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Equitable transformation, transforming equality: A grounded theory study on the role of equality and equity in research and policies for transformative change

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SUMMARY

This study aimed to explore the role that equality and equity plays in transformations research, and how it can be integrated further by asking the research question *How are the issues of equality and equity incorporated into the Transformative Innovation Policy conceptual framework and practice, and what lessons can be derived from it?* Through working in collaboration with the Transformative Innovation Policy Consortium, data was collected on how researchers perceived and implemented equality and equity in their policy work. Utilizing the equality and equity framework developed by McDermott et al. (2013) and Leach et al. (2018) in studies of socio-ecological systems, the concepts were applied to TIP, and by extension TIP's conceptual grounding, socio-technical systems (Geels, 2002). Through secondary data sources on policy experiments and interviews with researchers in TIPC, it was found that equality and equity was integral to TIP, although in an implicit manner through procedural mechanisms such as co-creation and mutual learning.

A full axial coding paradigm was created through the GT analysis, providing an abstracted, conceptual 'map' of the work of TIPC. This axial coding paradigm bridges the two conceptual frameworks, and presents an overarching description of the work of TIP practitioners. It was found that procedural equality was strongly emphasised already in the TIP framework, but recognitional equality played a barrier in interactions on both an individual level and a structural level. Distributional equality was framed as a distribution of knowledge resources, which highlighted the frictions between academics and on-the-ground practitioners. From the coding paradigm, certain values emphasised and strategies utilized by TIPC were emblematic of achieving equality: openness, capacity building, co-creation, consensus building, participation, network building, commitment to non-hierarchy, commitment to mutual learning and reflexivity, development of a shared narrative.

Beyond the framework used, the exploratory research identified a common thread which formed the 'theory developed' through the GT analysis: the underlying role of epistemic equality in transformations research. Relating to knowledge, who possesses the knowledge, and what knowledge is seen as legitimate, the role of epistemic (in)equality affected the interactions researchers had with practitioners based on their position within the Global North-South divide. Recommendations based on these findings include implementing guiding principles to examine the role of epistemic equality within deliberative methods such as co-creation, and continuing to foster reflexive practices within the research community and while engaging with practitioners and stakeholders.

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INTRODUCTION

Humanity faces unprecedented environmental challenges in the coming century, and policymakers must address this. These challenges characterise the Anthropocene, the new geological epoch defined by the impact humans have left on the planet (Zalasiewicz et al. 2010). Anthropogenic impacts to the planet, such as marine and terrestrial ecological decline, environmental damage and climate change are projected to continue apace in the 21st century (IPCC, 2014). These impacts place pressure onto the planetary system, exceeding what are known as 'planetary boundaries' (Rockström et al., 2009) – biophysical thresholds when surpassed could have disastrous consequences for life on earth. If not managed, these disastrous consequences will be felt in every aspect of society, affecting quality of life, human health and economic wellbeing. While anthropogenic impacts are beginning to affect ecosystems in the present-day, the effects and associated impacts to humanity will rise in both magnitude and frequency in the 21st century (IPCC, 2014). These challenges can be termed as 'wicked problems' – problems characterised by a dispersion of causes and effects, fragmentation of agency and institutional inadequacy manifested across both spatial and temporal dimensions (Gardiner, 2006). The deeply interconnected, fragmented but complex nature of these challenges require a paradigmatic shift in thinking and action; away from the hegemonic, causally linear, and siloized modes of knowledge production, and away from disjointed and reactive governance. To mitigate and adapt to such impacts, wide-scale changes must be made to how society functions: it must engage in a process of transformation. The research conducted in this thesis will investigate such a process of transformation.

This paradigmatic shift in the face of uncharted territory has begun. Within scientific enquiry, this shift is seen in the rise of what can be termed as 'post-normal science', a scientific practice characterised by extensive participation which encompasses the management of high levels of uncertainty and complexity (Funtowicz and Ravetz, 1993), or 'Mode 2' scientific discovery – socially distributed, application-oriented, trans-disciplinary, and subject to multiple accountabilities (Nowotny et al., 2003). In the domain of governance, there has been increased recognition of the necessity of cross-cutting policies, stakeholder inclusion, increased coherence, and integration as methods to tackle these 'wicked problems' (Biermann et al., 2010; Stafford-Smith et al., 2016). These include goal-driven governance mechanisms, such as the UN's Sustainable Development Goals, which exemplify the issue-oriented problem-based governance that focuses on promoting new interlinked frameworks and institutional arrangements (Biermann and Young, 2017), and mission-oriented policies, where objectives are addressed by multiple actors, fostered by new forms of partnerships and collaborations between the public sector, private sector and civil society and utilising cross-disciplinary knowledge (Mazzucato, 2018).

These simultaneous developments in governance and research have coalesced to form science-policy interfaces – relational processes between scientists and actors in the policy process which allow for the co-evolution and joint construction of knowledge that enhances

decision-making (van den Hove, 2007) – which aim to transform the systems that form the foundation of society itself. These changes involve normative challenges, calling into question the relations which power these systems. Addressing these challenges in the face of uncertainty requires the development of new norms and conceptual frameworks for collective action (Biermann, 2007). This thesis explores the normative dimension of equality and equity within sustainability transitions and transformation studies. Through working with the *Transformative Innovation Policy Consortium* (herein TIPC), a research consortium engaging with innovation policies as a mechanism for transitions and transformations, this thesis investigates how the norms of equality and equity have been integrated within a transdisciplinary project dealing with the science-policy interface such as TIPC.

The necessity to foster and implement transformative change grows increasingly salient. Research has shown that combating anthropogenic ecological decline will require transformative systems change – that is, change which is a fundamental, system-wide reorganisation across technological, economic and social factors which make sustainability the norm rather than the exception (Díaz et al., 2019). While research has excelled in understanding global environmental change and identifying technocentric solutions, it has mostly failed to engage with the critical question of how to enact transformational change within real-world situations (Fazey et al., 2018). In not engaging with real-world situations and the normative issues existing within the real world, there is a chance of replicating existing inequalities, unfavourable market settings, extractive relationships with ecosystems and exploitative relationships inherent within current structures of society. The normative dimension is central to transformation research, given that it is inherently political as it implies a process of changing the status quo. Sustainable development itself is a political project, dealing with social systems (such as food, energy, water, transport) and how it relates to the overarching goal of securing human wellbeing in the future. The operation of institutions will not spontaneously generate a trajectory that is sustainable, it requires engaging with the political (Meadowcroft, 2011). Furthermore, it cannot be assumed that the process will not be met with backlash from those who benefit from current societal configurations (Patterson et al., 2017; Fazey et al., 2018). In this regard, the issues equity and equality arise to the forefront of the implementation of transformations. Díaz et al. (2019) notes that there is a call for the promotion of inclusive approaches, such as rights-based approaches, which can reflect a plurality of values and promote equity.

PROBLEM DEFINITION AND KNOWLEDGE GAP

The work of TIPC aims to generate knowledge towards enacting such real-world change. TIPC engage in socio-technical policy experiments which apply the theoretical framework of transition theory. Socio-technical experimentation can be defined as experimental processes which treat society itself as a laboratory, engaging with real-world actors to purposively reshape social and material realities (Sengers et al., 2019). In doing so, the learning and demonstration effects of the experiments lends to the growing movement of emerging sustainable systems (Schot et al., 2017; Sengers et al., 2019). The methodology in encouraging sustainability transitions as advanced by

TIPC engages normative issues relating to the political, however the nascent quality of the research conducted by groups such as TIPC means that the post hoc theorising of how these principles is applied *in practice* still needs to be done. In other words, existing work in creating sustainability transitions and transformations require investigation into whether or not the normative concerns are addressed in an equitable manner. The issue presented here can be seen as a problem within the actualisation of truly sustainable transformations and a knowledge gap in the field. This is of importance to the field, as "behind policy there is always politics, and getting the politics right appears to be a prerequisite to getting the policies right" (Meadowcroft, 2011, p. 73).

The normative issues of equality and equity have been chosen as the relationship between (in)equity, (in)equality and sustainable development are undoubtedly interlinked – for instance, ensuring fairness for future generations being a central tenet. While the link between environmental degradation and inequality is well established (see Martínez-Alier, 2002; Bullard et al., 2003), the relationship between equality and sustainable development remains underdeveloped. As stated by Leach et al. (2018), issues relating to equity and equality are mentioned explicitly in two of the SDGs and 18 of the 169 SDG targets. However, despite the prevalence of rhetoric in promoting equality and empowerment, there is little research on how this is done in practice.

Furthermore, science can be seen as a 'common language' to encourage sustainability (Kasuga, 2021). As science can act as a 'common language', it is necessary to understand how it becomes a common language. One can view both science-policy interfaces and transdisciplinarity – where science is co-produced with societal actors – as processes in the formation of this common ground. As noted within studies of transdisciplinarity, there are theoretical and methodological discussions on how to support transdisciplinary (Pohl and Hirsch Hadorn, 2008; Enengel et al., 2012; Defila and Di Giulio, 2015), but few studies on the practice of integration in distinct research objectives (Hoffmann et al., 2017). The necessity of transdisciplinary projects to solve 'wicked problems' has highlighted the knowledge gap in the real-world implementation of these projects – specifically dealing with the realities of integrating difficult normative considerations in real-world settings subject to various stakeholder configurations, power dynamics and inequalities.

RESEARCH OBJECTIVE

The research objective of this thesis is to investigate how considerations of equality and equity have manifested in the work of TIPC's socio-technical experiments. The TIPC project serves as one specific theoretical model for transformation, providing the conceptual basis of the thesis. In essence, it is the application of transformations theory into the traditionally technocentric domain of innovation policy. Grounded theory is chosen as the research strategy as the policy experiments and theory are still in conceptual development. Additionally, the relationships between the two main theoretical strands of this research, equality and equity and

transitions/transformation theory, are still relatively under-investigated (Vollstedt and Rezat, 2019).

RESEARCH QUESTIONS

Based on the research objective, the central research question of the thesis is as follows:

How are the issues of equality and equity incorporated into the Transformative Innovation Policy conceptual framework and practice, and what lessons can be derived from it?

This central question can be divided into four sub-questions (SQ):

1. *How are the issues of equality and equity currently operationalised within Transformative Innovation Policy?*
2. *How were these issues implemented in practice?*
3. *What potential barriers and areas of improvement can be identified in the process of integration?*
4. *What recommendations can be derived for furthering equality and equity in transformations work?*

The first two SQs explore the work of TIP in relation to the conceptual framings of the study of equality and equity, essentially finding the common language used in both strands of inquiry to identify where work towards equality and equity is already existing in TIP. The following two SQs aim to find the areas in which TIP (and other projects working towards sustainable transformations) can improve and safeguard equality and equity.

RESEARCH FRAMEWORK

The research framework of the thesis is presented in Figure 1. This research adopts a qualitative approach using grounded theory, due to the exploratory nature of the project. The intended results aim to provide in-depth analysis to further theory development (Verschuren & Doorewaard, 2010). Based on the research framework presented, this thesis will firstly elaborate on the theoretical and conceptual underpinnings of the research in the *Theoretical Background* section. Following this, the *Technical Research Design* section will present the selected research strategy and the methodological steps undertaken. This is followed by the *Results,* which will include the results of the coding process alongside the theoretical and interpretative results.
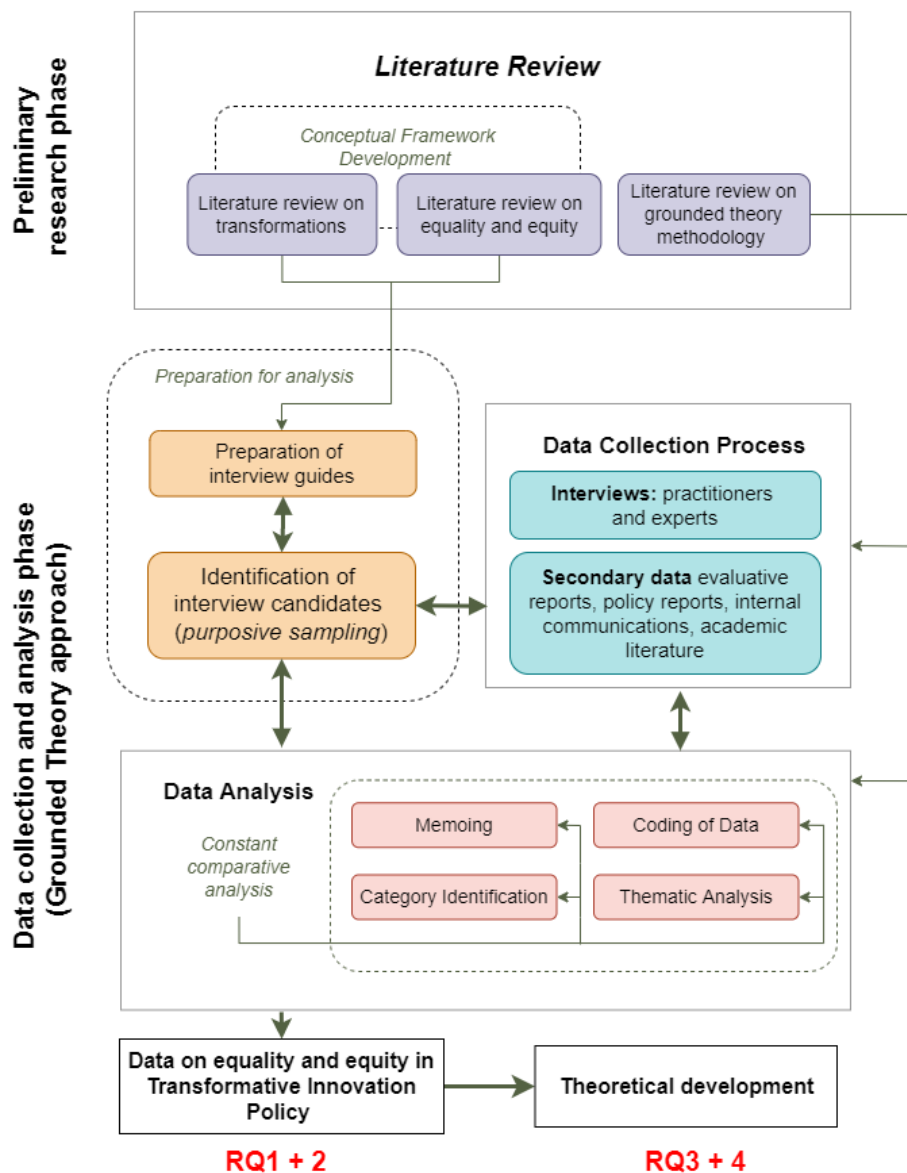
Figure 1. Research Framework

SOCIETAL AND SCIENTIFIC RELEVANCE

Regarding societal contribution, the research is relevant in the fact that it deals with the governance of critical systems for the functioning of society such as food and water provision. It aims to contribute to the body of literature in relation to the transformations of these systems which affect people's day to day lives. Furthermore, the work of TIPC is partnered with multiple national governmental departments, such as in Colombia and Sweden. Given the urgency to adapt to global environmental change, ensuring fair and equitable adaptations are of critical importance (Díaz et al., 2019). Without adequate and effective safeguarding of equality and equity, inequalities may be exacerbated, and conflict may arise from new socio-technical configurations.

This is a particularly pertinent issue in regions such as across Latin America and South Africa, two regions in which TIPC operates.

The scientific relevance of this research is twofold: Firstly, the thesis aims to contribute to the development of the Transformative Innovation Policy (herein TIP) theory as advanced by Schot et al. (2017). It will assist in the process of evaluating the outcomes of the policy guidelines. In doing so, the research will directly contribute to the TIPC knowledge platform, aimed at providing specific tools and guidelines for policymakers, civil society actors (for instance, NGOs) and innovation actors (such as private firms, investment funders, etc.). This contribution is reflexive, assisting in the development and refinement of the theory and the quality of work conducted in TIPC's transdisciplinary projects. Reflexivity is important for system innovation, learning and sustainable transformations (Sol et al., 2018). It refers to the ability to recognise an organisation or individuals place within the social structure, their influence within it and the type of knowledge they possess and how that knowledge is created. In doing so, being reflexive gives researchers options to handle situations where frictions, misunderstandings and conflicts are rising (Sol et al, 2018). Additionally, scientific research can be seen as a 'common language' to encourage sustainable outcomes in contentious societal arenas (Kasuga, 2021). As science can act as a 'common language', being reflexive gives more opportunity to find how this commonality is established.

Secondly, this research contributes to the body of literature relating equality, innovation theory and sustainability. It provides a novel case in bridging the distinct disciplinary domains, a providing a framework for normative evaluation often overlooked within socio-technical frameworks for transitions (see Avelino and Rotmans, 2009 and Feola, 2020 for areas which are overlooked within theory related to innovation transitions). Finally, the research provides an exploration into how forms of equality and equity play out within a transdisciplinary project in practice. It explores not only how the theory (TIP) is applied but investigates the direct experiences of the experts and practitioners involved as subjects within the broader scientific knowledge production process.

