 1) - K)$
PEI_{Max}	22	Priority Effectiveness Index Maximum = $R - 1$
PEI_{Opt}	1	Priority Effectiveness Index Optimal = 1
SCI_{Opt}	16.23	Situational Complexity Index optimal = $D * (N - 7) * PEI^{Opt}$
SCI_{Max}	357	Situational Complexity Index maximum = $D * (N - 7) * PEI^{Max}$
$SCI_{(emergent)}$	2016	$SCI^{(emergent)} = (N-7)(N-1)$
SCI	17.84	Situational Complexity Index = $D * (N - 7) * PEI$
CI	0.61	Consensus Index = $(V^{Max} - V) / (V^{Max} - 5)$
RV	26.44	Requisite Variety = $(N - 7) * ((V - 5) / (V^{Max} - V))$

CONCLUSIONS AND RECOMMENDATIONS

The Gedanken-experiment was conducted with the inclusion of a specific pilot group of stakeholders in the context of the deployment of the virtual mode of the Logosofia platform. All Problematiques constructed and presented in this report should be considered academic because the law of requisite variety was not satisfied. However, the intention was to test the premise and methodology in the **Studio** and **Lab** as indicated in the revised Domain of Science Model for Design Co-Creation based on the work of John Warfield, (Jones, P.H., 2018), as indicated in Figure 20 below.

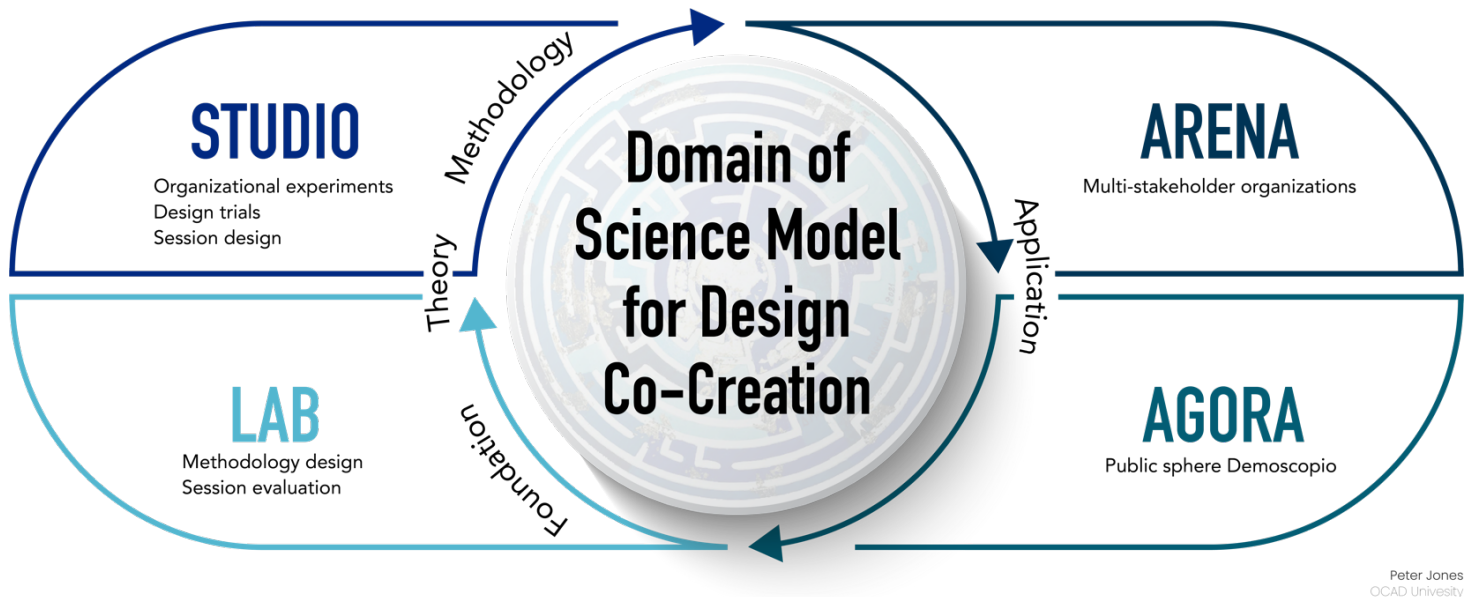


Figure 20: Domain of Science Model for Design Co-Creation

The Problematiques were all the products of a pilot group working in the studio. For the Problematiques to be useful and meaningful for policy design and action they should be constructed by people from all walks of life in the **Arena** and the **Agora** of the Domain of Science Model for Design Co-Creation.

The goal was to determine plausibility of co-constructing glocal (global and local) Problematiques that are ephemeral, situational, and replicable in an efficient and effective manner using Logosofia virtually and face-to-face in the **Arena** and eventually the **Agoras** (Fig. 20) in a similar fashion. Although there was significant learning that occurred during the experiment, we did not get a definitive answer to this question, and we will need to conduct additional action research with Logosofia on this issue.

