AN INTEGRATIVE ECONOMICS FRAMEWORK FOR INSTITUTIONAL ANALYSIS OF PRODUCTION AND CONSUMPTION DECISIONS FOR BIODIVERSITY AND SUSTAINABILITY

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Presented at the World Interdisciplinary Network for Institutional Research (WINIR) Conference on Polycentric Governance & the Challenges of the 21st Century in September 6-9th September 2022.

Abstract

Although policy actions are being taken by many governments around the world on sustainable development the application of institutional economics to sustainable development is still in its infancy. A range of institutional economics frameworks are deployed in the literature to explore aspects of sustainable development. The majority focus on common pool resources or social-ecological systems. There is often a high focus on extractive elements of the economy, overlooking consumption and the upstream economic drivers of consumption and choices concerning resource extraction. The paper presents an institutional economics framework exploring implications for multiple, interconnected capitals, addressing biodiversity and sustainability of production and consumption decisions. The novel framework illuminates' connections between institutions, economic activity and sustainability. The research draws on literature, experiential knowledge, and theory to construct the framework, and incorporates understandings from new as well as classical institutional economics, and makes use of the 'five capitals' model. The framework derived presents conceptual understandings of embeddedness and an extended and wider conceptualisation of value and, resources allocation in the light of production and consumption decisions. In relation to governance, wider understanding of institutions are brought into discussions, illuminating markets and organisations as value and values articulating institutions. At the level of the institutional environment, the environmental and ecological law literature is reviewed, revealing that institutional changes for sustainable production and consumption requires changes beyond property rights to ensure economies with a better capitals balance generating greater sustainability and biodiversity.

1. Introduction

The IPBES 2019 Global Assessment of Biodiversity and Ecosystem Services identified an unprecedented decline in nature and accelerating rates of species extinction, exerting significant impacts on economies, livelihoods, food security and quality of life. Land-use changes have had the greatest overall negative impact on biodiversity globally since 1970, where and how food is produced comprising one of the largest determinants of land-use change and with fishing exerting the greatest impact in marine environments (IPBES 2019). The principal underlying driver (indirect driver) of key global environmental pressures (such as climate change, land use and biodiversity loss) is final consumption (Lenzen et al 2007, Steffen et al 2015), the most affluent in society consequently exerting disproportionate impacts (Wiedmann et al 2020). Therefore, it is important to examine underlying drivers of consumption, and the social embeddedness[1] and norms that frame them (IPBES 2019, Dasgupta 2021). A key moderating force on the impacts of consumption are choices by producers in relation to management and governance of firms and supply chains that, along with technology choice, substantially moderate the embodied impact of consumption (including biodiversity loss).

The 'triple bottom line' approach has often been interpreted in practice as comprising three semi-autonomous domains of ecology, economy and society, yet the reality is that the economy is a subset of society that itself is a wholly dependent subset of the global ecosystem (Yolles 2018). Misunderstandings and misapplication of this concentric dependence lies at the root of much of society's over-consumptive, unsustainable norms. IPBES (2019) identities that 'transformative change' across economic, social, political and technological factors is critical for halting and reversing biodiversity loss. The Dasgupta Review (2021), as well as the Millennium Ecosystem Assessment (2005), TEEB [The Economics of Ecosystems and Biodiversity] (2010) and IPBES, all identify the importance of adequately factoring in the plurality of values of natural capital into decision-making tools and of understanding and exploring the role of changes in social embeddedness, governance and the institutional environment (including law) to protect and restore biodiversity as a basis for more sustainable and resilient economic growth.

Building the diversity of societal values of nature into the economy could constitute one of the most powerful levers for change, creating a foundation for sustainable business and policy decisions better serving current and future generations. Addressing this research challenge requires an integrative

[1] Granovetter (1985 p.482) identifies "embeddedness" as behaviour and institutions constrained by ongoing social relations. Another definition is as follows: "Economists using this concept recognize that entrepreneurs are embedded in their social environment, and that how they perceive opportunities in this environment results from social interactions and social context. It is emphasized that economic activities between actors do not occur in a vacuum but are under the influence of the constantly changing structure of social relationships (Young, 1998 as seen in Czernek-Marszałek 2020 p. 1)". This said the concept applies to other economic actors such as employees and consumers.