THREORETICAL BACKGROUND

The aim of this section is to present the theoretical background of this thesis. It will firstly elaborate on the core conceptual lenses used – transitions and transformations (toward sustainability) – and the prevailing discussions around the theories. They are central to the development of TIP, which forms the theoretical knowledge base to which the normative considerations of equality and equity will be integrated into. The section will conclude with an outline of the analytical tools developed in studies of equity and equality in the environmental domain which will inform and complement the methodology.

TRANSITIONS AND TRANSFORMATIONS

TRANSITIONS

Defining transformations requires firstly to elaborate on key terminology from the field of transitions studies, which forms the conceptual building blocks of the theoretical background. Namely, the notion of a *technological transition* must first be defined. A technological transition is defined as "a major technological transformations in the way societal functions such as transportation, communication, housing, feeding, are fulfilled. Transitions do not only involve technological changes, but also changes in elements such as user practices, regulation, industrial networks, infrastructure, and symbolic meaning" (Geels, 2002, p. 1257). As further elaborated by Grin et al. (2010), transitions are co-evolutionary, multi-actor processes that require multiple changes in the socio-technical system. The theory posits that transitions involve the development of technical innovations alongside their adoption within the societal domain. This adoption involves selection by consumers, alongside the process of societal embedding via regulations, infrastructures, and cultural symbols. The multitude of actors involved in these processes include users and consumers, businesses and firms, policymakers, interest groups and scientific communities; all interacting between one another.

The configuration of these relationships can be conceptualised into three discreet 'levels': *technological niches*, the *socio-technical regime*, and the *socio-technical landscape;* which form the Multi-Level Perspective (Geels, 2002; Grin et al., 2010, de Haan and Rotmans, 2011). The relationships between these three levels are visualised in Figure 2. The three levels provide different kinds of coordination and structuration to activities within an existent local practice. They differ in stability and size, ranging from the smallest and least stable – the niche, which represents novel innovations not yet subsumed into the mainstream – to the largest, the deeply embedded socio-technical landscape. Socio-technical landscapes form an 'exogenous environment' which is beyond the influence of niche and regime actors, such as cultural patterns, the macro-economic environment and political developments (de Haan and Rotmans, 2011). Within the socio-technical landscape exists the regime and the niches within the regime, forming a nested hierarchy.
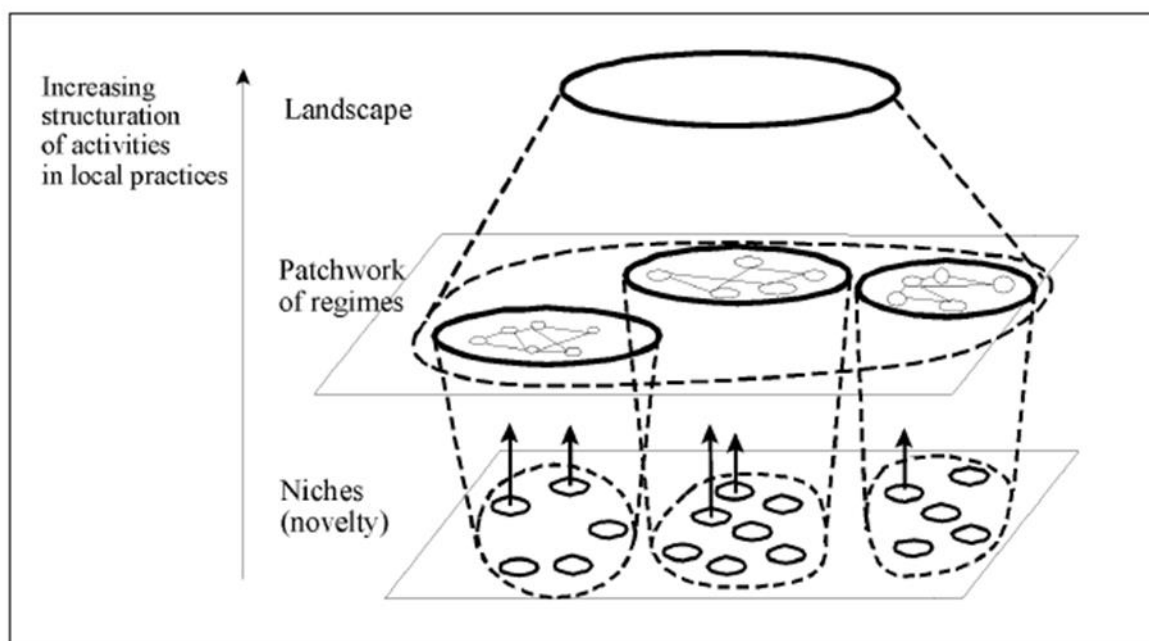
Technological transitions occur within a socio-technical regime. A socio-technical regime refers to the configuration of embedded practices, symbolic meanings, regulatory frameworks, production processes and procedures, infrastructural and industrial networks surrounding a specific technology and the technology itself (Kemp et al., 1998; Geels, 2002). It relates to the relationship the technology has with societal factors such as institutional-regulatory landscapes, infrastructural-spatial landscapes, and the societal sense-making processes. A socio-technical regime provides stable meanings to how a technology is utilized by society, and how societal functions such as housing, food and transportation are fulfilled. In this sense, the regime acts as a stabiliser for existing socio-technical trajectories, as the technologies within the regime are well established within physical space (in the form of existent machinery and infrastructures) and cognitive architectures (such as legal regulations and standards and cultural and social adaptations to technology) (de Haan and Rotmans, 2011). Socially, the regime consists of large and stable networks of users and creators within established market structures and relationships. Niches can be viewed similarly but on a smaller degree, as both the niche and the regime are formed by networks of actors that have shared values, which provides structuration to local practices (Grin et al., 2010). Within a niche, there is a different configuration of actors and processes, where the actors are oftentimes on the fringe or are dedicated users of a specific technology. A radical innovation may emerge from a niche, leading to a period of uncertainty and flux and which, given the right conditions, can trigger a technological transition. This process is illustrated in Figure 3.

The socio-technical regime concept, while offering a conceptual lens to envision structural change towards sustainability, has not been without criticisms. It has faced multiple critiques, particularly in relation to its relationship with the political. Geels (2011) outlines and addresses these criticisms, which include bias towards bottom-up change models, the implied
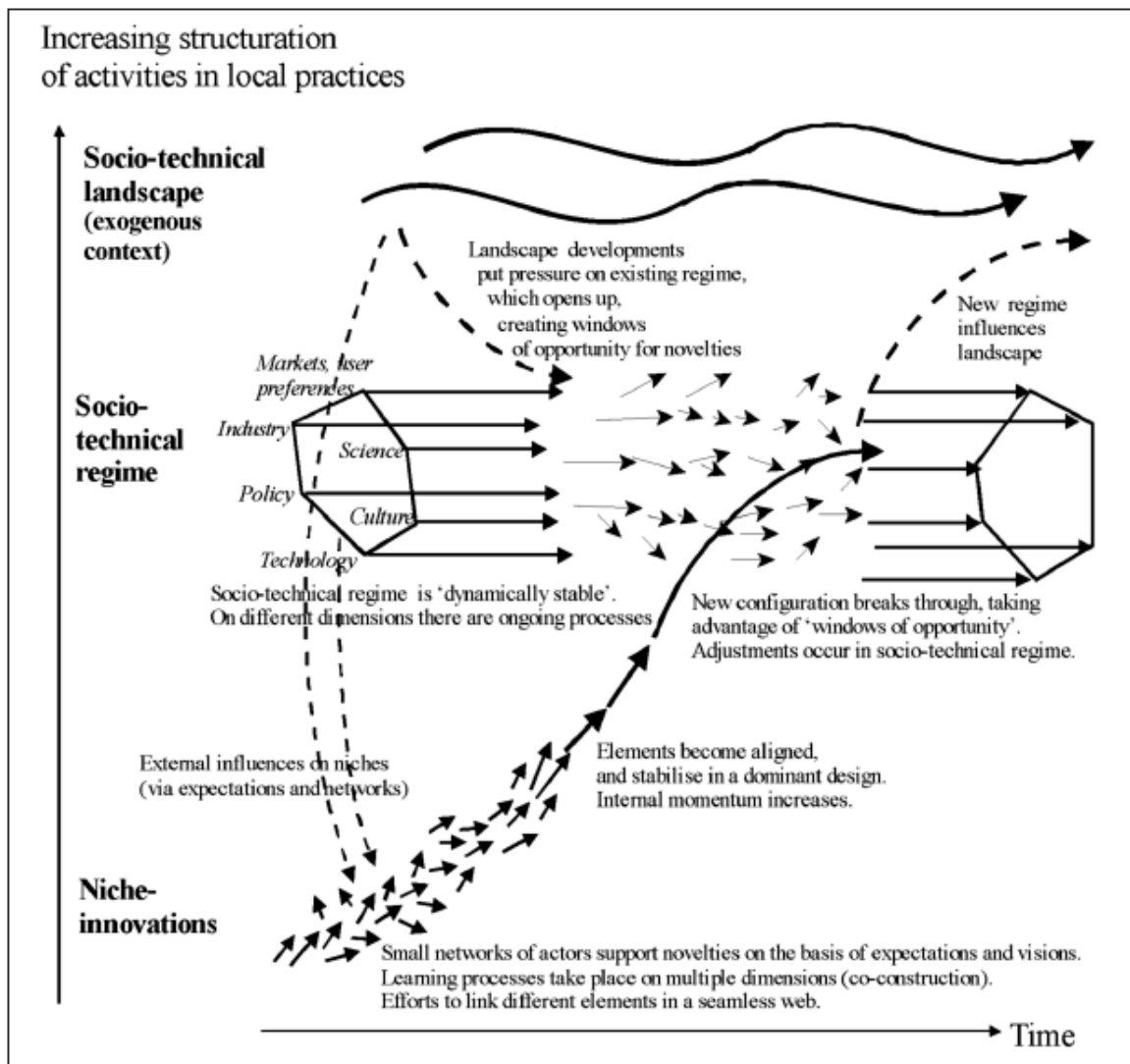
Figure 3. The interplay of actors within the Multi-Level Perspective during a technological transition (Geels, 2002).

lack of agency, and the view that contextual influences are not addressed but merely grouped into the analytical level of 'landscape'; criticisms which broadly can be linked to transition theory's relationship with power and political dynamics. A transition within the multi-level perspective involves the interactions between regimes, niches and landscape, which imply a degree of power exchange; however, explicit understandings of power and how it is expressed are lacking, leading to an area of conceptual weakness (Avelino and Rotmans, 2009). Power exchanges are fundamentally political, and politics can be seen as is 'the constant companion' of socio-technical transitions, which permeates the theoretical lens as either the context, arena, obstacles, enabler, arbiter, and manager of repercussions (Meadowcroft, 2011). Politics (as opposed to policy) is manifested on all three levels of the multi-level perspective, from the landscape level in terms of global political trends and going as far as in the cognition of actors and their relational behaviour. Governments can explicitly encourage technological paths (e.g. smart cities, digitalisation), and consequently are also involved in managing the impacts and fall outs of these changes. Feola (2020, p. 242) further addresses this lack of commentary from within transitions studies, explicitly focusing on the role of capitalist ideological underpinnings, which "permeates the workings and logics of socio-technical systems in ways that are critical both in the elaboration of

rigorous accounts of transition trajectories and for the capacity of [transitions research] to support future societal sustainability transitions". According to Feola, to take political ideology such as capitalism as an implicit factor deprives transition theory of a rigorous analytical examination of its "economic, political, social and cultural conditions and dynamics, its diversity, its influence on sustainability transitions in different contexts, and the possibility that sustainability transitions might involve potentially fundamental changes in the capitalist system".

Nevertheless, advocates of transitions theory stand to the fact that the theoretical lens mainly acts to serve as an abstract mental model to assist understanding socio-technical change (Geels, 2011). Furthermore, authors such as Leach et al. (2012) and Meadowcroft (2011) have suggested areas of analytical focus to ensure that the process of technological transition can engender greater sustainability. Firstly, this includes the three dimensions which should be accounted for in technological innovations: direction, diversity and distribution (Leach et al., 2012). Direction refers to the specific direction of change, being clear on goals and principles and actively steering them towards staying within the planetary boundaries and away from unsustainable trajectories. Diversity refers to encouraging diversity in approaches and forms of innovation to provide greater resilience in the fact of potential shocks to the system. Finally, distribution is the acknowledgement of the fact that altering society to stay within the planetary boundaries will mean facing trade-offs and a conflict of interests. Furthermore, as the process is inherently political, Meadowcroft (2011) proposes to approach transitions through viewing them from three interrelated domains: 'interests', 'institutions' and 'ideas', as opposed to the traditional engagement of transitions as simply a policy process. Here, interests refer to the political engagement of groups utilising new technologies, experimental practices and social movements; alongside established political actors and economic groups. Institutions refer to the organisations themselves which frame political interactions, sediment norms and relations of power, and have the capacity to enable reform. Finally, political ideas – such as political ideologies – influence how actors define problems, understand and determine what are acceptable solutions and what spaces these solutions can occupy. It goes beyond consumer preferences to encapsulate the preferences and functions of governments and markets; alongside deeper understandings of human/nature interactions and the workings of science and the economic system. These considerations all contextualise how sustainability transitions are (and can be) undertaken. The inclusion of such aspects in the analysis and implementation of transitions leads to another strain of thought: transformations.

TRANSFORMATIONS

Building from the concepts as defined within transition theory, *transformations,* on the other hand, is an emergent concept which encapsulates a larger definition of a socio-technical regime: one which is more complex, dynamic, political and involves change across multiple systems and multiple scales – social, technological and ecological (van den Bergh et al., 2011). The notion of transformation is still a burgeoning concept within scientific literature, with no set specific definition. Rather, multiple heterogeneous theories have emerged which have been outlined in studies such as Feola (2015) and Salomaa and Juhola (2020). These heterogenous theories all

converge on similar points. Transformations, according to the literature analysed by Feola (2015), is a process which is specifically non-linear and non-teleological; consistent with complex systems conceptualisations of societal processes; and is characterised by changes in endogenous and exogenous processes within a system, which leads to structural change. In essence, transformations are focused on a dramatic change or 'metamorphosis' (Salomaa and Juhola, 2020).

Transitions and transformation often overlap but hold differences regarding the scale and ontological structure of the change. While similar in both semantics and scope, studies of transformations build upon a long tradition of research focusing on social and environmental change in areas such as climate change, food security and poverty (Salomaa and Juhola, 2020), whereas transition theory draws from evolutionary economic theories of technical change and science and technology studies (Grin et al., 2010). Transformations are complex, contested and coevolutionary, and cannot be viewed in a disciplinary-bounded manner (Patterson et al., 2017). In essence, 'transitions' can be described as that which is "managed under orderly control, through incumbent structures according to tightly disciplined knowledges, often emphasizing technological innovation, towards some particular known (presumptively shared) end"; whereas 'transformations' involve "more diverse, emergent and unruly political alignments, more about social innovations, challenging incumbent structures, subject to incommensurable knowledges and pursuing contending (even unknown) ends" (Stirling, 2015, p. 54). Linnér and Wibeck (2019) provide a succinct definition: a transition is rooted in the notion of a passage between one state to another, whereas a transformation refers to the change in the form or shape itself.

Transformations, as they encapsulate a wider breadth of change, require a wider social focus which accounts for power relations, normative values and issues of agency in all their complexity. This is reflected in empirical studies working on the notion of transformation. Temper et al. (2018) in their study of transformations draws upon environmental justice movements. The authors argue that rather than only focusing on artifacts and technologies which create a technological transition, transformations require a socially driven, resistance-centred perspective, which acknowledges the political and contested nature of sustainability transformations. The process should focus on the creation of new values, institutions and power relations which brings forth new ways of being in the world, and in doing so, deals with inherent power conflicts that come with deviating from the status quo. This view of transformative change goes beyond technocratic and managerial interventions, investigating the role of citizen-led transformations, social and grassroots innovations (which can be viewed within the multi-level perspective as a niche) which challenges normative assumptions.

The issue of agency is outlined in the work of Herrfahrdt-Pähle et al. (2020). Here, it is emphasised that for transformations to be carefully navigated, the process requires oversight and navigation, otherwise transformations may lead to undesirable directions. The authors' research on historical real-world cases in Chile, South Africa and Uzbekistan show that successful transformation depends on a number of factors related to cognitive, structural and agency related capacities, such as the prevalence of visionary leadership, an enabling environment, and the

capacity to navigate the transformation itself. Essentially, the authors argue that social tipping is not sufficient, but a capacity to handle and guide the process of change is also required.

The two studies outlined here emphasise the importance of the social domain in defining the process of transformation. While many environmental challenges can be tackled through technocentric solutions – that is, in case-by-case *transitions* of technologies – 'wicked problems' that are deeply embedded into the political and normative realities of the real-world require *transformational* change. Nevertheless, calls for transformation can often be empty rhetoric if there is no substantive outline of the process of transformation. As noted by Salomaa and Juhola (2020), anything can be defined as a transformation if there are no specific targets or designated durations. Two points have been raised within this account of the theoretical background: the plasticity of the concept of transformation, which has rarely been operationalised into a framework that is empirically viable; and the necessity of socially grounded guiding principles. It is from these points that TIP emerges, and consequentially the application of equity and equality frameworks upon the work of TIP.