The challenge of our era is the enhancement of the capability of our species to take charge and design action plans in anticipation of a crisis, as opposed to the "muddling through" approach that is dominant today. For example, we are at present muddling through with the corona-virus pandemic. Is it conceivable that, at this juncture of the evolutionary process, we collectively design at glocal scales a "blueprint for conscious evolution" for the sustainability of the species, or are we doomed to a scenario of "evolutionary consciousness?" The second scenario will most likely bring about a catastrophe. For example, the consequences of the climate change crisis were anticipated fifty years ago by some scientists in the Club of Rome prospectus (Ozbekhan, 1970; Christakis, 1973); however, the political and economic elites were not mobilized to address the Global Problematique, because they preferred the short-term benefits at the expense of the long-term consequences and costs.

The costs of the long-term consequences have been labeled by the dominant economic rationality as “internalizing the externalities,” namely the costs of cleaning the air, the water, the sea, and all the other ingredients that sustain life on the planet for the generations to follow. The trouble with this rationale is that there exist some costs that are irreversible, such as the reduction of biodiversity. Just like humankind was able, because of the observations of Galileo with the telescope, to adopt and implement the paradigm shift from the geocentric explanation of the planetary system to the heliocentric, **the time is ripe for the adoption of the paradigm shift from the anthropocentric to the eco-centric model of planetary sustainability, with the help of the Logosofia platform and the adoption of all the six principles displayed graphically in Figure 11.**

Another example of our failure to appreciate intersubjective observational complexity is the formation of task forces for an assault on the situational complexity of the corona-virus pandemic (Christakis N. A., 2020). These task forces have been dominated by medical scientists, at the exclusion of other disciplines and perspectives, such as psychosocial, environmental, ethical, educational etc. The disadvantage of such a monochromatic approach is that it disregards the multi-dimensionality of the pandemic crisis (Warfield & Christakis, 1987). By violating the Law of Requisite Variety (Ashby, 1956), this approach fails to launch an effective assault on the intersubjective component of the situational complexity (see Figure 6).

On the basis of the lessons learned from this inquiry, and the linkages among the six principles as depicted in Figure 11, a potential strategy for navigating the Labyrinth of situational complexity is the establishment of opportunities around the world for people to congregate and deliberate inclusively and effectively using a structured process such as SDD to capitalize on the cognitive diversity of people from all walks of life (Kakoulaki & Christakis, 2018). Our visionary anticipation is enabling people from all walks of life to become co-owners of their Glocal Problematiques and the co-construction of sustainable futures for their communities and the future generations of the planet as a whole.

In summary, the conclusions and lessons learned from the conduct of the Gedanken-experiment focusing on the co-construction by a pilot group of two Global Problematiques, employing a subset the Club of Rome CCPs relevant to the climate crisis situation, are:

- The six principles observed in the area of practice of SDD must be adopted and implemented if humankind is to successfully navigate the Labyrinth of the situational complexity of our era;
- Both Retrospective and Retroductive Problematiques offer evidence of the critical role the domain containing the intersubjective observational complexity CCPs (see Figures 15 and 18), must play in navigating the climate crisis situational complexity.
- The cybernetic embedding created by the virtual space Situation Room of the Logosofia platform is inferior to the physical space Situation Room of a Demosofia facility (see Figure 21 below);
- The propaganda cluster of CCPs, and the lack of public participation and deliberation cluster of CCP in the Retrospective Problematique of Figure 14, represent deep drivers responsible for the deterioration of the climate at the global scale during the last fifty years;
- In the Retroductive Problematique of Figure 17, “CCP #28: Ideological fragmentation and semantic barriers between individuals. group. and nations,” is the deep driver at Level 10 of the tree of influence; the best way for humankind to ameliorate the strong leverage of CCP #28, is by establishing at the global scale capabilities to engage diverse stakeholders in efficient and effective dialogue in an environment designed to protect the authenticity of every voice.

- In accordance with the formulas for the calculator of the Situational Complexity Index (SCI), the reduction of the SCI corresponding to the CoR Global Problematique CCPs, as a result of the pilot group work with the virtual mode of Logosofia, was of the order of 95 percent.