framework. Dasgupta (2021) articulates that institutional dimensions of the economy are key to building the values of nature into the economy and achieving sustainable development. Institutions can help shape the way society values, safeguards and ideally restores biodiversity. Institutional economics as a discipline can bring together the economic, social, political and technological considerations required for an inter-disciplinary framework and provide a foreground focus and consideration of institutions and their role in incorporating the values of nature into economic decisions in both production and consumption. Paavola and Adger (2005, p.365) identify ecological institutional economics as a 'promising cross-over between a new institutional economics and ecological economics' and the most advantageous strand of institutional economics for analysing the design, implementation and effectiveness of environmental governance solutions. This definition however neglects early insights from classical institutional economists and the advantages that classical institutional economics understandings can bring in progressing ecological economics. Most existing frameworks applying institutional economics perspectives that also address aspects of biodiversity and sustainable development draw principally on new institutional economics (NIE) in line with Paavola and Adger's definition above. These frameworks also tend to focus on resource extraction, not consumers and other parts of the production chain that remain key gaps. Classical institutional economics understandings can provide greater interdisciplinarity, wider conceptions of institutions and value and their interaction, as well as a greater focus and understanding of behaviour, informal institutions and their functioning relevant to production and consumption decisions. Consumption decisions are the more germane to restoring, or alternatively continuing to degrade, biodiversity as a foundation for achieving sustainable development. This paper develops a novel, integrative framework, with institutions crafted in the foreground and reconciliation of insights from both new and classical institutional economics alongside the 'five capitals' approach. A key contribution of the paper is to demonstrate the possibility and usefulness of incorporating both classical and new institutional economics insights into one framework to investigate sustainable production and consumption. In so doing, the paper demonstrates the advantages of a wider conception of institutions and value in relation to ecological economics than that conventionally applied in new institutional economics. The paper proceeds as follows: Literature review (section 2); Method (section 3); The framework (section 4); Discussion (section 5); and Conclusions (section 6).

2. Literature review

Early works on institutional economics and the environment includes but are not limited to: Kapp (1969) on the subject of social costs; Swaney (1987) who identifies the role of institutional economics in addressing environmental and sustainability challenges; exploration of neoclassical approaches and institutional approaches to the environment by Söderbaum (1990 and 1992); and (Costanza et al. 2001) exploring the linkages between institutions, ecosystems and sustainability. More recently, authors such as Arild Vatn, and others have provided fundamental insights in the field, publishing key works on the

subject (Vatn, 2005, 2010, 2012, 2015a,b; Vatn 2020). Bradley (2022) identified a wide range of institutional economics frameworks deployed to explore aspects of environment and sustainable development. However, Bradley (2022) found that most existing frameworks are based on common pool resources or social ecological systems, most frequently focusing primarily on direct exploitation of these systems though not on upstream economic drivers of consumption and choices. It is also notable that NIE frameworks, constituting the most prevalent approach, tend to predominantly recognise institutions as rules (formal and informal). Classical institutional economics can provide a wider conception of institutions as well as a greater focus and understanding of informal institutions, behaviour and value. Whilst these aspects are particularly important for biodiversity and sustainability, they are most often neglected in most new institutional economics work (with the exception of social norms). This paper recognises the potential for a novel framework combining insights and understandings from both classical institutional economics and NIE for progressing the field of ecological institutional economics. This study builds on that insight, combining understandings from both fields to help inform institutional questions and analysis in the pursuit of a biodiversity-rich and sustainable economy. This paper's main aim is therefore to craft an analytical framework to explore in this vein, addressing the research question: Can a framework integrating classical and new institutional economics inform production and consumption decisions for biodiversity and sustainability?

3.1 Method

In preparation for this paper, a systematic literature review of existing institutional economics frameworks focused on environment and sustainable development was undertaken (Bradley 2022). However, Maxwell (2005) identifies that a narrow approach of reviewing and summarising a body of theoretical or empirical publications is insufficient because it:

1. can lead to a narrow focus on the literature, ignoring other conceptual resources that may be of equal or greater importance for your project;
2. tends to generate a strategy of "covering the field" rather than focusing specifically on those studies theories and studies that are particularly relevant to your research; and
3. can generate simply descriptive rather than practically useful outcomes.

For these reasons, Maxwell (2005) recognise that the most productive conceptual frameworks also integrate ideas from outside the traditionally defined field, or integrate different approaches, lines of investigation, or theories not previously connected. This is due to the fact that conceptual frameworks are inherently constructed, rather than simply falling out of reviews of existing published research which may not include ready-made solutions.

This research therefore draws on both experiential knowledge as well as existing theory and research to build a novel conceptual framework. The use of experiential knowledge has gained wide theoretical and philosophical support in developing conceptual frameworks (see Berg & Smith, 1988; Denzin & Lincoln, 2000; Jansen & Peshkin, 1992 in Maxwell 2005). Experiential knowledge is one of the most important conceptual resources, yet one that is most seriously neglected. The experiential knowledge approach makes use of a scientist's technical knowledge, research background and personal experience to inform and craft the framework in the required way (Maxwell 2005).