TRANSFORMATIVE INNOVATION POLICY

Both transitions and transformations are contested, subject to regime resistance, path dependencies, power dynamics and political considerations (Geels, 2014; Patterson et al., 2017). Drawing from both the fundamentals of transition theory (particularly in relation to the conceptualisation of technological transitions and socio-technical systems) and accounting for the complexity of a wide-scale transformation, TIP is a theory which aims to consolidate and synthesize the central elements of both theoretical strands in a way which is applicable to real-world governance.

TIP is the main object under study. As a concept, it aims to simultaneously provide theoretical understanding towards systemic change, alongside operationalising such knowledge towards usage within real-world contexts such as policymaking and advocacy (Ghosh and Torrens. 2020). Core to the concept is that it is what Schot and Steinmueller (2018) refer to as a 'Third Framing' of science and innovation policy, where such policies are a driver of transformative change, via socio-technical transitions. The three frames as defined by Schot and Steinmueller (2018) are observed within historical developments, with the first framing emerging from the Post-World War II institutionalisation of science and research and development to provide national economic growth; and the second emerging in post-1980, emphasising knowledge creation to garner economic competitiveness in an increasingly globalised world. The third framing, however, is currently emerging in reaction to the necessity of addressing these global environmental issues. While the previous two framings focused on the role of science and innovation on the growth of output and employment – which then benefits the economic welfare of states and its citizens, thus leading to social progress – the third new framing differs in the fact that innovation cannot be assumed to equate to social progress. The overall scheme of the three framings is presented in Figure 4. In previous framings, negative effects of

innovation are corrected with social policies, however the third framing addresses the intrinsic negative effects in certain innovations (such as petroleum products).
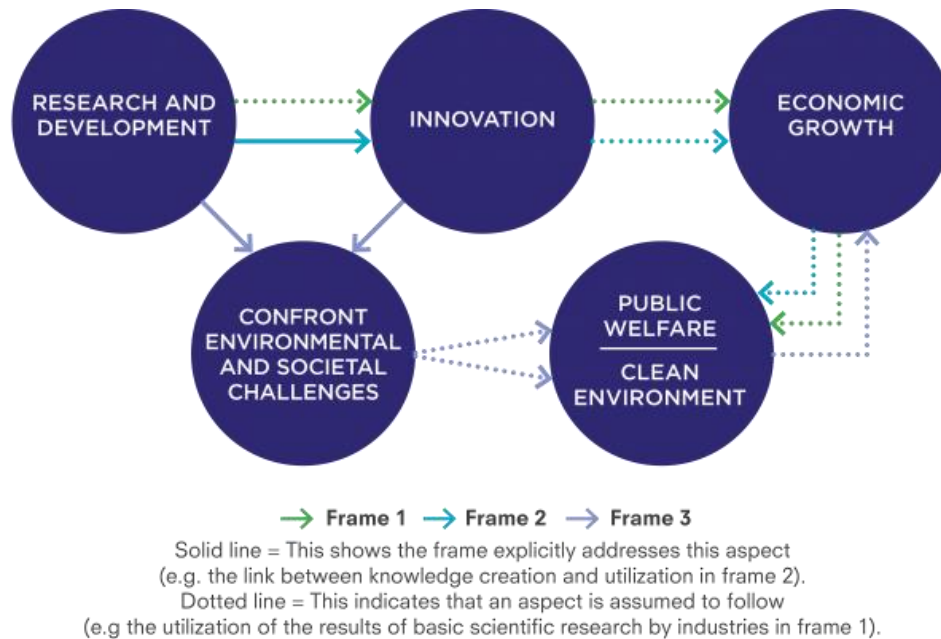
Currently, the two frames dominate innovation policy discourse. Thus, central to TIP is the promotion of this new frame within science, technology and innovation policy in order to address grand challenges, or 'wicked problems'. In doing so, TIP engages with transformative change, and aims to influence the directionality of innovations in conjunction with attempting to destabilise and transform current socio-technical regimes (Schot et al., 2017). Directionality refers to a specific direction which is based upon societal challenges, for which solutions can be developed through technological research and innovation (Weber and Rohracher, 2012; Schot and Kanger, 2019). It is explicit in its goals, principles and timeframe which are used steer towards the materialisation of these goals (Leach et al., 2012).

TIP exemplifies a transdisciplinary project, in the sense that it is drawn from different academic communities and engages in co-creation with societal stakeholders. It focuses on shared conceptual elements, which include socio-technical systems, economic theory on production and consumption systems, institutionalism, and actor-oriented approaches (Ghosh and Torrens, 2020). As a policy process, it deviates from conventional policy instruments such as regulation, and seeks to phase out unsustainable systems by fostering disruptive initiatives. Chataway et al. (2017, p. 16) has outlined six principles which typify what constitutes as TIP: "1) directionality: focus on alternative futures associated with technological design choices; 2) goal: focus on grand environmental and/or social challenges; 3) impact: focus on socio-technical systems and system-level issues; 4) degree of learning and reflexivity: focus on second-order learning, problematization of operating routines of different actors and the creation of spaces for

experimentation; 5) conflict: focus on disruptive change, possibly resulting in major disagreements between actors; 6) inclusiveness: focus on initiatives with a broad base of participation, including the consideration of non-users as potentially affected parties". These principles touch upon the techno-managerial critiques which have been stated for transitions theory and also embrace the criteria necessary for achieving transformative change in complex systems (Meadowcroft, 2011; van den Bergh et al., 2011; Leach et al., 2012). However, given the fact that TIP is an ongoing development, the reality of the implementation of these principles has yet to be examined.

TIP is an ongoing project, and one key feature is its focus on experimentation within the field of policymaking. These are socio-technical experiments, which, as defined by Sengers et al. (2019, p. 154), "...implies a more engaged and social constructivist position: society is itself a laboratory and a variety of real-world actors commit to the messy experimental processes tied up with the introduction of alternative technologies and practices in order to purposively re-shape social and material realities ... [they are] microcosms of sustainable systems and practices, the alternative socio-technical configurations embodied in experiments emerge in real-life contexts with the aim of technological, social and institutional learning. The promise is that learning and demonstration effects of experiments add to the momentum of emerging sustainable configurations, which are geared to transform unsustainable socio-technical systems". These policy experiments have ranged across Columbia, Finland, Norway, South Africa and Sweden, in varied sectors such as coffee production to biotechnology to low-carbon transport and mobility. The research questions proposed within this thesis engage with these ongoing projects, analysing how the normative domain of equality and equity has materialised in projects that deal specifically with transformative change for sustainability. Under examination will be the *Living Catchments* project, conducted in South Africa in conjunction with the South African Water Research Commission, South Africa's Department for Science, Technology, and Innovation, and South Africa National Biodiversity Institute. The project aims to prevent water scarcity by providing a long-term sustainable solution to water provision. Core to the project is the emphasis on making ecological infrastructure – such as wetlands – on par with man-made infrastructure. Additionally, the project aims to create a more resilient, resourced, and relational community which is capable of drawing from best practice in sustainable water governance. The project contends with the highly fragmented existing water infrastructure which is defined by its colonial past. Supporting data which will also be under examination includes secondary sources from other sociotechnical experiments relating broadly to their Latin America Hub[1], the MOTION project for climate innovation[2], and to the general development of TIP theory. This will further be outlined in the *Data Collection* section.

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[1] Projects undertaken by the Latin America Hub can be found at
https://www.tipconsortium.net/experiment/latin-america-policy-experiments/
[2] More information on MOTION can be found at https://www.tipconsortium.net/experiment/the-motion-project/

EQUALITY AND EQUITY

Closely related concepts and often treated as synonyms, the concepts of equality and equity are central to the achievement of transformative change. Working with the principles of equality and equity in mind is particularly pertinent when influencing the directionality of innovations for sustainability, for such changes in complex socio-technical landscapes may have unintended consequences. For this reason, the terms equality and equity must be defined.

In the simplest sense, equality strictly refers to the concept of equal treatment, whereas equity refers to ensuring that everyone has what they need for wellbeing in a given context (Leach et al., 2018). Equality and equity are also centrally linked to the notions of justice. Drawing from contemporary theorists such as Sen (1992), Fraser (1997, 2009) and Young (1990), the concept of what is equality, equitable and just has been expanded beyond the Rawlsian notion of justice as relating solely to distribution. Rawls's (1971) theory defines justice as fairness in the principles of distribution, wherein a 'veil of ignorance' is applied to avoid bias in the provision of goods necessary for wellbeing. This is further developed in Sen's (1992) capabilities approach, in which equality goes beyond the fair distribution of goods to account for a form of distribution which focuses on one's capability to achieve wellbeing. It is founded upon the equality of 'something', such as that of income, utility, welfare, opportunity, rights, or liberties which are used to meet one's full capability.

Theorists such as Young (1990) and Fraser (1997, 2009) expand the idea of equality, equity and justice beyond this to refer not only to distribution, but also to the institutional conditions and the issue of representation within such institutions. Young argues that attention must also be placed on the cultural, symbolic, social and institutional conditions which underlie the poor distribution of goods. Here, the distribution of goods is relational, determined by the social and institutional milieu in which the act of distributing is carried out. Focus is placed on the relational aspects of society which create inequities – termed as oppression and domination by Young. Fraser (1997) provides a succinct elaboration on the subject and splits the issue into two understandings of inequity and injustice: the first understanding is socio-economic, rooted in the political-economic structure of society. It includes economic exploitation, economic marginalisation and deprivation of living standards. The second is cultural and symbolic. It is based upon social patterns of representation, interpretation and communication and manifests itself as cultural domination, nonrecognition (where one is rendered invisible by one's culture) and disrespect. While there are two distinct strands, Fraser highlights that "… the distinction between economic injustice and cultural injustice is analytical. In practice, the two are intertwined. Even the most material economic institutions have a constitutive, irreducible cultural dimension; they are shot through with significations and norms. Conversely, even the most discursive cultural practices have a constitutive, irreducible political-economic dimension; they are underpinned by material supports. Thus, far from occupying two airtight separate spheres, economic injustice and cultural injustice are usually inter-imbricated so as to reinforce each other dialectically. Cultural norms that are unfairly biased against some are institutionalized in the state and the economy; meanwhile, economic disadvantage impedes equal participation in

the making of culture, in public spheres and in everyday life. The result is often a vicious circle of cultural and economic subordination" (Fraser, 1997, p. 15).

The work on equality and equity has primarily dealt with social policy and the welfare state. Schlosberg (2004, 2013) provides an account of justice and equality specific to the environmental domain, and the ways in which these issues interact and correspond to the spatiotemporal issues within environmental issues (such as that of environmental pollution, extreme weather events, climate change, etc.). Justice, as expressed within the environmental justice movement, is argued as equity in the distribution of environmental risk, recognition of the diversity of participants and experiences within the community in question, and participation in the political processes which creates and manages environmental policies (Schlosberg, 2004). In the previous decade, the realm of a specifically environmental form of justice has expanded both conceptually and spatially, moving away from environmental conflicts and the management of environmental risks towards a consideration of what can be referred to as sustainable materialism – the acknowledgement that the material relationships which create inequities and injustices are interlinked with the condition of the natural world (Schlosberg, 2013). These sustainable materialist approaches deal mainly with issues related to our day-to-day lives such as food and energy, and the conditions of these day-to-day practices and material flows are themselves the basis for social justice. These issues are directly related to the study of sustainability transitions, and the shift in the contemporary environmental justice movement towards this idea of the 'just transition' highlights the role and importance of understandings of equality within the management – and transformation – of complex systems.

Taking into account the conceptual development of justice (and by extension, equality and equity) to encompass environmental and material domains, these conceptions of equality and equity have formed the basis for operationalising the concept within studies of socio-ecological systems (McDermott et al., 2013) and in socio-technical regimes (Jenkins et al., 2018). McDermott et al. (2013) provide an analysis addressing the issue of equity within payments for ecosystem services, noting that discussions around global environmental governance reflect the centrality of equity to sustainability but lack clarity in relation to the definition and the components of equity. Their study provides a tripartite framework which draws upon the work cited above to analyse the notion of equality and equity and emphasises the existence of three interdependent dimensions of equity: distribution, the procedural and contextual disposition of capabilities, access and power. The final dimension has been modified by Leach et al. (2018), to encompass what can be termed as recognitional equality. The definitions of these concepts are provided in Table 1.

The dimensions within this terminology are interlinked with each other when applied to areas of sustainable development and transitions. The areas of distributional, recognitional/contextual, and procedural inequities interact with each other as feedbacks within a given intervention (Leach et al., 2018). Recognitional/contextual equity plays a role in setting the socio-historical landscape in which procedural equity emerges within the governance intervention, which in turn feeds back into the dynamics of distributional equity. In turn,

distributional equity shapes subsequent processes of recognitional and procedural equality through successive cycles of intervention and change. While the dimensions are interlinked, the concepts described provide conceptual blocks which assist in the abstraction process in the analysis of the gathered data, which will be outlined in the following section.

Table 1: The three dimensions of equity, adapted from McDermott et al. (2013) and Leach et al. (2018)

Distributional equity	Distributional equity refers to how resources, costs and benefits are allocated or shared amongst people and groups. Examples include water access and wages.
Procedural equity	Procedural equity refers to fairness in the processes and mechanisms related to political decision making. It involves issues such as inclusion, representation and participation; and is related to broader issues such as who possesses legitimate claims to knowledge and authority.
Recognitional/ contextual equity	Recognitional/contextual equity refers to the pre-existing political, economic and social conditions which limit or enable the capacities of people. It encompasses issues such as gender, ethnic, cultural and political identities.

TECHNICAL RESEARCH DESIGN

This section will firstly provide background on the research strategy chosen, alongside the methodological steps such as the operationalisation of the concepts at hand and the practical steps of data collection and processing.

Following Verschuren and Doorewaard (2010), the design of the research project is rooted primarily in theory-developing research, where the objective is to solve a problem encountered in the process of theory development in a particular scientific area with regard to a specific issue. This can also be termed as exploratory research, wherein the nature of the research is to clarify phenomena rather than to confirm or validate it. In this case, it is to answer the research question: *How are the issues of equality and equity incorporated into the Transformative Innovation Policy conceptual framework and practice, and what lessons can be derived from it?* The methodological approach to the research is the Grounded Theory approach (GT). GT is an inductive approach; it is characterised by its ability to gain theoretical insights with only minimum prior knowledge, and by utilising continuous comparison in engaging with the phenomena under study.

The research question is broken down into four sub-questions allowing for further elaboration of the logical sequencing of the research design:

SQ1: How are the issues of equality and equity currently operationalised within Transformative Innovation Policy?
SQ2: How were these issues implemented in practice?
SQ3: What potential barriers and opportunities can be identified in the process of integration?
SQ4: What recommendations can be derived for furthering equality and equity in transformations work?

The first two questions build upon the theoretical concepts discussed in the previous section and will be answered through the *Coding and Analysis* section, based on the coding paradigm developed. Following on from this, the findings generated in the exploratory research outlined in the *Interpretation and Theoretical Development* section will inform the last two sub-questions.

RESEARCH STRATEGY

GROUNDED THEORY

Grounded theory was first developed with Glaser and Strauss' (1967) work *The Discovery of Grounded Theory*. GT is defined as a process in which theory is derived from systematically gathered data rooted in a specific area of study; where it is grounded in data rather than deduced through testable hypotheses from existing theories (Corbin and Strauss, 1990; Charmaz, 2006). It is an emergent form of naturalistic enquiry, with the systematic analysis of the data creating the theory during and throughout the research process. Naturalistic enquiry is a research

ontology defined by its engagement with real-world situations as they unfold naturally as opposed to laboratory or other manipulated settings (Bowen, 2008).

The core principles of GT as defined by Glaser and Strauss are as follows: data collection and analysis are simultaneously involved, alongside the consistent application of the comparative method; analytic codes and categories are constructed from data, not from preconceived hypotheses; theory is advanced during each step of the analysis, and sampling is aimed toward theory building rather than population representativeness; and finally, memo writing is carried out to elaborate categories, the relationships between categories and to identify gaps (Charmaz, 2006). Encompassing the whole analysis is the necessity for *theoretical sensitivity*, which refers to the required sense of openness, capacity of understanding, the ability to separate pertinent information, and to extract elements for emerging theory (Corbin and Strauss, 1990; Verschuren and Doorewaard, 2010; Chun Tie et al., 2019). Theoretical sensitivity comes from various sources, such as the respective literature (although it is not directly drawn from existing literature), professional and personal experiences of the researcher and the analytical process itself (Corbin and Strauss, 2015). Theoretical sensitivity thus creates a cognitive frame of reference to make judgements, allowing for the generation of insight beyond what may appear prima facie on the dataset. In this case, the concepts presented in the theoretical background, alongside the familiarisation with the day-to-day workings of the TIPC form the sensitising concepts which frame the data collection process.