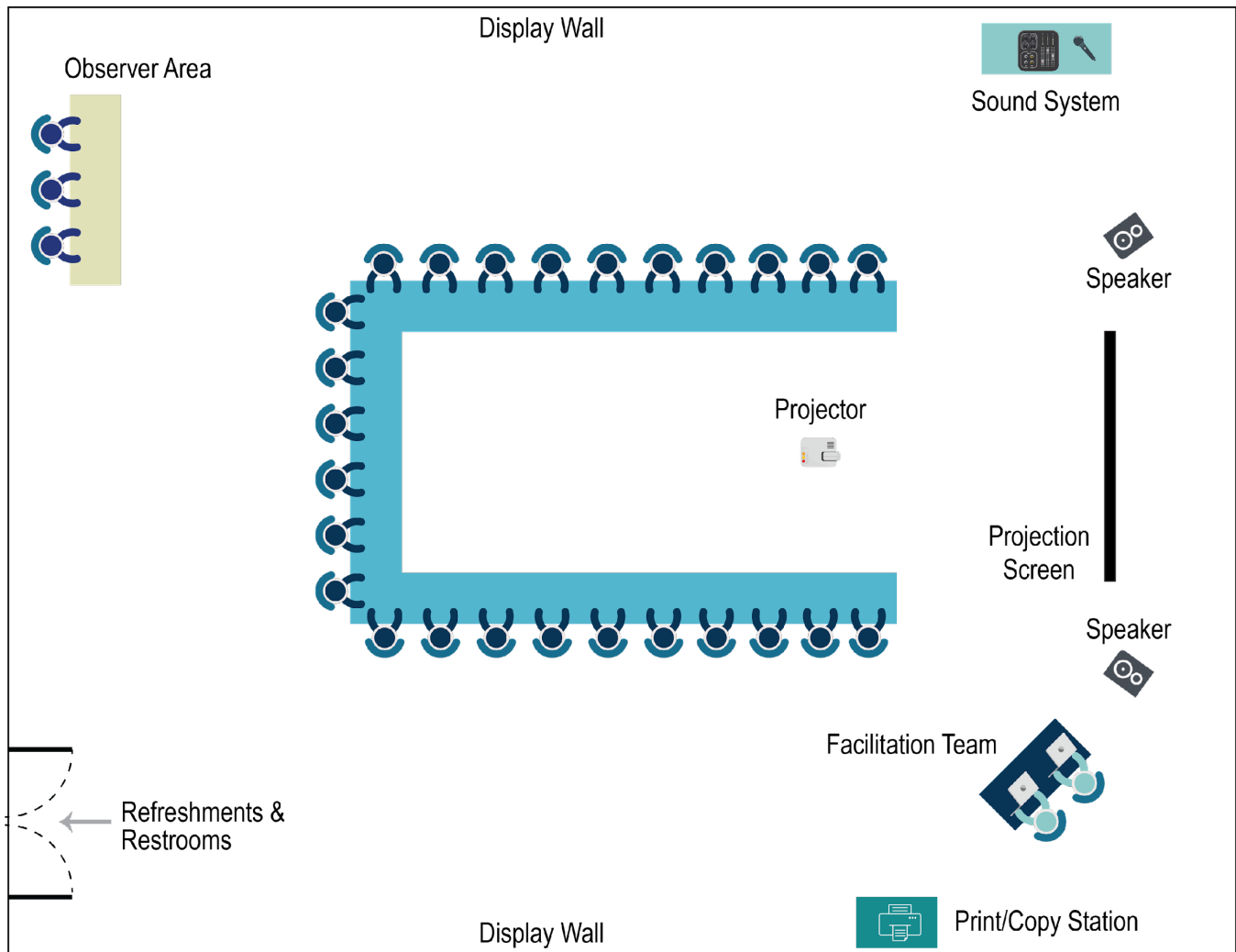


Figure 21: Physical space Situation Room of a Demosofia facility

LESSONS LEARNED

The authors were unsure what to expect launching this Gedanken-experiment. A small core planning team was established which focused primarily on drafting the generic question. Several iterations of the generic question were drafted prior to adopting the version utilized in the experiment. Adjustments were made to the original generic question for the Retroductive Influence Mapping.

Given participant's familiarity with interpretive structural modeling and the methodology of Structured Democratic Dialogue, one hypothesis was this group would be better able to "defactualize" immediately - liberate themselves of "what is" and instead focus on what should have been or ought to be. A survey was conducted at the

completion of the Retrospective Influence Mapping (results in Appendix B) and results indicated this was not the case for the majority of respondents.

Another hypothesis was that additional clarification was not necessary for the CCPs as the meaning was perceived to be self-evident. It quickly became apparent clarifications were needed and were provided by Christakis given his familiarity with Özbekhan's intent.

Another observation was the distinction between the Problematique constructed by one observer (Christakis) as compared to those co-constructed by a group of observers (the Pilot group). The first two represent the mental model of one individual observer who addressed the intersubjective subset of CCPs subjectively without taking into account the intersubjective observational complexity. On the other hand, the latter two, because they were constructed by means of structure group deliberation addressed the intersubjective observational complexity. In other words, the first two Problematiques represent the mental model of one observer, while the latter the mental model of a group of observers. For public policy the utility of the mental model of one observer is marginal when compared to the benefits obtained from building a group consensus in the construction of a Problematique.

Finally, and as previously noted, virtual engagements have advantages and disadvantages. As the Logosofia platform is enhanced to accommodate virtual engagements, we will also be investigating additional platforms to supplement Logosofia. For instance, the platform [Zoom](#) was utilized to engage participants and [PollEverywhere](#) for voting. Logosofia has the capacity to vote remotely but it requires virtual participants to have two screens or a computer and a tablet. This was not utilized as not all participants had access. We hypothesize having two screens would promote better engagement and deeper learning amongst the participants.

Further recommendations can be found in Appendix B: Participant Survey Results. Ultimately, the lessons learned in the "Lab" and "Studio" as described in Jones' revised Domain of Science Model for Design Co-Creation will help us move to the "Arena" and "Agoras" where meaningful change occurs.

REFLECTIONS

In an effort to gain further insights, four participants were invited to reflect and critique the experiment. The hope is that these insights will help move this important work forward, making iterative improvements that lead to impactful change for the planet.

Tom Flanagan

Reflecting on the historic position for a Gedanken-experiment on the SSD Structuring Process.

Some fifty years ago, following World War II, an international community began gathering itself with shared concerns about the future. Initially the group was drawn to consider the rapidly growing gap between developed and undeveloped nations, which was conceptually crystallized in a book titled ***The Chasm Ahead***. The group named itself the Club of Rome and soon realized that the scope of the challenge that lay ahead was far greater than technologies alone. They commissioned a scoping document from a celebrated international business ethicist located at the Warton School, Hasan Özbekhan. Hasan drafted a report which was called ***The Predicament of Mankind***, and it featured a set of 49 continuous critical problems which were all woven together through influences such that to try and change one problem alone would only exacerbate others. Intellectually this sociological masterpiece was daunting. Tools for modeling the implications for efforts to resolve this system of problems would only become available years later.

In an effort to launch activities with modeling tools which were already at hand, the club opted to focus on modeling

the trends in the stocks and flows of material systems on the planet. This approach led to an academically arguable position for insisting that action needed to be taken immediately. The findings were discriminated in a book called **The Limits to Growth**. Tragically, the analytical argument failed to generate the sociological energy sufficient to initiate real changes in human behaviors. Facts about planetary resources simply didn't evoke civic response as might be expected from stories about human struggle. Artistic representation of ways that humanity were systematically destroying the earth proved catalytic in launching special purpose organizations and government agencies that would focus on pieces of the problem, but the assault on the larger problem still remained incomprehensible for many except a small number of enlightened thinkers.

The problems named by Hasan Özbekhan in *The Predicament of Mankind* exist still today, and their interwoven influences have been amplified by some of the "technological progress" over the years. In parallel, however, modeling technologies for finding leverage points in highly complex, or wickedly complex, human system situations have matured to the point that today they do offer new avenues for engaging global crisis. In one application of such a modeling method, Hasan Özbekhan himself co-constructed a model of his continuous critical problems and identified what he argued to be the most highly leverage problem in the problem stack (***A Retrospective Structural Inquiry of the Predicament of Humankind***). Investing focused energy at this specific level was reasoned to percolate relief across all the other named problems. The modeling project was not an attempt to hammer out a detailed blueprint of each and every step that would lead to a problem resolution, but rather to identify a starting point which, if accepted, would pull together the strength of all who would need to be a part of the ultimate problem resolution. This approach was tested and validated in highly complex situation in industries and communities across the globe, and was also used to build essential political will for taking on the world's largest public health mission, the global elimination of elephantiasis (a project which continues on track today; see ***Setting the stage for a Global Programme to Eliminate Lymphatic Filariasis***).

The power of the social system modeling approach is not obvious. One intuitively expects the strength exists in getting the "right answer." Indeed, getting the "wrong" answer would be terminal, but getting the "right answer" proves to be a secondary benefit to "having the right means for getting to the right answer." The essential social power for truly large-scale change depends critically on the dialogue that leads to an inclusive discovery of what can be done together. It is this dialogue – call it performance art – that leads to a story – call the story the epic saga of the day – that creates energy.

Today we have some remarkable epic stories. The messaging is smart, artistic, and powerfully performed in video recordings that can be shared across the globe at almost negligible cost. The stories evoke an audience's imagination, yet they also evoke an audience's static role as a spectator. For sure, some in an audience will be catalyzed into action. And in some cases, some small few highly energized individuals may launch an initiative that will yield remarkable civic impact. When civic initiatives do not require significant active investments of the majority of the population, then small-group-led initiatives can prevail. This path for civic change, however, is becoming increasingly rare when change requires many people accepting ways of doing things differently. People who do not feel part of conversations which redesign their world rarely embrace the world visions of others. If their good will is needed, then the experience of the discovery dialogue needs to be shared with them in some authentic way. This is a challenge worthy of some deep reflection.

How do we open up an essential discovery dialogue to many, many different people from many, many different cultures in a way that will allow them to apply their understanding of the world and construct a model that will bring them all to a shared starting point? This is precisely the challenge that Alexander Christakis has devoted his life's energy for resolving. If the fruit of Christakis's life work has not already brought us the essential approach for achieving this goal, it has brought us very, very close (**A Democratic Approach to Sustainable Futures**).

Alexander Christakis and his colleagues have adapted an expert model for tracking root causes in complex problems to a democratic model for discovering root opportunities in highly complex situations. The reason that this innovative modeling approach is scalable is due to the fact that a group consistently applies an approach for thinking as a group while the group is focused on a consistent question. The thinking pathways may and arguably really should vary across groups. Different groups will have different individuals who will have seen the world from different

perspectives. Their views of how the world works will vary. As they share their views for how the world works, some perspectives in some members of a diversified group will shift. The group will start thinking and learning as a group. As the process continues, the diverse understandings that were initially carried into the group move toward a coherent understanding. And while the overall understanding will surely differ across groups, the deep drivers of complex situation will become increasingly clear. Christakis uses the emerging coherence around deep drivers of complexity as a means of helping a group recognize where they can agree to focus joint effort so that they all will benefit from addressing that specific challenge. While the understandings will differ, the groups will all share the experience of thinking coherently together as they discover root opportunities. And recently emerging evidence suggests that diverse groups from cultures across the world will discover comparable root opportunities – which means that diverse groups from across cultures of the world can directly discover where they may start working together to begin to take on problems as large as global crisis.