The coding process and the development of categories is central to the formation of the conceptual elements of a theory (Glaser and Strauss, 1967). Categories emerge through a close engagement of the data, but it is through the process of iterative constant comparison which allows their theoretical elaboration and integration. Categories form the theoretical bones of the analysis, which is then fleshed out by identifying their various properties and relations (Dey, 2007). They play a dual role in that they are both analytic categories of themselves and further sensitising objects, increasing the ability to communicate the phenomena observed. Memo-writing runs in tandem to this, to keep track of ideas which form during the analysis. Collecting memos allows for reflexivity through the process of repetition and comparison across data. When formulating categories, codes are used. Codes in GT can be seen as 'transitional objects' which form a third space within the development of theory, occupying an intermediate space where knowledge is both further understood and new knowledge is created through the process of abstraction (Star, 2007). *Theoretical sampling* is conducted based on the knowledge generated in the coding process, and during so, "theoretical sampling stretches the codes, forcing other sorts of knowledge of the object. The theory that develops repeats the attachment-separation cycle, but in this sense taking a code and moving it through the data. In so doing, it fractures both code and data" (Star, 2007, p.84). The 'fracturing' – or abstraction – to the point of data saturation cumulates to the development of theory.

Due to the time constraints and data protection concerns, a fully rigorous GT approach – wherein a full theoretical basis is developed through continuous checking and revision – cannot be conducted. Rather, this thesis aims to utilise GT principles within the data collection process

and analysis with the aim to address the research questions. Timonen et al. (2018) outline principles required of GT research, two of which are most relevant to this thesis which will frame the data collection processes. Firstly, GT research should employ unstructured or lightly structured interview guides consisting of open questions. This is so as to not force data into *a priori* categories. Secondly, codes and concepts must be emergent within the analysis process, yet simultaneously, they must be cross-examined with existing concepts and knowledge. This process occurs before, during and after the data collection via a literature review and empirical data gathering. The process of cross-examination will be informed by a review of existing literature.

PROBLEM-CENTRED EXPERT INTERVIEW

The expert and practitioner interviews, coupled with supporting textual analysis, forms the empirical data gathered in this thesis. To specify, the interviews to be undertaken are *problem-centred expert interviews* (Döringer, 2021). As outlined by Döringer, the problem-centred interview is a specific design for conducting interviews, which involves using a thematic framework which orientates towards the research questions as opposed to a rigid question-answer scheme. It consists of open-ended questions to elicit a narration from the interviewee. After the narrative episode, it is then followed up with specific explorations relating to the narrative as well as ad hoc questions generated within the interview process. Interviews are done with experts in order to target those with specific knowledge who hold a certain function in the relevant field and action (Bogner and Menz, 2009). These experts possess subjective relevancies, viewpoints and perspectives which are drawn on within their practice (Bogner and Menz, 2009; Döringer, 2021).

The problem-centred expert interview is a suitable method to answer the research questions and related sub-questions as it holds two distinct benefits: firstly, it facilitates the collection of a systematised comparable set of collected data, while still maintaining the fact that interviews should not force data into *a priori* categories for the GT analysis. Secondly, elucidating on the analytical and interpretive knowledge that the experts hold, along with the embedded subjectivities and perspectives within such knowledge, are key to discovering how issues of equity and equality are integrated both explicitly and implicitly in a reflexive manner – that is, recognising the interplay between equity and equality and the practice of transformations research itself. In this case, the thematic framework implemented is the three dimensions of equity which provides the systematisation of the open-ended questions. This is followed by ad hoc questions which encouraged 'free association' with the subject matter through the process of eliciting concrete examples via stories within TIP work (Hollway and Jefferson, 2009). Eliciting stories anchors interviewee's accounts to reality and provides material for the exploration and abstraction embedded perspectives. The interview guide is presented in Appendix A.

ENSURING VALIDITY AND RELIABILITY

To ensure scientific rigor, validity and reliability must be met. This can be done by incorporating verification strategies into the research design, such as ensuring coherence between the

methodology and the research questions, analysing the data in an iterative manner, sample representativeness and data saturation (Morse et al., 2002). While the first two – methodological coherence and iterative analysis – have already been touched upon in the previous sections, this section will elaborate on how GT establishes rigor in sample representativeness and data saturation.

Sampling and data saturation can also be referred to as *theoretical sampling* and *theoretical saturation* in GT. As the data becomes abstracted by codes into categories which form the theory, it is integral to the process that saturation is reached. Reaching saturation can be described as so: "data saturation entails bringing new participants continually into the study until the data set is complete, as indicated by data replication or redundancy. In other words, saturation is reached when the researcher gathers data to the point of diminishing returns, when nothing new is being added" (Bowen, 2008, p. 140); thus, achieving theoretical saturation is a consequence of the sampling process.

Sample representativeness within GT differs from other research strategies, as sampling is done based on concepts that have proven theoretical relevance to the emerging theory (Corbin and Strauss, 2015), as opposed to seeking population generalizability. It therefore focuses less on sample size, which is only important insofar as getting enough data to the point of redundancy and more on the quality of the sampling. A 'representative' sample would compose of participants who best represent or have knowledge of the research topic (in this case, the experts and practitioners involved in TIPC), alongside documents and/or events which assist in refining ideas, identifying conceptual boundaries and the relevance of categories (Saunders et al., 2018). As it is not possible to determine what is or is not theoretically relevant, sampling in GT can be split into two stages: initial sampling and theoretical sampling. Charmaz (2006) defines initial sampling as a point of departure, not of refinement. Meanwhile, theoretical sampling means seeking data applicable to the development of the emerging theory, leading to refinement of the categories constituting the theory (Charmaz, 2006).

METHODOLOGY

ANALYTICAL FRAMEWORK

Based on the principles of the research strategy as discussed, the research will be divided into three phases. Due to the exploratory and constructive nature of the research, the phases themselves are not sequentially delineated and serve mainly to illustrate the different steps completed. Both the data collection and the coding process are conducted iteratively and in parallel to each other. This is illustrated in the analytical framework presented in Figure 5, adapted from Chun Tie et al. (2019).
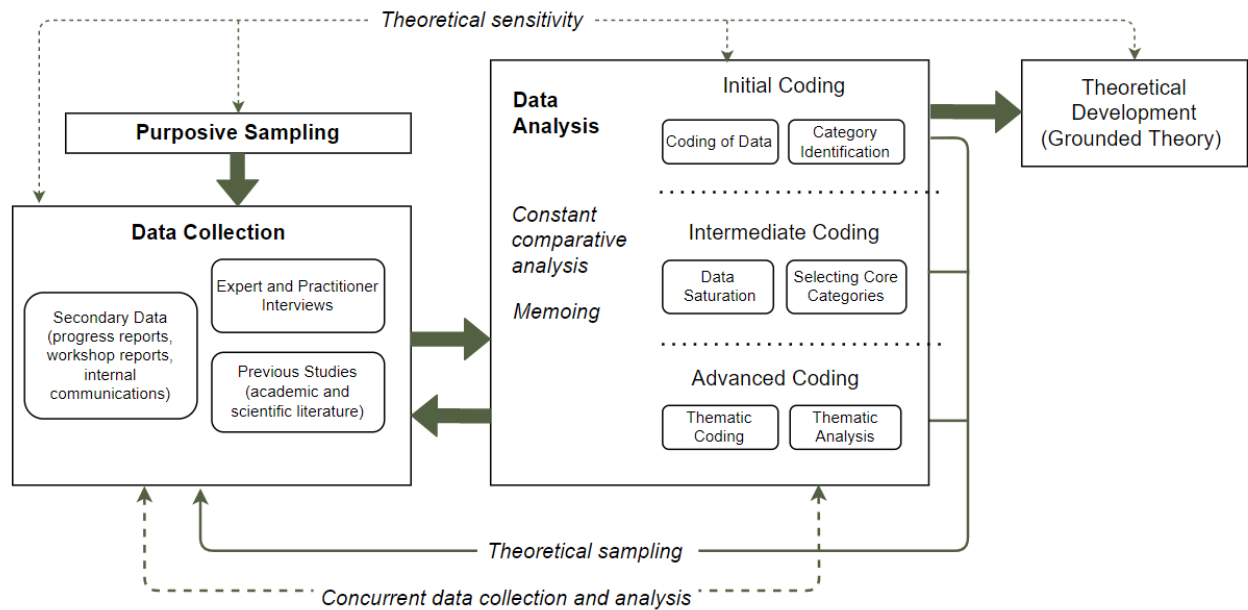
Figure 5. Analytical Framework

DATA COLLECTION

Phase 1: Literature review and desk research

This phase involved a literature review of published reports from TIPC, scientific articles relating to transformations, and grey literature surrounding the relationship between sustainability transformations and equality and equity. Desk research refers to the use of existing material in the absence of direct contact with the research object (Verschuren and Doorewaard, 2010). Due to the confidentiality of the projects conducted by TIPC and the resources required, there are significant limitations to engagement with the projects themselves; thus, a 'case study' approach is not possible. Rather, the desk research approach was preferred. The gathering of suitable data via desk research contributed to the data used for GT analysis. The objective of the literature review was primarily for orienteering and problem-framing; while the objective of the desk research was to clarify working definitions, concepts and boundaries within the work of the experts and practitioners of TIPC, otherwise known as increasing theoretical sensitivity. Data gathered from the desk research phase include data relating to the *Living Catchments* project (workshop activity sheets and plans, anonymised reflections, supporting literature); unedited transcripts relating to the operation of the Latin American Hub and their respective policy experiments; and evaluation reports. A full list of these documents is provided in Appendix B.

Phase 2: Expert and Practitioner Interviews

The interviewees were chosen based on their expertise and roles within the organisation. Attention was placed on their roles in order to generate differing viewpoints, reactions and approaches; and to provide a holistic representation of the group, thus increasing theoretical saturation. Due to the nature of their work; the interviewees have been anonymised. All interviews were undertaken in June 2021 and were carried out over Zoom or Microsoft Teams.

Seven 45-minute-long interviews were conducted in a semi-structured manner, with the respondents given an information sheet and consent form prior to the interview. At the beginning of the interview, the interviewees were briefed on the concepts of equality and equity relating to their work (see Appendix A) in order to guide the responses and to elicit stories relating to their work. Table 2 below lists the interviewees and their role and area of expertise.

Table 2. List of interviewees (anonymised)

Name	Details
Interviewee A	A research professor in science and technology studies, with a focus on the evaluation aspect on the TIPC methodology.
Interviewee B	Postdoctoral interdisciplinary researcher working with systems design and innovation studies, with a background of working in higher education settings in Colombia.
Interviewee C	Programme co-director of TIPC, focusing on the operational aspect of the consortium and contributes to the design and implementation of the programme work in TIPC.
Interviewee D	Research fellow at TIPC with a background in sustainability transitions in mobility, with a focus on Global South megacities.
Interviewee E	Professor with expertise in human development, higher education, global citizenship and transformative innovation, working on formative evaluation within TIPC.
Interviewee F	Communications officer in TIPC, organising external communications and training events for the consortium.
Interviewee G	Research fellow at TIPC, working on mission-oriented policies in technology and financing for sustainability transitions. Background in technology governance and economics.

Phase 3: Coding of materials and memo writing

Analysis was conducted with the use of NVivo software. In preparation for the analysis, interviews were transcribed, and all gathered data was converted to either .docx or .pdf files which are compatible with NVivo (see Appendix B). Overall, 32 pieces of data were processed in NVivo. These include the seven 45-minute interview transcripts relating to TIPC members reflections on the role of equality in their work. Text resources include a further three transcripts relating to the work surrounding Latin America; 18 pieces of text data relating specifically to the *Living Catchments* project, which include four anonymised reflections on the workshop itself and three blog posts written by attendees; six pieces of data relating to the workshop process such as activity sheets, workshop guidelines and structure; and five pieces of supporting literature. A further four evaluation reports relating to other projects were included. Memo writing was conducted in tandem with the coding process, aiding the process of simultaneous comparison, the naming of phenomena, linking concepts with other concepts and the analysis.

Raw data such as transcripts and notes can be seen as representing the complexity of reality (Patton, 2002). Therefore, data gathered throughout the interview process was operationalised through the coding process. Coding here is done on a line-by-line basis of what is relevant to the research questions (i.e., filtering out parts of the interview such as introductions and off-topic discussion). For efficiency, a 'line' refers to a line of thought, or a string of sentences conveying one concept. Coding can be separated into three main methods: open coding, axial coding and focused coding. Open coding refers to the initial codes generated within the data. These can be in vivo codes, that is, codes directly derived from the data; or a priori codes, which are codes theoretically derived from prior reading and existing concepts (Patton. 2002; Jackson and Bazeley, 2013). The a priori codes used within this analysis are the three dimensions of equity adapted from McDermott et al. (2013). Through the process of constant comparison and refinement, codes are then devised into a coherent coding paradigm through the axial coding process. Axial coding can be described as coding which investigates the relationships between concepts and categories that have been developed in the open coding process (Corbin and Strauss, 2015; Vollstedt and Rezat, 2019). It is formulated into a coding paradigm, which can broadly be summarised as highlighting the phenomenon under study, the conditions related to the phenomenon (such as contextual conditions, intervening structural conditions or casual conditions), the actions relating to the handling of the phenomenon, and the consequences of said actions. The resulting codes contain categories – or 'axes' – that are supported by the final focused codes. Focused coding is the culmination of the GT process and are the final codes in the analysis presented in the results.

The axial process was tailored to the specific questions asked in the research at hand, and the full coding paradigm is elaborated in the results section. A summarised example of the codes and how they were formed is provided in Table 3. The interpretation of the results – the theoretical development within the GT process – was supported with a cluster analysis of the focused codes on NVivo. This cluster analysis groups the codes based on their similarity or dissimilarity in terms of words used within each code. The analysis excludes 'stop words', words which are less significant to the analysis such as conjunctions, prepositions and other such words. Pearson's correlation coefficient is then used to determine the similarity between the codes. Codes that have a high degree of similarity are clustered together. The cluster analysis itself is not in itself the results of the analysis, but an interpretative tool assisting the generation a theoretical narrative.

Table 3. Examples of codes generated in the analysis following the axial coding logic

Concept	Code Type	Description
Distributional equality / Recognitional equality / Procedural equality	A priori code	These codes are the three dimensions of equity/equality as discussed in the theoretical background.
Environmental justice	Focused code to Axial code	This code is a focused code generated through constant comparison. Categorically, the content of this code stands alone from the three aforementioned dimensions of equality as it pertains specifically to the environment.
Materialist concerns	In vivo codes to Focused code (child code)	Initially starting as in vivo codes relating to green jobs for economic equality, materialist concerns as a specific line of environmental justice emerged via abstraction of the issue at hand.
Nature-infrastructure understandings	Open code to Focused code (child code)	This code represents a specific line of thought relating to environmental justice relating to how nature and infrastructure is perceived.
Contexts	Axial code	'Contexts' is the axial code representing the conditions in which the work of TIPC is influenced by. Essentially, it is category for the exogenous factors or intervening conditions to their work.
"…bridging science/engineering, social sciences and humanities in the education system"	In vivo code	This code is a line taken verbatim from the data. This forms the initial process of coding, wherein it is later abstracted and refined into a focused code. These codes are not shown in the finished coding paradigm
(Shared understandings) - Discursive common ground	Open code to Focused code	'Shared understandings' was an open code signifying the bridging between two separate discourses and finding common ground. It becomes 'discursive common ground', a focused code based on refinement of other codes such as in vivo codes.

RESULTS

CODING

The coding process first involved the a priori codes as defined by the equality and equity domains. This was then followed by numerous in vivo line-by-line codes, which were then categorised (and re-categorised) during the process of constant comparison. To familiarise and to contextualise the interview data, the coding process began with the data collected from the *Living Catchments* project and evaluation reports. Following this was then the coding of the interview data. Familiarising with the secondary sources first provided a 'face value' reading of how equality and equity is represented within the work of TIPC, which then was developed further in depth with the interview data. This process was iterative, with many re-readings of the source materials as the process continued. This helped to reframe parts of the data which initially seemed to be irrelevant. The culmination of the coding process resulted in the coding paradigm presented in Figure 6.

Coding Paradigm

Following the principles of the axial coding method, the coding paradigm devised consists of four main groupings (numbered in red on Figure 6) of codes corresponding to the axial categories:

1) The conditions related to the phenomenon are represented by the axial code 'Contexts'
2) The phenomenon under study is represented by 'Challenges' and 'Goals'
3) The actions relating to the handling of the phenomenon by 'Ideals' and 'Processes'
4) The consequences of said actions are represented by 'Emotions' and 'Understandings'

Here, the phenomenon under study is the work of TIPC itself. Contexts represents the specific set of characteristics the phenomenon is embedded in, which simultaneously characterises the set of conditions in which action strategies take place in relation to the phenomenon (Vollstedt and Rezat, 2019). In other words, they form the exogenous factors relating to the work at hand which influences the expression of equity and equality within TIP. Similarly, relating to the language of transformation theory, these can be seen as the landscape conditions and socio-technical regime conditions directly influencing the implementation of TIP. The phenomenon under study is split into two axial categories: 'Challenges', which represent the issues which are directly faced by TIP, and 'Goals', which are the objectives of TIP. The inclusion of equality and equity as goals corresponds to the research question at hand. While Challenges and Goals represent the abstract notion of TIP, the axial codes 'Ideals' and 'Processes' represent the actions relating to the handling of the phenomenon. In essence, Ideals here represent the application or the 'handling' of the goals, and the processes can be seen as action strategies relating to the ideals and goals. Finally, 'Emotions' and 'Understandings' are the codes that can be seen as the consequences of the action strategies. The work of TIPC aims towards capacity building, network formation and strengthening the work of policymakers within their specific contexts. The consequences of the action strategies here observed on the practitioner level rather than an institutional level (i.e. the

improvement of a water catchment is the action strategy of the South African government, the action strategy of TIPC is to implement TIP framings of innovation policy onto the policymaking body). As this process engages with policymakers relationally via workshops and co-creational instances, the 'consequence' or result of the action strategy can be seen as cognitive – the emotions which were felt, and the changes in the way one understands the phenomenon and the related contexts/actions/interactions. Both emotions and understandings can represent negative outcomes and positive outcomes. Based on this paradigm, the following list describes each code derived from the data.