The Gedanken-experiment for enhancing the model building approach for very large-scale use is directed toward the “structuring question” which informs the influence linkages that a group evaluates when building a model. This is a less intensely considered aspect of the methodology and thus has warranted focused attention in the current work. The design team sought to evaluate two forms of structuring question: one of the forms is called Retrospective (i.e., what would have happened in the past ...) and the other of form is called Retroductive (i.e., “what should happen in the future ...). In the context of expectations for highly leverage root opportunities for effecting systemic response the two different questions may or may not identify the same root opportunities. The shift in probable root opportunity does, of course, reflect assumptions about what has changed or is likely to change over the two selected points in time. Design participants are challenged to consider both their theories for the way that a specific pair of concerns interact and also how those theories may or will evolve.

The subject matter draws upon the Özbekhan continuous critical problems in the restricted context of climate change. The design team were recruited for a virtual design using a cloud-based platform customized for the Interpretive Structural Modeling of the Structured Dialogic Design (Structured Democratic Design) methodology. Several challenges were engaged during the Gedanken-experiment which are typically resolved during the ideation phase of the design process. The nature of the problems themselves were complex, and different design participants had different views of what the problems “really” meant. This situation reflects a limited capacity to defactualize (in Özbekhan’s terminology) and re-learn together. The shared understanding of the problems also became compromised as participants entered and left the virtual design space during deliberations. This fuzzy clarification added stress to a group process which was cognitively stressful in the best of situations.

Rather remarkably, the models themselves displayed an unexpected vertical partitioning of types of problems as a result of the modeling work. Too little can be said about the specific applicability of specific findings of the models (in this participant’s view based upon participation in only the initial cycle of design). Will the modeling drive collective action? Under ideal conditions, perhaps. It is too soon to tell. The spirit of this Gedanken-experiment warrants replication under settings where additional participant and content variables can be more rigorously controlled. Current results suggest that future work along these lines could provide powerful insights for enhancing the core design methodology.

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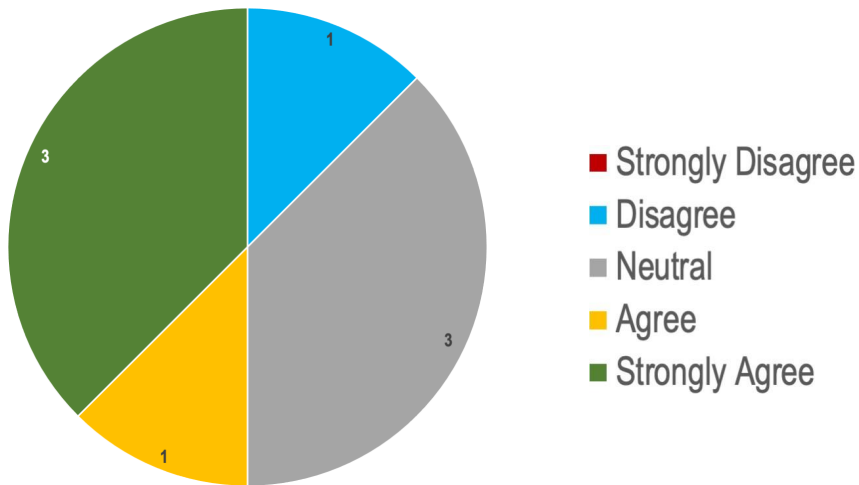
Appendix A: List of Participants & Observers

Participation in this experiment fluctuated and some sessions included observers. Some members did not participate in all the sessions of the experiment. Participation was floating, with members fluctuating throughout the experiment.

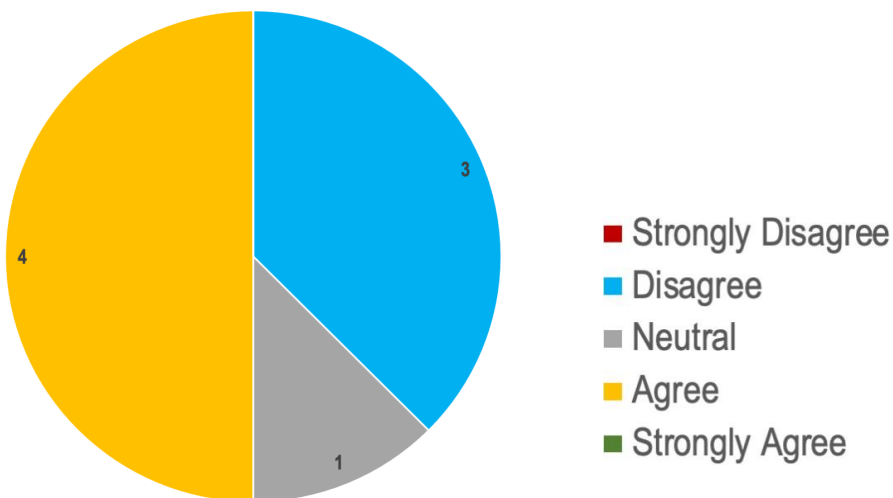
Name	Country
Heiner Benking	Germany
Alda Roxana Cardenas	Mexico
Alexander Christakis	Greece
Kevin Dye	United States
Tom Flanagan	United States
Marcus Hallside	United Kingdom
Peter Jones	Canada
Yiannis Laouris	Cyprus
Craig Lindell	United States
Marios Michaelides	Cyprus
Scott Staley	United States
Reynaldo Trevino-Cisneros	Mexico
Kirk Weigand	Canada
Observers	
Norma Romm	South Africa