List of Codes

I.   *'Contexts'*

a.   *Economic growth imperative* – The economic growth imperative is a factor which was identified as a context influencing the work of TIP. Relating to the work of a partnered governmental body within the Global North, the expression of transformative policy relates to "main purpose of converting societal and environmental challenges into opportunities for economic growth" (from the supporting literature in Interaction 2 of the *Living Catchments* project).

b.   *Epistemic orthodoxy* - Epistemic orthodoxy, relating to the idea that one 'should' work in a certain manner, was identified as a contextual factor influencing the work of TIP practitioners. This was expressed by six of the interviewees (A, B, C, D, G and E), alongside interim reports within the projects. Existing expectations and pre-established practices within policymaking were cited: "I will say that some of the practitioners that we work with in TIPC, are really, really keen on making that influence or making that extra, taking that extra risk taking that experimental approach, even though they find they feel a lot of resistance from their peers and colleagues and other departments" (Interviewee D); alongside pre-established norms within academia, such as differing perspectives and approaches based on academic field.

c.   *Existing implicit bias* – Existing implicit biases refers to biases such as those relating to nationality and gender – "with some of the participants that kind of lack of credibility more because, well, your accent, you look different, Colombian, and you are coming to Sweden, to our agency that were taught to tell us what to do? No." (Interviewee B). It was also expressed as implicit stereotyping based on occupation, class, and political views.

d.   *Existing institutions* – Pre-existing institutions form a structural context to the work of TIP implementation. These differ within the separate contexts of each project, with some exhibiting larger pre-established networks than others.

e.   *Political contexts* - Political contexts here refer to the difference in socio-economic, cultural and political contexts on a country-by-country basis.

i.   Violent political contexts – A sub-category of political contexts, this was an emergent theme within the work relating to Latin America: "Now, if we were to look at Columbia, which is one of our partners, people in the communities that we would like to work with, that are close to TIPC – people that are in these communities who push these kinds of approaches usually get shot.

So that's a very different political context." (Interviewee A). Violence features as a contextual factor in that it is used by the state, or prevalent within communities as crime.

f.   ***System complexity*** – System complexity here refers to the complex interactions within the work of environmental, social and techno-scientific policy which is the target of TIP. In the language of transitions theory, these represent the broad socio-technical 'landscape' and the networks of actors within it.

II.   <u>***Challenges***</u>
a.   ***Epistemic issues*** – The broad categorical code for issues relating to the production of knowledge, the dissemination of knowledge and ways of thinking.

b.   ***High levels of abstraction*** – This code relates to the fact that TIP and transition theory concepts are abstract mental models in relation to the project work conducted.

c.   ***Directionality issues*** – Issues relating to the directionality of the projects. Directionality refers to the specific direction in which TIP and/or project organisations wish to steer research and innovation. Here, challenges relate to how directionality interacts and conflicts with other goals such as issues surrounding representation.

d.   ***Siloized thinking*** – Conceptual silos are present both externally, such as policymakers working in specific subject areas, and within the organisation. For instance, one response elaborates on the differences in thinking between academic fields: "I think we are learning and because I came from development [studies], maybe I'm more trained on that. I used to do all these participatory approaches, but not all of us came from the same background. And innovation studies are not the same as the human rights studies or development research, a different approach is more is dominated a lot by economics, the innovations in economics…" (Interviewee E).

e.   ***Hierarchy-hegemony –*** The broad categorical code relating to hierarchical dynamics and issues relating to cultural hegemony.

i.   *Global North vs. Global South* – The codes relating to the dynamics and challenges between individuals/institutions based in the Global North and those based in the Global South. Generally, these relate to how issues of sustainability, technological knowledge and programme management are communicated, alongside the sentiments on how equitable these relationships are: "Who are we to even talk about the global south? Because it's not like [they are] equally represented in our teams? Not really, at least or I don't know, at least that's my impression. So yeah, sometimes, I'm a bit like, again, the intentions [of the team] are really good" (Interviewee F)

ii.   *Internal dynamics* – Relating to the hierarchical nature within the organisation itself, how researchers and support staff interact with each other.

iii.   *Power dynamics* – Relating to the implicit (or explicit) power dynamics within the interactions during TIPC projects. This can relate to level of education, gender, class, and role within organisations.

f.   ***Legitimacy*** – Legitimacy refers to the perceived legitimacy of the actions undertaken by TIPC practitioners in their respective contexts. This can relate to the nature of the work, and how

it goes against the grain of traditional policymaking; or it can relate to the practitioners themselves, and how they are perceived as 'experts' or 'nonexperts' based on their race, gender, nationality, and so on. Whether or not something is perceived as legitimate can be tied in with the other concepts expressed in this coding paradigm, such as broader issues around who possesses 'legitimate' knowledge (epistemic justice), or what actions are seen as legitimate in the policy arena (existing institutions, political contexts).

III. _**Goals**_

a. _**Equality and equity**_ – Codes here represent the three dimensions of equality and equity as discussed in the theoretical background. Furthermore, emergent codes delating to equality and equity which were not captured by the pre-existing framework were also developed.

_i._ _Environmental justice_ – This form of equity deals specifically with the environmental domain, that is, pertaining to the biosphere and the natural world. It is expressed in two different sub-categories:

_1._ _Nature-infrastructure understandings_ – This code relates to how nature and infrastructure is perceived. As a subset of environmental justice, it considers the relationship between the natural world and man-made infrastructure; and how this is expressed within ecological management. It relates to how practitioners perceive the two issue areas as either a cohesive system or as two discreet domains. For instance, "…there was a constant call from the project team that they need evidence-based engagement and co-development of policy that will show the benefits of taking an ecological management approach. It was mentioned a few times that they need a framework/policy outcome that will allow for a better way to engage with engineers." – Reflection 2 in the Living Catchments project.

2. _Materialist concerns_ – Relating to the work of Schlosberg (2013), the code 'materialist concerns' relates to the strain of environmental justice which deals with equality in terms of the material conditions of people (such as their wealth and access to healthcare), and how it relates to environmental conditions at hand. The lack of materialist concerns in the ongoing conceptualisation of equality in TIP was mentioned: "so okay, sustainability, that also can be related with equity, and in some way, maybe transformative innovation policies should address social problems, to take into account your health problems, education problems in that way. But I don't know, I don't see the connection very clear at the moment" (Interviewee E).

_ii._ _**Distributive equality**_ – The manifestation of distributive equality within TIP, it relates to fair wages and the provision of resources. Distributive equality does not feature heavily within the discussions on equality within TIP, as it is core to the foundational objectives of transformative policy rather than the methodological processes TIP employs. Nevertheless, it features as a part of a holistic interpretation of equality within transformative change: "there is income inequality and there are people not getting their fair share of resources and not being compensated fairly for their jobs and so on. So, yeah, there is a big issue, because I think transformation in the global south has to be much more about social justice and economic justice as much as it is environmental justice" (Interviewee D).

iii.   ***Epistemic justice*** – Epistemic justice, a focused code which emerged in-vivo, refers to the line of equality relating specifically to knowledge and how an individual is treated in relation to their capacity as a 'knower'. This form of (in)justice is intertwined with one's identity, and how that can influence how others perceive their level of knowledge. Differentiating it from recognitional equality and procedural equality is that this code relates specifically to the injustices in viewing the possession of legitimate knowledge. Working in unorthodox procedural processes such as co-creation in diverse, global settings, epistemic justice was a salient theme when discussing the potential areas of improvement within the TIP model.

iv.   ***Recognitional equality*** – Recognitional equality refers to the pre-existing political, economic and social conditions which limit or enable the capacities of people. Throughout the data collection process, recognitional equality was raised as a prominent theme within the work of TIPC, particularly as a challenge that needs to be addressed not only on a structural level but also within the agent/individual:

> *And there are, for example, cultures that are more hierarchical. And you can see you can experience how this affects the collaboration. And therefore, there is another question, and I'm really sorry that I am posing [these answers] as questions, but I don't have really the answers. The question is, again, is it a sign of respect to accept the fact that this culture is hierarchical, and to respect it by not challenged again? ... And my sense, my first, like, very practical insight is that you have to go by the face, despite the fact that it might be uncomfortable, because you cannot impose a different set of values. You cannot impose them de facto, you know, I think if your values are a better, hypothetically speaking, or a better scenario than the values that are on the ground, who is to say that? I think you need to leave the ground for people to sort of negotiate this in their own circumstances, even if it is uncomfortable for you. - Interviewee C*

1.   *Complexity in identity* – A subset of recognitional equality, this code refers to the interplay between aspects of identity (for instance, one's culture, one's nationality, one's level of education, gender, age, etc.), how these aspects intersect and interact with each other, and how this adds complexity to how one identifies themselves within a system. Complexity in identity adds to the complexity in achieving recognitional equality. Beyond identity markers, 'complexity in identity' also serves as the code for the pitfalls of recognitional equality, in the fact that one's values, desires and political affiliations are not a given based on certain identities.

b.   ***Procedural equality –*** Procedural equality refers to fairness in the processes and mechanisms related to political decision making. Procedural equality plays an important role within TIP, being the form of equality most explicitly outlined within their work and project reflections. Expressed by Interviewee E, procedural equality is the most important dimension of equality and equity within the TIP framework and the form currently addressed within their evaluative research. This is expressed through the commitment to co-creation and participatory design within developing the theory of change alongside the policy implementation process.

c. *Structural change* – Structural change is the code representing the main goal of TIP and transformational policy in general – to create change from pre-existing systems to new, sustainable systems.

IV. *Ideals*

a. *Non-hierarchy* – The code representing the ideal of non-hierarchy within the TIP process, where any stakeholder no matter what standing can contribute to the development of transformative policy. During this process "…it assumes a sort of bottom-up role, [where] multiple stakeholders are driving this bottom-up change. In theory, of course, there is the assumption that these multiple stakeholders work together, the coordinate and the negotiate. So there are some assumptions around the so-called power relationship between the different actor groups, and how that might influence transformation" (Interviewee D). Non-hierarchy refers specifically to the hierarchies surrounding knowledge, legitimacy and expertise – that is, the assumption that the researchers possess more knowledge, and therefore their input is more valid.

b. *Mutual learning* – Mutual learning is the ideal which reflects TIP's desire to achieve learning in both the practitioners, as well as those engaging with the TIP workshops. Rather than forming a one-directional mode of learning between expert and non-expert, both parties form a dialectical process in which both mutually gain new knowledge.

c. *Inclusiveness* - Inclusiveness can be seen as the expression of participatory equality within the organisation's work, it is divided into two sub-codes:

1. Shared narrative – In terms of inclusiveness, developing a shared narrative is one of the ideals emphasised with the creation of TIP. A shared narrative can be understood as having the same, shared understanding of the world.

2. Co-creation – Co-creation refers to the process of developing a shared narrative within the policy formation of TIP. Co-creation is the inclusion of societal actors in the policy development process.

d. *Flexibility* – In the generation of theories of change in the policymaking process, the theories will be flexible, implying that they should not be understood as a fixed causal chain between inputs, activities, transformative outcomes and impacts, but rather they can be revisited and redefined as a result of the formative evaluation process.

e. *Consensus building* – Consensus building involves engaging with multiple groups, 'bridging the gap' in knowledge and reaching agreement. Relating to the work of TIP, it focuses on creating commonalities in order to reach a specified theory of change.

f. *Reflexivity* – Reflexivity refers to the capacity of an individual to recognise their own agency and embeddedness in the social structure

g. *Openness* – Openness refers to the programmes aim of fostering open exchange and open-mindedness in the face of new perspectives and knowledge. As well as the facilitators and practitioners being open-minded and reflexive in their practice, the participants are also expected to share their ideas and reflections openly. Openness also sets the intention that all viewpoints will be listened to, will be respected, and are appreciated within the learning process.

V. *Processes*

a. *Learning –* The code 'learning' represents the process learning within TIPC. It involves the exchanging information from one party to another in a collaborative manner, gathering information from new experiences

b. *Formative evaluation* – Within TIP, there is a focus on the process of formative evaluation. This style of evaluation is conducted throughout the policy implementation process as opposed to the final product of the process. It is reflexive and flexible, allowing for policymakers to learn during the process and for the goals to adapt in the face of new information and challenges.

c. *Capacity building –* The process of capacity building refers to the expanding of an agent/practitioners or a system's capabilities based on their particular needs. This can include increasing skills, disseminating knowledge or connecting them to resources and networks.

d. *Network building –* The process of network building refers to expanding the number of people willing to engage with TIP goals – the mainstreaming of alternative, sustainable practices for transformation – and creating the connections between them. This includes the creation of a communication network between practitioners, stakeholders, interest groups, policymakers and consumers.

e. *Participation –* Participation refers to the actioning of inclusivity. Within the work of TIP, those who are subject to policies made, such as societal and commercial stakeholders, citizens and consumers, participate within the policymaking process.

f. *Questioning –* Questioning as a process refers to the emphasis on keeping an open mindset for the participants, alongside fostering a continuous process of evaluation. Questioning is the method in which to foster mutual learning, reflexivity and openness.

g. *Tailoring –* Tailoring refers to the creation of specific, tailor-made solutions to each policy problem.

VI. *Emotions* -

a. *Optimism* – Feelings of empowerment and confidence expressed in relation to the work of TIPC, from either the researchers or the policy practitioners engaged in the workshops.

b. *Eagerness* – Feelings of desire to work towards transformative goals, to expand and explore the theory and to teach or apply the theoretical framework.

c. *Struggle* – Feelings of discontent while working with transformative outcomes/TIP. These feelings were related to a struggle to bridge differing viewpoints, a struggle to communicate between different contexts and a struggle to understand and to apply the theory to various other projects.

VII. *Understandings*

a. *Different understandings of outcomes* – Referring to the presence of a difference within the situation, wherein one or more groups have different desires for the outcome of the policies at hand. An example of this is difference in understanding a system-wide transition versus the implementation of one policy goal.

b. ***Difference in viewpoints*** – Referring to the difference in how one or more groups view something due to their value system, ideology, culture, etc.

c. ***Dialogue*** – Dialogue refers to the presence of sustained dialogue between one or more groups or people, where there is open and sustained communication of knowledge and ideas.

d. ***Desired outcomes*** – Referring to what is stated to be a desired outcome. The desired outcomes of one stakeholder can differ from another (e.g. the desired outcome of profitability versus the desired outcome of job security), affecting the communication and collaboration of the interactions.

e. ***Discursive common ground*** – Discursive common ground refers to the presence of a common understanding of something (e.g. the role of technology, the purpose of nature, what constitutes 'nature'). A discursive common ground is one of the aims of consensus building and the ideals.
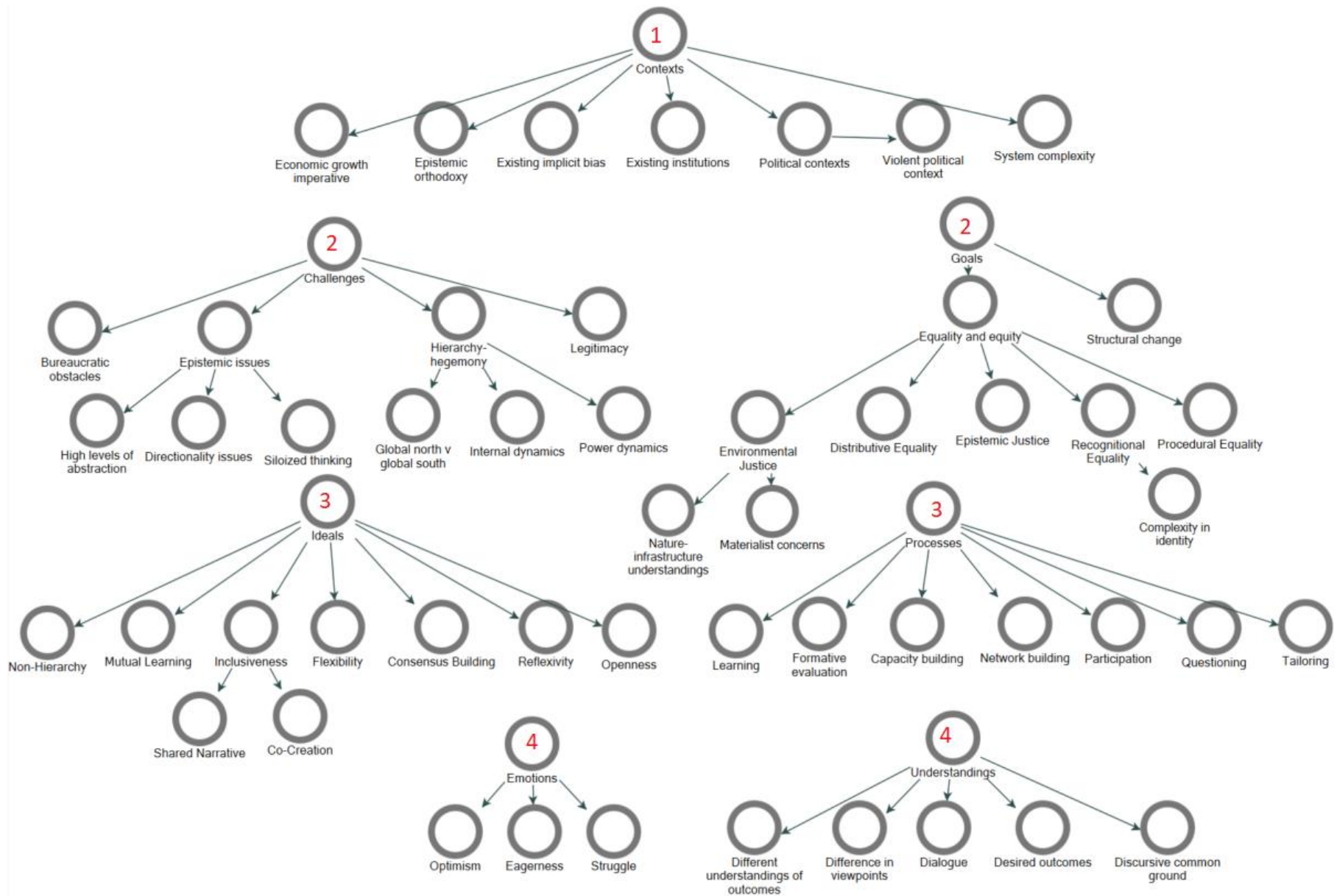
Figure 6. Coding paradigm