Appendix B: Participant Survey following Retrospective Influence Mapping

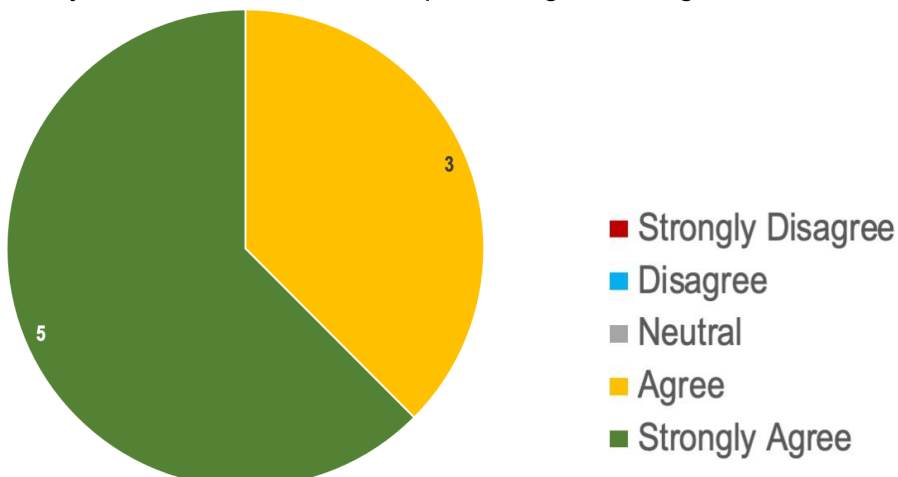
1. During the initial session, the instructions for this experiment were clear.



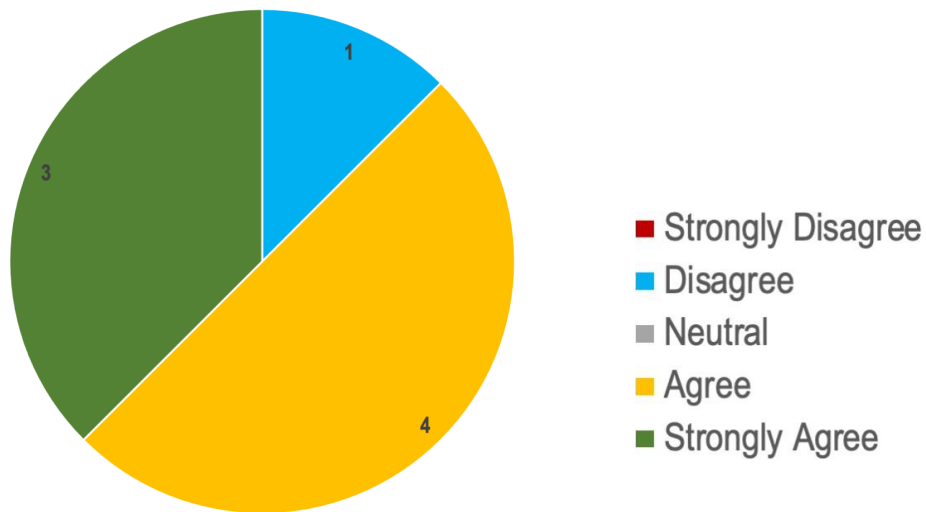
2. The Generic Question was clear



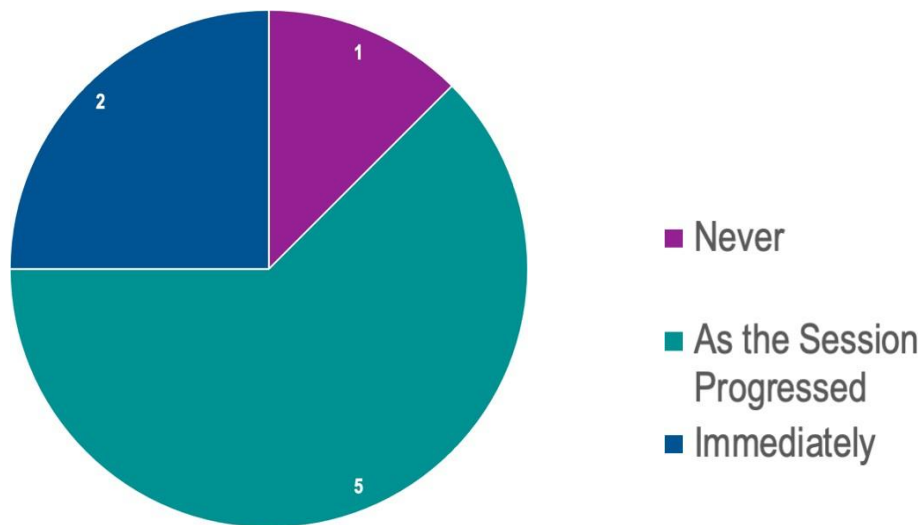
3. I felt my voice counted and was equal during the dialogue