The codes form a meta-level conceptual illustration of the work done at implementing transformational policy. In reality the relationships between the codes and categories are closely and complexly interrelated, with codes across different axial codes touching upon the same concept or strategy. Direct causal connections cannot be derived, however an interpretation of the factors relating to equality and equity in transformative practice can be gleaned from the data. Nevertheless, some interlinkages are clearer than others. Figure 7 illustrates the relationships between the contexts and the challenges. The set of codes here show associations which can be represented linearly. For instance, the imperative for economic growth is seen as a legitimating factor in innovation policies, meaning that without clear-cut economic growth outputs, policies which aim for systemic transformation can be seen as non-legitimate. Epistemic orthodoxy coupled with existing biases and system complexity reinforces epistemic issues such as siloized thinking within a highly abstract issue area such as systemic transformation via one policy sector. Political contexts are related to issues surrounding power dynamics and hierarchy, ranging from internally within the organisation to the Global North-South divide, while existing institutions (or lack thereof) can create bureaucratic obstacles. Relationships between the other coding categories are not illustrated in this linear manner due to the complexity of the potential linkages but are implied through the cluster analysis presented in Figure 10 in the following section.
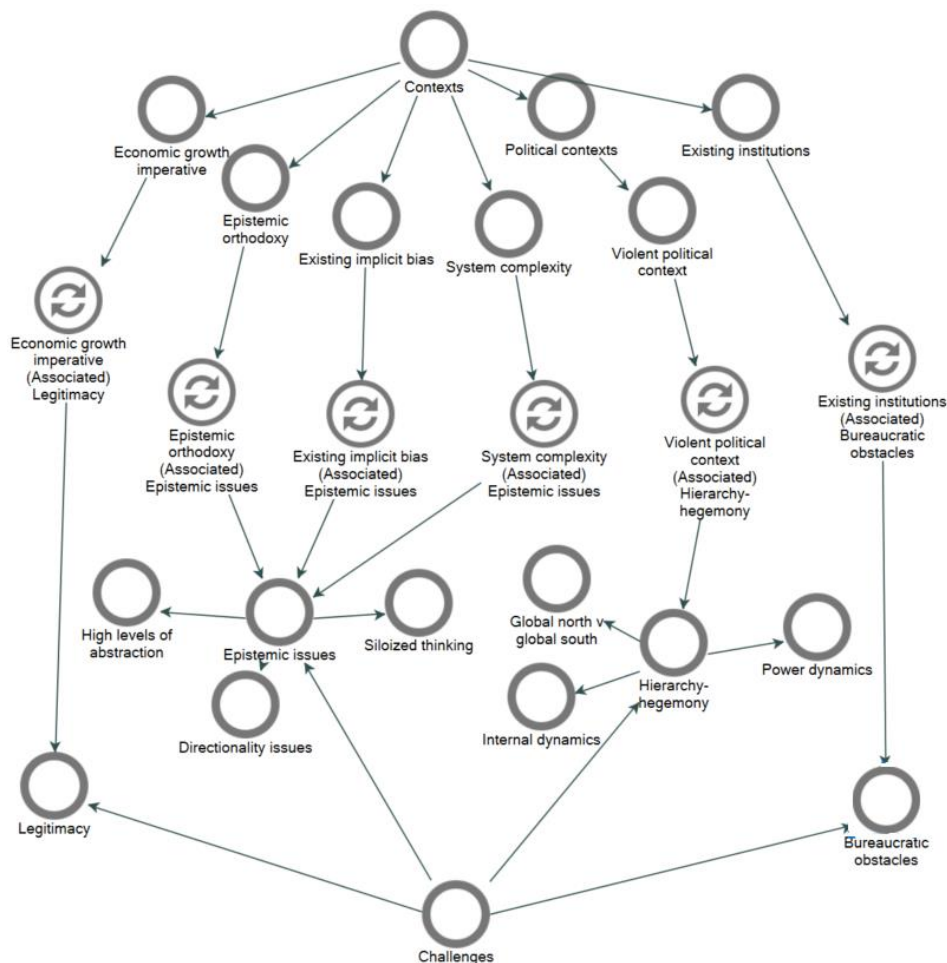

Figure 7. Relationships between 'contexts' and 'challenges'

The relationship between the context and the challenges forms the external aspect of the work in which it is embedded. All codes identified are emergent through the GT processes. While some of the codes are addressed within TIP and more broadly transformations theory (such as those of system complexity and the economic growth imperative), codes such relating to epistemic issues and hierarchy and hegemony feature heavily within the interview data. Table 4 shows the frequency of the codes throughout the data. Evidently, the codes hierarchy and hegemony (41), inclusiveness (31), procedural equality (26) and recognitional equality (24), epistemic issues (21), network building (18), dialogue (14) emerge as the most dominant themes. How these codes relate to each other can be seen in Figure 8, showing the percentage coded within each interview amongst the practitioners and transcript data.

Table 4. Frequency of codes

| Code (including second and third order child codes)	Number of instances		
Emotions		**Ideals**	
Struggle	5	Inclusiveness	31
Eagerness	3	Non-hierarchy	8
Optimism	2	Consensus building	7
		Flexibility	7
Challenges		Mutual learning	7
Hierarchy-hegemony	41	Openness	7
Epistemic issues	21	Reflexivity	4
Bureaucratic obstacles	6		
Legitimacy	6	**Contexts**	
		Epistemic orthodoxy	9
Goals		Political contexts	6
Procedural equality	26	System complexity	5
Recognitional equality	24	Existing implicit bias	4
Epistemic justice	12	Economic growth imperative	3
Environmental justice	8	Existing institutions	3
Distributive equality	7		
Structural change	4	**Processes**	
		Network building	18
Understandings		Formative evaluation	8
Dialogue	14	Participation	6
Desired outcomes	10	Questioning	6
Discursive common ground	10	Capacity building	4
Difference in viewpoints	9	Learning	4
Different understandings of outcomes	4	Tailoring	2
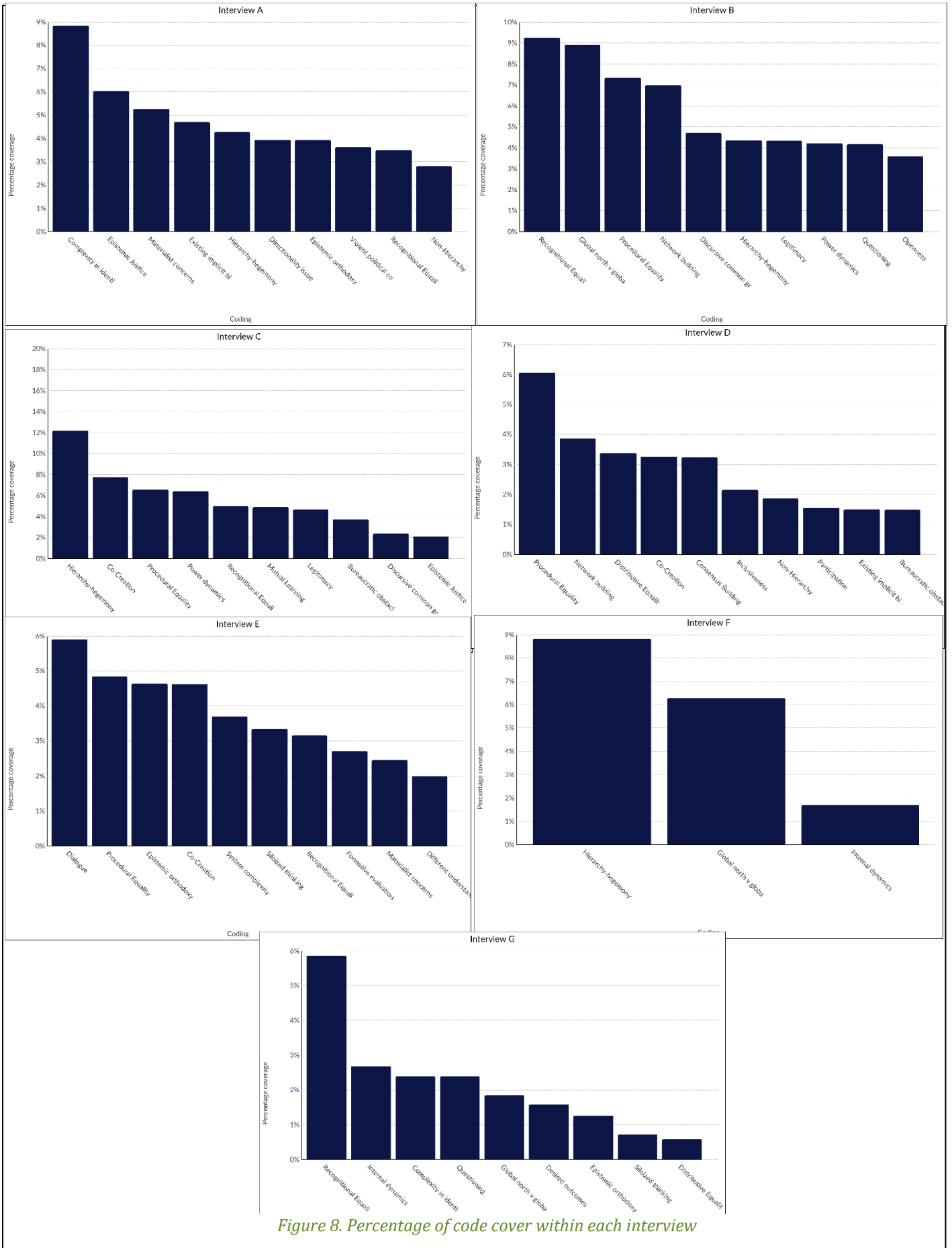
Figure 8. Percentage of code cover within each interview

ANALYSIS

Returning to the first research sub-question – **SQ1** *How are the issues of equality and equity currently operationalised within TIP?* – the coding paradigm created presents a systematic categorisation of the concepts mentioned through the interviewing process. These concepts are essentially abstract thematic elements taken from the interviewing and document review process. Utilising the coding paradigm, the data will be analysed and discussed in relation to the research questions.

In answering **SQ1**, the language of TIP can be merged with the terminology taken from studies of equality and equity, lending the conceptual framework to the work of TIP and providing discrete measurable concepts for further analysis. The frequency of the forms of equality can illuminate which areas are discussed most by the interviewees and within the secondary data. As shown in Table 4, procedural equality (26 coding instances) alongside recognitional equality (24) feature the most within the work of TIP. This is expected, given the emphasis on the role of inclusiveness in separating TIP from traditional modes of innovation policy (Chataway et al., 2017). While not explicitly operationalised in a form that is linked to the dimensions of equality and equity, how these dimensions of equality play out can be elucidated through the axial codes regarding the action strategies, particularly those of which that also feature heavily in the data. Figure 9 shows the axial codes relating to SQ1, as the ideals and processes represent the 'action strategies' of TIP – in other words, how the issues are operationalised. Utilizing equity framework presented in Table 1, Table 5 presents a summary of the codes most representational of the forms of equity.

Table 5: Codes relating to the three dimensions of equality/equity

| Form of equity	Description	'Action strategy' codes representing each dimension
Distributional equality	Distributional equity refers to how resources, costs and benefits are allocated or shared amongst people and groups.	• Openness • Capacity building
Procedural equality	Procedural equity refers to fairness in the processes and mechanisms related to political decision making.	• Inclusiveness (Co-creation) • Consensus building • Participation • Network building
Recognitional equality	Recognitional equity refers to the pre-existing political, economic and social conditions which limit or enable the capacities of people.	• Non-hierarchy • Mutual learning • Reflexivity • Inclusiveness (Shared narrative)
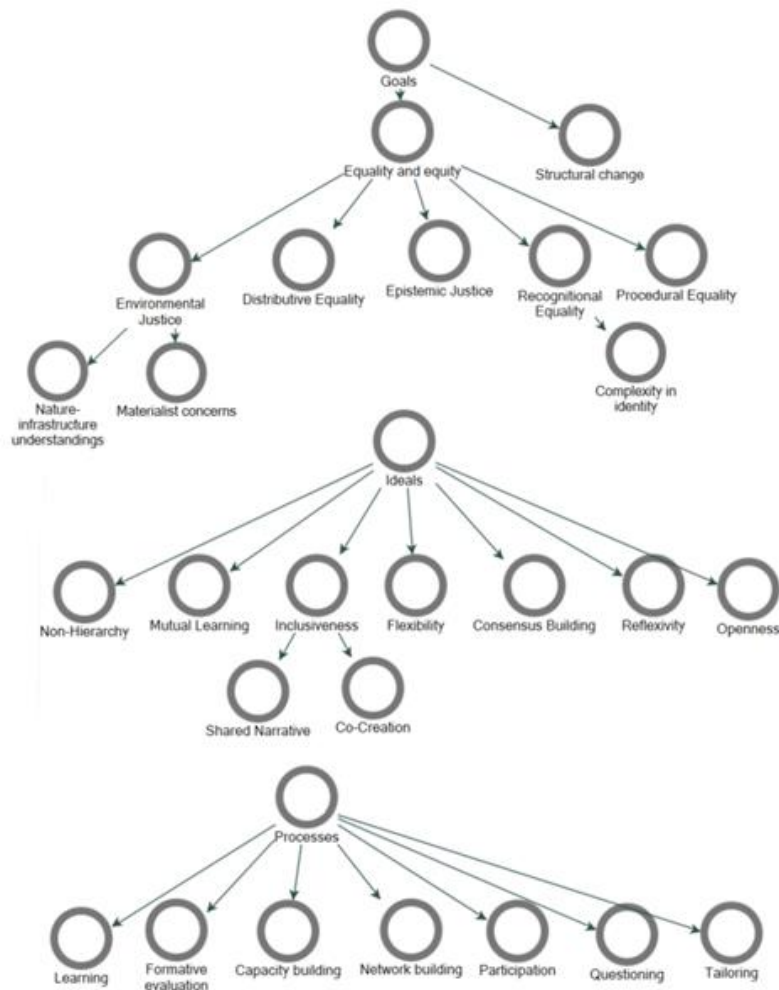
Figure 9. Codes for equality and equity, the ideals and the processes

These codes, which are the goals and ideals of TIP and the associated policy experiments, are how equality and equity are operationalized. Procedural equality can be linked to co-creation, consensus building, participation and network building. These strategies specifically target the decision-making mechanisms, focusing on increasing equity within the policy interventions. Through co-creation and participation, a more deliberative form of decision-making is encouraged to ensure procedural equality. Consensus building assists in ensuring that each voice has an input. However, defining and characterising precise measurable forms of procedural equality has proven challenging:

> *"How is your policy, your project or programme transformative? And then, we build a theory of change which is in itself a procedure – like choosing the pathways that you will follow – And within those pathways, you have the questions of 'whose voices are integrated there?' 'How are they represented?' Is it more of the kind of traditional participation where you have design everything, and you just inform people? And you see them as beneficiaries? Or is it really*

dynamic and a kind of participation that implies agency within the groups?" –
Interviewee B

The idea of whether participatory equality is tangibly achieved within the current framework was
also expressed:

> *"I think that this would be really interesting to actually incorporate it much*
> *better in the frameworks, because the frameworks currently do not really make*
> *it explicit. The sort of power dynamics, the sort of procedural issues, because we*
> *assume that we can co-create knowledge and we can collaborate easily with*
> *practitioners. And it's okay. And it's almost like we take it for granted that all this*
> *different diversity of the team working together. In a diverse team, what are the*
> *challenges? And what are the opportunities?" – Interviewee D*

While these action strategies are present within the work, adequately capturing the process of
increasing participation and co-creation beyond tokenistic actions was raised as an issue.

Steps to ensure recognitional equality can be seen in the action strategies of non-
hierarchy, mutual learning, reflexivity and the development of a shared narrative. Recognitional
equality is rooted within the cultural and symbolic, where one's identity is present in the
overarching social structures. Here, these action strategies lend themselves to the inclusion of
outsider voices not within the policymaking structure. The emphasis on a shared narrative
encompasses recognition of another's viewpoint and position; and practicing recognitional
equality can be seen as a prerequisite for mutual learning. Reflexive practice increases
recognitional equality, as the process of reflexivity actively addresses one's position within the
social structure that is present in the decision-making mechanisms. Finally, openness and
capacity building can be linked to distributional equality. Rather than the sharing of material
resources, TIP emphasizes the necessity of sharing knowledge as a resource. The collaborative
and non-hierarchical nature of the policy experiments emphasizes fostering open exchange, and
increasing the capabilities of practitioners so that the management of socio-technical systems can
be continued without external expert input. This creates a specific, epistemic form of
distributional equality in which knowledge as a resource is distributed fairly and accessibly.

Based on this categorisation, the codes representing the ideals and goals of TIP can be
viewed as methods to achieve the three dimensions of equality. However, the presence of these
practices do not illustrate the full picture of how they are implemented in TIP policy experiments
themselves. By answering **SQ2** *How were these issues implemented in practice?* and **SQ3** *What
potential barriers and opportunities can be identified in the process of integration?,* theory can be
developed through exploring the concepts based on the data collected.

Regarding how these issues were implemented in practice (**SQ2**), further GT theoretical
development is completed. To assist in the theoretical development, Figure 10 presents the
results of a cluster analysis ran on NVivo which generated ten clusters using Pearson's r
coefficient. This cluster analysis maps out the level of correlation between the codes based on the

words in each code, meaning codes grouped within each colour share the same references and words used. Here, inferences can be drawn based the groupings demarcated to only assist the GT analysis. Based on the cluster analysis, the three clusters relating to the equality and equity domains are presented and supported with interview excerpts. This is then followed by a holistic interpretation of equality within the *Living Catchments* project.
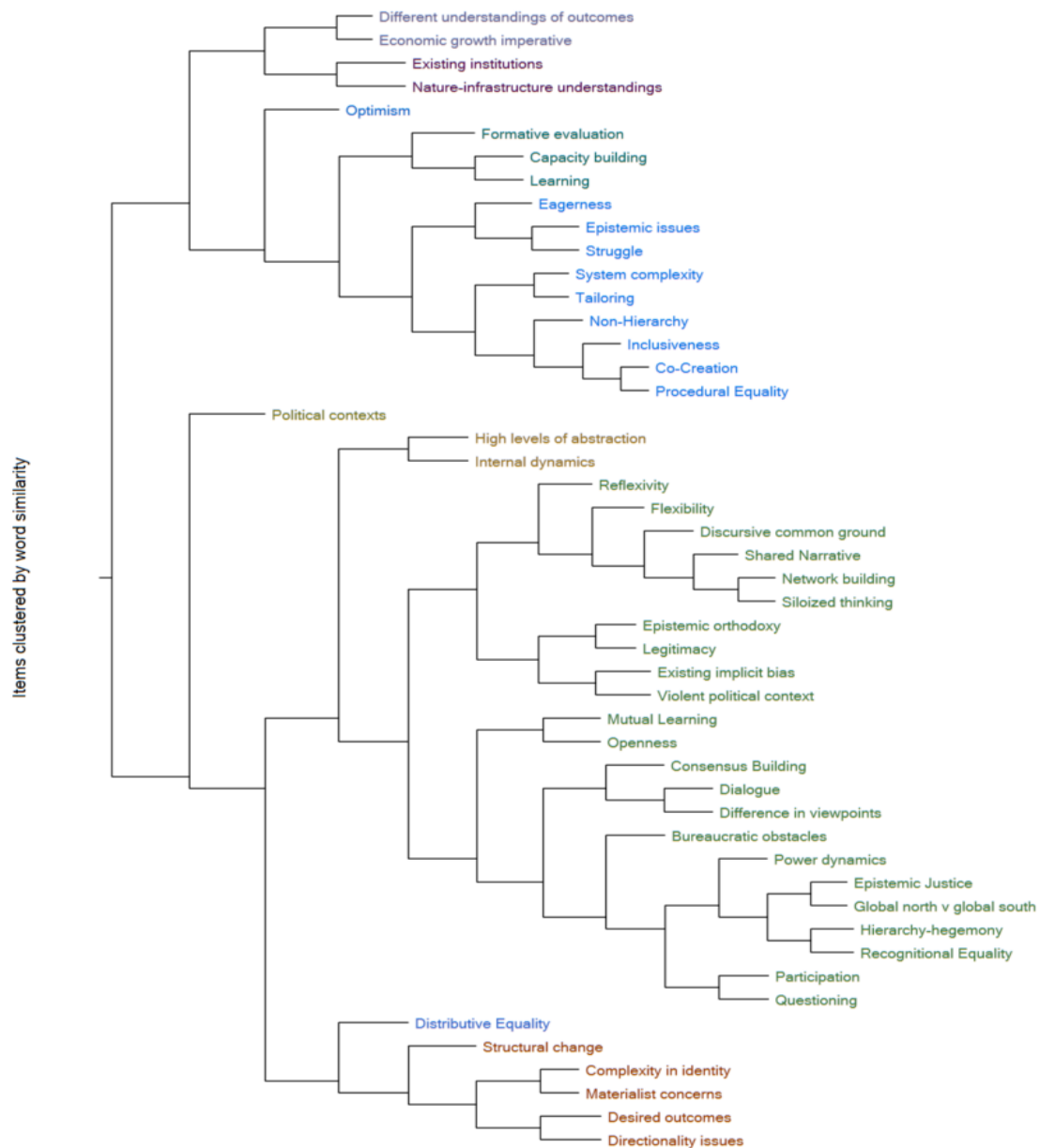
Figure 10. Cluster Analysis

Procedural equality (in blue) is clustered with inclusiveness, co-creation, non-hierarchy and system complexity. This cluster represents one of the nascent themes emerging from the data and explains how procedural equality manifests itself in transformations work – the work of implementing a non-hierarchical, inclusive systems. However, in practice, existing inequalities presented challenges to the implementation of procedurally equal decision-making mechanisms. Co-creation practices showed that dealing with preconceived prejudices was a notable issue.

These preconceived prejudices affected both the individual and as a wider system. On both the individual and structural level, prejudices were faced by the researchers:

> *"However, there are nuances. And there are, for example, cultures that are more hierarchical. And you can see and experience how this affects the collaboration. And therefore, there is another question, and I'm really sorry that I'm posing this as questions, but I don't have really the answers. The question is, again, is it a sign of respect to accept the fact that this culture is hierarchical, and to respect it by not challenging it? …. And my sense is that you have to go by the face, despite the fact that it might be uncomfortable, because you cannot impose a different set of values or you cannot impose them de facto, you know? I think if your values are a better, hypothetically speaking, or a better scenario than the values that are on the ground, who is to say that? I think you need to leave it on the ground for people to sort of negotiate this in their own circumstances, even if it is uncomfortable for you." – Interviewee C*

Furthermore, enacting procedural equality requires examining one's own potential prejudices which can develop based on one's occupation:

> *"My personal feeling is that it's very difficult for many academics, to engage in processes of procedural equity. Because academics build their careers on personal reputations that have to do with their views of reality, being in a way or another, acknowledged to be superior." – Interviewee A*

Despite the emphasis on procedural equality within the theoretical frameworks and theories of change for TIP, the reality of working on the ground is underscored by these existing hierarchical systems and prejudices. Issues of power and agency are consistently present in these real-world situations, and are evident when trying to achieve collaboration:

> *"It is very hard to talk about the opportunities without recognizing the role of power and agency. Some people will push on, some people will be followers, okay, and we all need to come to the same level, and to listen to each other, and to accept conflict, to accept disagreement, and to still work together over and above that. I think the point I'm trying to make is to get rid of very standard and traditional perceived obstacles, such as 'when I disagree with you, the collaboration falls apart' – it is not the case any longer." – Interviewee B on co-production*

In the cluster analysis recognitional equality (in green) is clustered with hierarchy-hegemony, epistemic justice, Global North vs. Global South and power dynamics – amongst many other adjacent conceptual codes. As stated by Fraser (1997), the distinctions between forms of injustice are primarily analytical while in reality, they are often intertwined. This statement rings true for the distinction between procedural and recognitional equality. Of the three dimensions

of equality, implementing recognitional equality faced the most criticisms, particularly in relation to the North-South divide in terms of policymaking:

> *"I would say, depending on which part of the world you are working in, you know, there can be an element of – and we have come across it – the perception of an of 'white' imposition. And a Global North literature type of imposition. And the question of how sensitive and how appropriate any literature, any methodology stemming from conditions in the north, how appropriate is it to apply on a sensitive, very local South context...*
>
> *...but at the same time, because of the hierarchies, because of the different culture and values there you are seen as a non-expert. And then not only you are a non-expert, who has come to do what in the local country, but also you are a white person who is trying to impose a methodology that has not been validated enough to make sense in the local context." – Interviewee C*

The interviewees touched upon a concern over colonial replication, in terms of an imposition of a theoretical framework developed and researched based on a Global North context. Additionally, it was felt that this did not take into account the social milieu of Latin America, particularly in the conceptualisation of social change, through the exclusion of popular social movements as a topic of research, and the lack of acknowledgement of the political atmospheres of non-North countries:

> *"Now if we were in Columbia, which is one of our partners, people in the communities that we would like to work with, that are close to TIPC. People that in these communities who push these kind of approaches usually get shot. So that's a very different political context. I think this is a big thing of the tale on what equality means within TIPC. Equality is something that you pursue with the assumption that the political context in which you will work will have the tools at your disposal to be able to pursue these goals of equality through the tools of participation. ...*
>
> *...very sceptical of the capacities of the organisation at the local level, to deal with the differences in power ... differential access to the means by which you exercise violence ... The levels of inequality are such that really are the subject of a political confrontation, which is not what we encounter in Finland, Sweden, and Norway and the Netherlands, which is a peninsula." – Interviewee A*

Nevertheless, the inverse also appeared as a concern amongst researchers advising governments in the Global North who were from the Global South:

> *"...but specifically with some of the participants [you can lack] credibility more because, well, your accent, you look different. Colombian and you are coming to Sweden, to our agency that were taught to tell us what to do? No. Well, that says*

The hegemonic power dynamic between the North and the South affects the perceived credibility of the researched, and by extension the legitimacy of the methodology. The bi-directional nature of these concerns emphasizes the complexity and intersectionality one's identity within the research system. While the focus is on implementing fair and equitable decision-making systems, pre-existing social frameworks and environments have shown to be hard to navigate.

Distributive equality is clustered with structural change, complexity in identity, materialist concerns, desired outcomes and directionality issues. The narrative theme developed by examining distributive equality moves away from matters pertaining to identity and culture. The act of redistribution is inherently political and suggests a move towards a specific goal or image of the future, in other words, directionality. The cluster of codes touches upon the realm of environmental justice, particularly to Schlosberg's (2013) idea of 'sustainable materialism', how material matters affect ones equal standing in society, in environmental justice;.

> *"So let's put it up front. I mean, you already know this direction [sustainability],*
> *but it's directionality in a certain direction, and not all directions are the same."*
> *– Interviewee A*

Questions were raised in relation to if recognitional and procedural equality will be achieved if the notion of a desired future is already constrained by the goal of directionality as outlined in TIP.

The interview data is supported by the secondary source data, which presents a holistic example of how the dimensions of equality were implemented. Turning to the data gathered from the *Living Catchments* project, a synergistic approach was undertaken where concerns of environmental justice – in relation to improving the ecosphere and aquatic biosphere – are directly tied to that of distributional equity while also placing an emphasis on procedural equity and in turn, recognitional equity. The project encompasses the three dimensions of equality while also touching on the two other forms identified – environmental justice and epistemic equality. Material concerns around the distribution and maintenance of water supplies for all citizens are interlinked with ecological goals. The material distributional aspect of the project – water provision – is interlinked with procedural equity, manifested primarily as network building and participation amongst those responsible for provision and the larger community base. Further distributional equity is exhibited in the primary aim of capacity building. Nevertheless, based on the reflection data, challenges in capacity building were present. Rooted in the creation of a shared narrative and consensus building regarding the theoretical framework used, friction emerged between the academic team and the project participants:

> *"The academic team has been very focused on the academic model of regime,*
> *niche, and landscape as well as on the theory of change. A few of the project team*
> *were questioning if the theory of change was in fact the correct framework as*

well as questioning if the transition theory was more applicable to a technological change rather than the social change that is trying to be achieved in this project. The academic team did respond to this and highlighted that along with a social change there would also be a technological change that would result in this project in relation to the type of water infrastructure that is implemented."

– Reflection on the Living Catchments project from an anonymised participant.

This sentiment is echoed within other projects implemented within the Global South, where expectations of outcomes were not aligned:

"The missing link with the practitioners was a shared concern of participants. There is mismatch between the industry and academia in terms of the expectation they have from the output of such exercises. It was suggested that TIPC can try to bridge academia and practice. It is important to understand who is going to use these tools: is it only for academic purposes or is it going to be used by practitioners on the ground? Questions were raised regarding the capacity of the policymakers to understand these new concepts in order to engage with them and use the framework to measure transformative potential of their projects, programmes and policies. One participant with experience as a practitioner shared that in day to day job, a lot of policy makers work on basic provisions of services. They are less concerned what concepts or frameworks are used to analyse their work. Terminology and concepts can make or break innovations and services; thus, the language and communication need to be simple since policy makers are still failing to relate to concepts like transformational adaptation to climate change, sustainability transitions, circular economy etc. The question was raised on who needs to adapt to whom in order to create an impact on the ground, is it academics or policy makers? The idea should not just be to measure transformation but also how to provoke transformation to happen on the ground."

– Workshop on the Transformative Outcomes in the Global South, 25-26 June 2020

The question posted at the workshop presents a disconnect between parties that can be viewed from a distributional equality lens. If knowledge is seen as a resource to be distributed, in practice there is a level of inequity as the conceptual resources provided do not meet the needs of the practitioners on the ground. Nevertheless, the emphasis on reflexive capacity building has been well received. While the three understandings of equality and equity are seen as necessary for equitable transformative action, the reality as shown within this study is that these domains do not necessarily overlap synergistically with other goals such as regime change.

Overall, the practice of implementing each domain of equality highlighted frictions, creating essentially an academic-practitioner divide in TIP in terms of understandings, shared languages and shared end goals. More broadly, this can be seen in the divide between society-wide expectations in relation to distribution of material goods, direction of change, understandings of 'how' and 'what' should be done in terms of systemic transformation. This is primarily expressed in a linguistic gap and a goal gap (for example, getting the project done vs. building capacity). Building dialogue and mutual understanding – through shared linguistic and theoretical concepts – are the main forces for implementing procedural and recognitional equality in transformative policy.

INTERPRETATION AND THEORETICAL DEVELOPMENT

Regarding *SQ3,* potential barriers and areas of improvement which emerged from the data primarily touch upon three themes which can be seen as barriers to the successful implementation of TIP: recognitional inequality, Global North-South divide and differences in understandings. The three barriers were discussed in terms of the equality framework under *SQ2*. Returning to what Corbin and Strauss (1990) termed as theoretical sensitivity, the literature surrounding equality and equity forms the cognitive frame of reference for the judgments and findings. The emergent themes of recognitional inequality, North-South divide and differences in understandings are interrelated and can be understood under a focus on epistemic orthodoxy. The idea of an epistemic orthodoxy has been expressed by the Latin American interviewees:

> *Well, sometimes it is as if the Global North has invented the wheel. Let's talk about technological sovereignty. And actually, this is something that economists and political scientists and other scholars have been talking about for years and years about - technological sovereignty. So that's one thing, and the other is like, this kind of colonial type of way of thinking of sustainability, about development and so on. The point of view of people who are really affected by the very issues that we try to address is underrepresented. But I don't know if it is an issue of Global north and Global South because it is an imbalance of power related to those who have resources or not. … Look back to Brazil, which is a very unequal country, where those who have money have power and then they are able to talk about the subjects as if they know it better than those that are affected. – Interviewee G*

Epistemic orthodoxy is a theme which is outside of equality and equity frameworks used. It is the common thread linking the disconnect between the shared understandings of the decision-making structure, the conceptual language used to communicate and the shared understandings of desired outcomes and structural realities. Furthermore, it is implied in the hegemonic power imbalance between those in the Global North and the South. The pre-existing prejudices relating to identity and culture can be viewed from the lens of those who should possess knowledge, and those who should not.