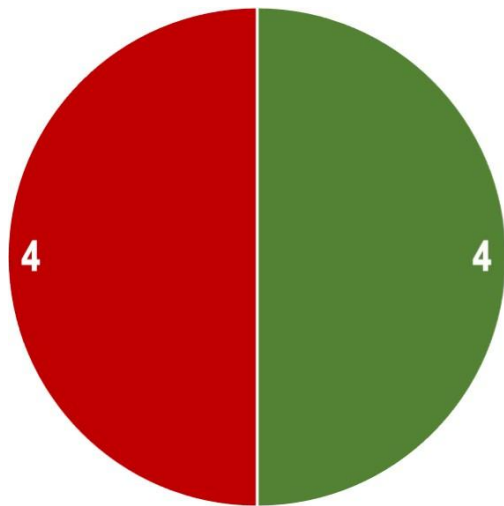
4. The various technologies were effective for the experiment



5. I was able to “defactualize”

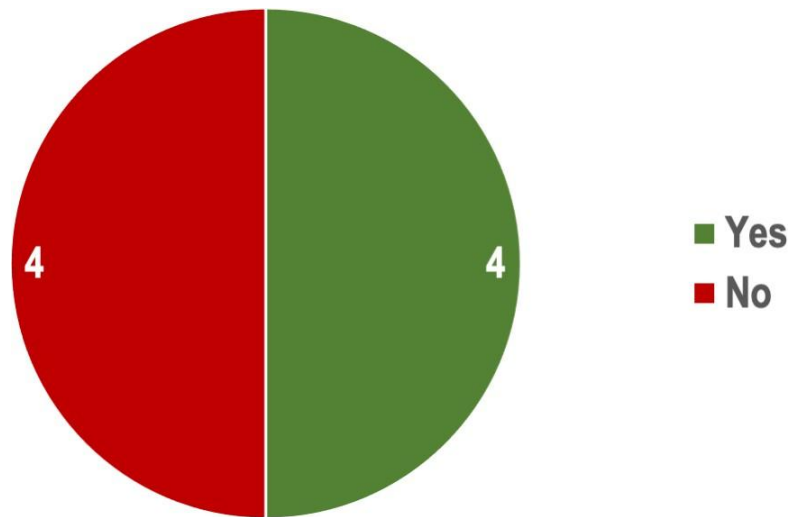


6. Has the experiment help you to appreciate the distinction between the Triggering Question and Generic Question?

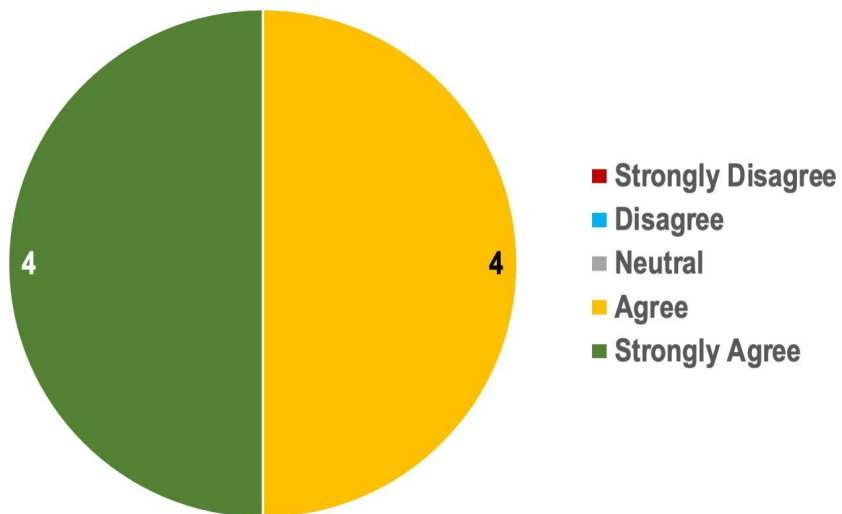


■ Yes
■ No

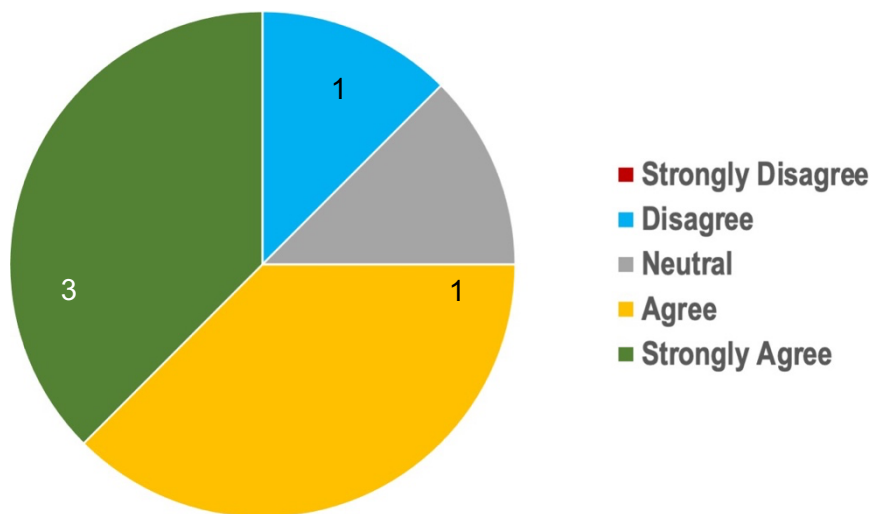
7. Have you learned or enhanced your knowledge about the role of the Generic Question in the design and conduct of colabs?



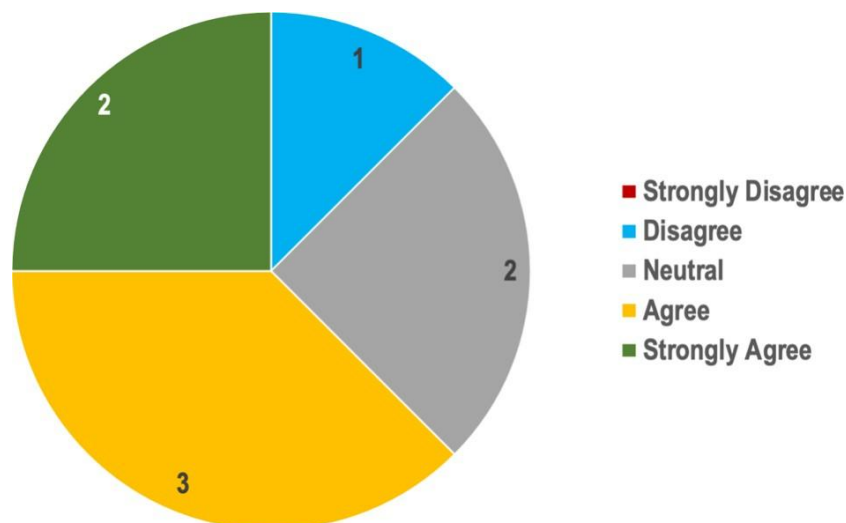
8. By participating in this experiment, I have learned with and from my colleagues



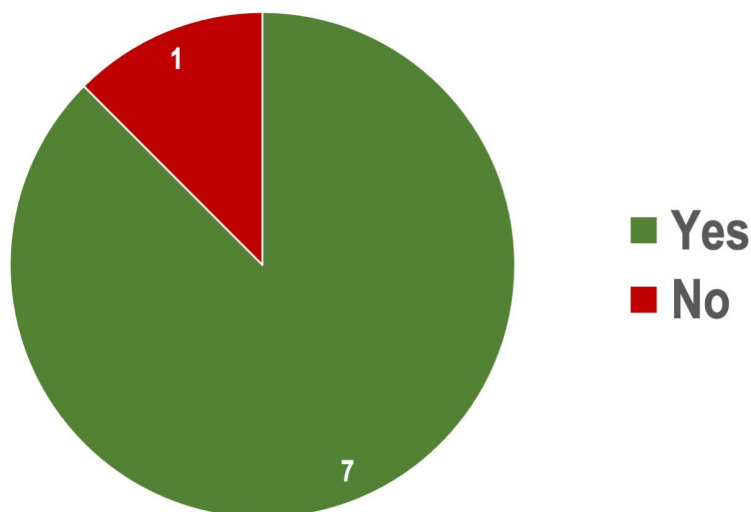
9. I believe this will be a valuable reference and inform future presentations



10. Overall, I found the experiment a valuable use of my time



11. Do you think that designing and conducting virtual colabs with Logosofia would be productive in your community of practice?



12. What would have improved this experiment? (What should we do differently the next time?)

- Using the experiences and input from the group rather than the historic references
- Follow the guidelines for Application Structural Types more strictly.
- Several examples should be given for the defactual alleviation of each CCP. A very short title should be designed for each CCP so it all reads consistently as barriers or challenges.
- I believe that beginning with our own group generation and clarification of ideas would have thrown a better comprehension of the global problematique and would have induced better responses after applying the Generic Question to all the selected relevant issues.
- Mainly the simulated/training exercise that could have enabled many of the issues relating to deactualization to be identified prior to the start of the process.
- I enjoyed the sessions and believed I should commit to as many as possible. The length of time needed in total was rather significant and unplanned for. There might be other ways to use Logosofia and briefer sessions to explore the problematique, such as by starting from and critiquing (building on to) a partial set (10-15 CCPs) mapping done prior to full group engagement

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