Turning to the areas of improvement for understanding equality and equity in TIP, the findings can be placed within in the context of epistemic equality. Epistemic (in)equality emerged as a dominant theme within the data. Not specifically defined in the dimensions of equality, the emergence of this form of equality directly impacts the other three dimensions: in recognitional equality in terms of questions pertaining to who possesses valid knowledge, how that knowledge is legitimated, understood and worked with within transformative practice; in procedural equality, how knowledge is exchanged in procedural mechanisms and in the knowledge on how to run a procedure itself; and in distributional equality, as knowledge can be viewed as a resource to distribute in itself. Epistemic (in)justice can be defined as relating to the injustices faced by someone in their capacity as a knower (Fricker, 2007). According to Fricker, it emerges in two forms: testimonial injustice and hermeneutical injustice. Testimonial injustice refers to the credibility of a statement based on the identity of the speaker. Existing examples of this can be seen in racist and sexist behaviour within legal systems. Hermeneutical injustice occurs when one's experiences are not understood due to the fact that the experiences do not fit with any established conceptualisations or ways of knowing. It can be defined as "the injustice of having some significant area of one's social experience obscured from collective understanding" (Fricker, 2007, p.155). The collective understanding, or 'ways of knowing' can be described as hermeneutical resources, which are the shared concepts, narratives, conceptual frameworks and ideologies of a community that enable a person to make sense of themselves and their surroundings (Medina, 2013).

Of the two forms outlined by Fricker, hermeneutical injustice is the form of epistemic justice most relevant to the study. Hermeneutical injustice is structural, rooted in society's lack of interpretive resources to make sense of a speaker's experience (Anderson, 2012). This is due to the speaker's marginalised position in society, wherein they are excluded from meaning-making activities. These 'meaning-making activities' can include legitimating social-political institutions such as policy documents, government programmes and agendas, articles in the media and academic journals. Social-political institutions themselves are not epistemically neutral, but convey one form of epistemic understanding and embody a legitimated 'way of knowing'. These institutions carry a prestige which can legitimize one point of view, thus disregarding others.

Anderson (2012) shows that current research on epistemic justice focuses on marginalised groups and their ability to be seen as people who possess knowledge. However, based on coding of the interview data, it is possible that this frame of justice can be extended into transformations research. The epistemic justice framing is complimentary to TIP's desire for co-creation, mutual understanding and non-hierarchical network building. Transformative policy aims to restructure existing socio-technical systems in an equitable manner. This resonates with Anderson's discussion on social institutions and systems of inquiry, where she posits that remedying epistemic injustice is a virtue that should drive said institutions. Anderson (2012, p. 171) states that "if group segregation is the structural ground of the types of epistemic injustice … then group integration is a structural remedy—a virtue of epistemic institutions. When social

groups are educated together on terms of equality, they share equally in educational resources and thus have access to the same (legitimate) markers of credibility. ...Shared inquiry also tends to produce a shared reality, which can help overcome hermeneutical injustice and its attendant testimonial injustices".

Drawing from the narrative lines formed by answering *SQ2* and *SQ3,* the final sub-question *SQ4 What recommendations can be derived for furthering equality and equity in transformations work?* will be answered.

Based on the work of Anderson (2012) and Fricker (2007), further implementation of the epistemic frame of equality into transformations work and socio-technical systems research can yield better understandings. Already epistemological matters are considered within socio-ecological systems, for instance, in the treatment of indigenous knowledge and the understandings of human-nature relationships. These matters are also subject to questions of equality, equity and justice. Returning to the Multi-Level Perspective (Figure 2 and 3) as presented by Geels (2002), it is already possible to take into consideration the role in which knowledge plays in the socio-technical system. As regimes provide meanings to technology as utilized by society, it can be possible to frame these meanings as sites of potential discursive struggle – sites which may be subject to inequities as one group dominates the other. This was somewhat reflected within the interview data, where some respondents felt as though the theoretical basis itself is rooted within a specific view dominated by the Global North.

The area in between the theoretical conceptual framework and the on-the-ground practice still produces frictions. Frictions were also felt particularly by those whose expertise was not considered legitimate due to their professional and academic background, their gender identity or their culture and nationality. While the theoretical background emphasises the process of change and transformation, on-the-ground practitioners were more concerned for the overarching goal: material change of the system. This difference in focus, alongside the implicit biases and preconceived notions which come with engaging in wider society, brings forward the different understandings of socio-technical systems. From this analysis, there are three recommendations. Firstly, to reorientate considerations of equality and justice towards an epistemic focus. This conceptual lens accompanies the work done to consider procedural equality within co-creation for TIP. This can be done through the inclusion of the epistemic dimension in evaluative equality frameworks. Secondly, to engage with distributive equality in terms of knowledge as a shared resource and in material terms (i.e. the project goals of increased healthcare provision, increased wealth for farmers, water provision, and so on) and to investigate the interplay between how these goals shape the co-creation process. Finally, a continued and sustained commitment to reflexive practice for both the researchers and those involved in the political experiments and an acknowledgement of the differences in historical, cultural and political backgrounds – the exogenous socio-technical landscape – in which these transformations wish to take place.

DISCUSSION

The overarching goal for a GT analysis is to develop a theory based on the coding. Returning to the overarching research question – *how are the issues of equality and equity incorporated into the Transformative Innovation Policy conceptual framework and practice, and what lessons can be derived from it?* – the findings of this project have presented the work of TIPC through the lens of equality and equity studies.

The GT study presented a narrative developed through the examination of 8 in-depth expert interviews, workshop documents and other secondary sources, leading to an axial coding paradigm which shows the work of TIPC. The coding paradigm captures the 'contexts' in which the work is done, which can be viewed from a transition theory lens as the exogenous landscape factors of the socio-technical regime. It showed the challenges faced by the researchers, alongside a categorisation of the goals and ideals of TIP. These were then linked to the normative dimension of equality and equity. Here, an overarching narrative theory was formed which encompasses the struggles with working between academics and policy practitioners, working within global, international contexts defined by historical and geopolitical differences; a case study on the realities of working on the precipice of a 'wicked problem'. Through viewing the various stakeholder configurations, power dynamics and inequalities in the lens of both transitions theory and equality and equity, insights have been generated into how transformative policymaking has played out in practice.

It has shown that the core practices and ideals of TIP – openness, capacity building, co-creation, consensus building, participation, network building, commitment to non-hierarchy, commitment to mutual learning between academics and practitioners, reflexivity, development of a shared narrative– are all emblematic of procedural equality. Equality and equity have been considered in terms the three dimensions, alongside addressing environmental justice through the process of transformation. In TIP, there is an emphasis on the procedural, with consensus-building deliberative forms emphasised. Distributional equality can be viewed as the emphasis on open knowledge sharing across the different groups involved in the TIP network. However, achieving recognitional equality is still a challenge. Lessons learned from this analysis have highlighted the frictions between the research group and stakeholders and practitioners, particularly in finding a shared conceptual ground for the policy experiments and their goals. As science can be seen as a 'common language' (Kasuga, 2021), finding this shared epistemic grounding in the goals and methods of achieving sustainability in socio-technical transformations is necessary to ensure equitable outcomes. Based on this, it can be recommended that for furthering equality and equity in transformations work, an epistemic justice focus should be taken. This can be done through the inclusion of the epistemic dimension in evaluative equality frameworks, the development of guiding principles for researchers on the field, and a continued commitment to reflexive and critical examination.

REFLECTIONS ON THE METHODOLOGICAL APPROACH

The grounded theory approach coupled with in-depth expert interviews presented a novel method in engaging with transitions and transformations research. Rather than a focus on a specific transition project or policy area, the focus is turned away from the political-institutional and technical towards the social. The actor-oriented qualitative data gathered provided insight into the on-the-ground practices of implementing transformations policy. The focus on the members of the research consortium as the units of observation brings to light the obstacles and opportunities during these practices. This allowed for an exploration into the realm of equality and equity through investigating personal and professional experiences. These experiences belong to the actors within a niche – the niche in question being TIPC – which forms the basis of any socio-technical transition. In relation to the theoretical background of this thesis, transition theory, it highlights the potential shortcomings when engaging in transnational sustainability transformations (especially if these take place between the Global North and the Global South). Furthermore, the constructivist, exploratory nature of the work suited the abstract nature of the conceptual frameworks used (transitions theory and dimensions of equality and equity); allowing for exploration into how these concepts can be expanded and refined in sustainability transitions research.

LIMITATIONS

The identified limitations are as follows: firstly, a limitation relating to the scope of the project can be found in the time span of the project itself. The field of equality and equity is vast and touches upon many philosophical concepts which are only briefly mentioned here, and are distilled into a three-dimensional framework. The time span of the project did not allow for a thorough GT approach. Furthermore, the data collection process was be limited to online interviews due to the COVID-19 pandemic. This affected the ability to reach a level theoretical saturation which might have been achievable if more contact was available through ad-hoc encounters in person.

Secondly, general limitations relating to the GT approach and strictly qualitative data are also relevant to this study – namely, the issue of replicability as there are no standardised set of rules. Much of the results are reliant of personal interpretation of the data, informed by previous knowledge and my own theoretical sensitivity. Although every measure was taken to prevent personal bias and ensure methodological rigor, it may not be possible to fully be exempt from one's own views within the GT approach.

Finally, a major limitation was that of data sensitivity, which arguably had a larger effect than time constraints. Understandably, it was not possible to deal with high level policymakers, alongside being denied access to some documentation and interviews with members affiliated with TIPC in the middle of the project, which was an unforeseen circumstance within the Utrecht branch of the consortium. Ironically, this denial of data was due to the perceived unnecessary interference from the team (and its interns) in the Global North, becoming an incident where

epistemic hegemony was brought to the forefront of this project. Nevertheless, focus was turned towards the researcher's experiences rather than an evaluation of the projects themselves, providing a novel phenomenological study on the experiences of trying to enact a socio-technical transformation.

AVENUES FOR FURTHER RESEARCH

The research conducted in this study has many avenues for further research. Firstly, the topic of epistemic equality is under-utilized within transitions and transformations research. Increasingly salient in studies of equality, the concept has the potential to provide new insights to the transitions framework, particularly in examining frictions between landscapes, regimes and niches. Within socio-technical systems, epistemic equality can be operationalised into a framework for evaluating future projects, particularly those which involve knowledge co-production.

Secondly, this study focused on exploratory research, which leads to one descriptive case. There is potential for further case studies with other organisations, or within other contexts. Additionally, this study is very context-bound, and there is potential for exploring the role of equality and equity in other projects. With research into socio-technical transitions, the opportunities to explore how equality and equity intersects with technological change for sustainable transformations are manifold.

This study was also limited in terms of breadth and depth. Relating to the breadth of the research, there is potential to further investigate other engagements with policymakers. In relation to depth, further examination into each policy experiment (in this case, only one was discussed due to the sensitive nature of the data) could be conducted, alongside more interviews and primary sources.

CONCLUSION

This study aimed to explore the role that equality and equity plays in transformations research, and how it can be integrated further. Utilizing the equality and equity framework developed by McDermott et al. (2013) and Leach et al. (2018) in studies of socio-ecological systems, the concepts were applied to TIP, and by extension TIP's conceptual grounding, socio-technical systems (Geels, 2002). Through secondary data sources on policy experiments and interviews with researchers in TIPC, it was found that equality and equity was integral to TIP, although in an implicit manner through procedural mechanisms such as co-creation and mutual learning.

A full axial coding paradigm was created through the GT analysis, providing a abstracted, conceptual 'map' of the work of TIPC. This axial coding paradigm bridges the two conceptual frameworks, and presents an overarching description of the work of TIP practitioners. It was found that procedural equality was strongly emphasised already in the TIP framework, but recognitional equality played a barrier in interactions on both an individual level and a structural level. Distributional equality was framed as a distribution of knowledge resources, which highlighted the frictions between academics and on-the-ground practitioners. From the coding paradigm, certain values emphasised and strategies utilized by TIPC were emblematic of achieving equality: openness, capacity building, co-creation, consensus building, participation, network building, commitment to non-hierarchy, commitment to mutual learning and reflexivity, development of a shared narrative.

Beyond the framework used, the exploratory research identified a common thread which formed the 'theory developed' through the GT analysis: the underlying role of epistemic equality in transformations research. Relating to knowledge, who possesses the knowledge, and what knowledge is seen as legitimate, the role of epistemic (in)equality affected the interactions researchers had with practitioners based on their position within the Global North-South divide. The method of research and collaboration exhibited within TIP exemplifies 'Mode 2' science – socially distributed, application-oriented, trans-disciplinary, and subject to multiple accountabilities (Nowotny et al., 2003). However, despite the emphasis on collaboration and social distribution, the findings echo the fact that transformations are inherently political and are subject to the issues of power, hegemony and justice. It only underlines the necessity of the work of TIPC in relation to increasing reflexivity and remaining critical within systems as a method for sustainable transformation.

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APPENDIX A – INTERVIEW GUIDE

Part 1: Background

Question 1: What is your professional/academic background? For example, your key areas of interest?

Question 2: Can you describe your role within TIPC?

Part 2 Reflections on equality

Equality and equity: The project aims at understanding equality in TIP and within TIPC itself. Equality in this regard means equal opportunities for everyone despite characteristics of race, religion, gender, age etc. Equity is more about fairness or impartiality and can be seen as a means to achieve equality. Therefore, we will use different approaches of equity to understand equality within TIPC.

Here, we will discuss three key areas of equity which relate to the work of TIPC: **Recognitional equity,** which is respect and acknowledgement for identity and values. Examples of this include cultural and political equity, and equity in terms of gender, age, nationality, and other forms of identity and culture.

Procedural equity, which highlights how decisions are made, the extent people and groups are represented. This form of equity relates to the process of implementing co-creational activities.

There is also **distributional equity** which refers to how resources, costs and benefits are allocated or shared amongst people and groups. This form of equity is the most visible and mainstream of the concepts.

Question 1: How do you see these forms of equity within the TIP (frame)work?

Question 2: Which do you see featuring most in your approach/work

Question 3: Are there any particular challenges in implementing these within your work?

Question 4: Could you give us an example of project or time that these issues of equity came up in your work, and how the project was carried out? (No need for specific names)

[Ask to follow up on any interesting details]

Question 5: Do you think that issues of equity are incorporated enough in the current approach TIP? Especially reflected within your work?

Part 3: Co-creation and knowledge integration in practice

A large part of the TIP framework is not only addressing environmental and technical change surrounding grand challenges, but creating conditions for socio-cultural *transformative* change. Relating specifically to your role as a practitioner / researcher, we would like to ask you some questions about the practice of engaging with these normative issues such as equity.

Question 1: How do you see procedural equity manifested in your work when it comes to co-creation for transformations? This can relate to your own experiences, or experiences you've had engaging with project partners.

- How did you deal with this?
- Did you see this as challenging?
- But also do you see any opportunities and benefits in using this approach?

Question 2: Can describe an instance where you worked with issues of recognitional equity, such as something which has happened in one of your projects? Again, this can relate to your own experiences, or experiences you've had engaging with project partners.

- How did you deal with this?
- Did you see this as challenging?
- But also do you see any opportunities and benefits in using this approach?

(**Question 3:** How has distributional equity played out in your work relating to transformative practice? This can relate to how you've experienced issues relating to distributional equity, or with the project partners.)

Question 4: What do you think are the opportunities to better achieve equality in transformative practices?

Any further comments or queries?

Thank you for your time!

APPENDIX B – NVIVO DOCUMENTS AND CLASSIFICATIONS

Name		Codes	References	Classification
Interaction 1 Reflections		5	5	SA Project Reflection Papers
Interaction 1 Structure		1	1	SA Project Reflection Papers
Interaction 2 Reflections		10	11	SA Project Reflection Papers
Interaction 2 Structure		0	0	SA Project Reflection Papers
Interaction 2 Supporting Literature		8	12	SA Project Supporting Literature
Interaction 3 Reflections		3	3	SA Project Reflection Papers
Interaction 4 Activity Sheet		3	3	SA Project Reflection Papers
Interaction 4 Structure		0	0	SA Project Reflection Papers
Interaction 5 Supporting Literature		0	0	SA Project Supporting Literature
Interaction 6 Structure		3	4	SA Project Reflection Papers
Interaction 7 Reflections		1	1	SA Project Reflection Papers
Interaction 7 Structure		0	0	SA Project Reflection Papers
Interaction 7 Supporting Literature		3	6	SA Project Supporting Literature
Interview - (E)		12	19	Interview Transcripts
Interview - (G)		8	9	Interview Transcripts
Interview - (F)		3	5	Interview Transcripts
Interview - (D)		14	22	Interview Transcripts
Interview - (C)		17	30	Interview Transcripts
Interview · (B)		23	29	Interview Transcripts
Interview - (A)	∞	22	26	Interview Transcripts
Interview · (LA1)		7	9	Latin American Hub Transcript
Interview · (LA2)		11	14	Latin American Hub Transcript
Interview (LA3)	∞	11	15	Latin American Hub Transcript
Report - LA Hub 2020-2021		2	2	Evaluation Reports
Report - MOTION Evaluation	∞	8	16	Evaluation Reports
Report - Transformative Outcomes in the Global South		7	7	Evaluation Reports
SA - Living Cachements May 2021 Report		6	6	Evaluation Reports
SA LC Blog Posts		19	24	SA Project Supporting Literature
SA Project Details	∞	22	27	SA Project Supporting Literature
SA Project Info Pack		7	8	SA Project Supporting Literature