4 Resulting framework

4.1 Defining institutions and sustainable production and consumption

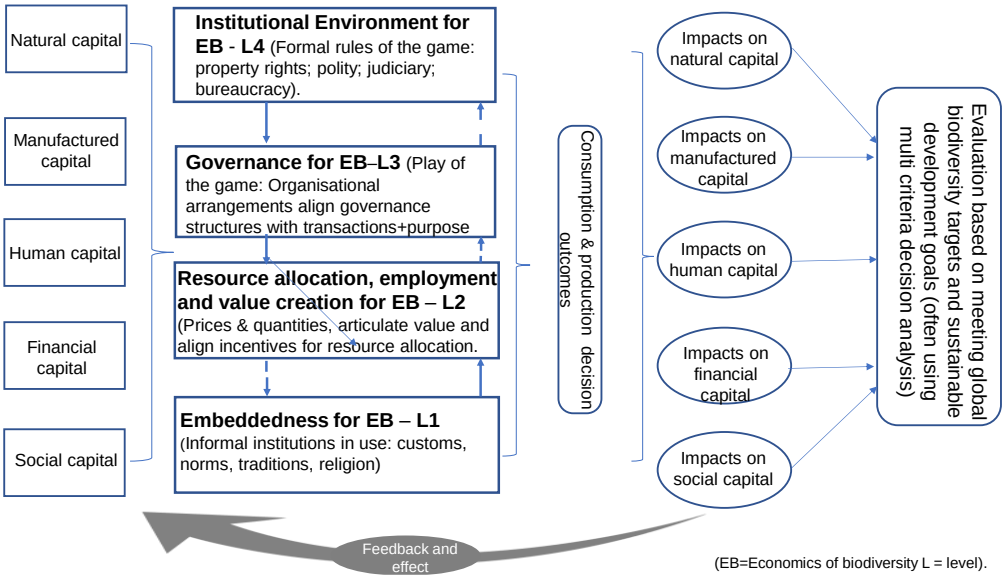
Institutions are defined in varying ways by different authors. The definition applied in this study is from the classical institutional economics school, from which Dequech (2002) identifies institutions as being partly seen as constraints, as cognitive models, or as normative structures. The paper applies this definition, but later in the paper replaces normative structure and cognitive models with a broader definition of 'modes of thinking, feeling and action' proposed by Kapp et al. (2011). This expanded conception of institutions spans broader levels of social analysis.

4.2 The structure for guiding different levels of social analysis and understanding interaction in relation to consumption, production, biodiversity and sustainability

The novel conceptual framework in Figure 1 integrates a modified version of a NIE approach developed by Williamson (2000) considering the contributions from and impacts upon 'five capitals' model understandings (Porritt 2007[2] extending the four capitals identified by Ekins 1992, 1998, 2000) which also embodies plural values of biodiversity. Annex 1 contains definitions of the five capitals applied in this study. This integrated approach connects institutional dimensions of production and consumption decisions to capitals, biodiversity and sustainability.

Figure 1: An integrative framework for institutional analysis of production and consumption decisions for biodiversity and sustainability

[2] Discussed in Maack and Davidsdottir 2015



A revised focus on embeddedness and behavioural institutions

Williamson (2000) identifies the level of embeddedness (L1 in Figure 1) as taken as given (and preferences) by most institutional economists. For considering biodiversity (and sustainability) outcomes of production and consumption decisions, embeddedness is extremely important and must be considered (Dasgupta 2021) and strong consideration is also required in order to understand the range of institutional forms and mechanisms through which institutions at this level drive and encourage or discourage particular forms of consumption and production to the benefit or detriment of biodiversity of sustainability. The explicit focus on embeddedness that the revised framework in Figure 1 has means that the original focus and questions of classical institutional economics become highly relevant again, such as: "*What are the concrete needs and wants of human beings?" and "What are the specific, proximate reasons for human conduct, effort, and expenditure*?" (Kapp et al 2011). Such research questions can be explored at the level of embeddedness (L1) and are therefore helpful for designing more sustainable, 'biodiversity-rich' economies.

The prominence of embeddedness in shaping consumption and production decisions necessitates reordering Williamson's (2000) framework:

Level 1 (L1) remains Embeddedness;

L2 is revised as Resource allocation and employment, ensuring a closer relationship with embeddedness (as institutions at the level of embeddedness have a profound impact on consumption choices and demands that are serviced at level 2);

L3 remains as governance; and

L4 is now Institutional environment as it substantially shapes what is possible for all other levels.

Analysis of governance (L3) structures often becomes important because of the prevailing set of rules and laws at L4 (as in Williamson, 2000), with L4 shaping L3 but also L3 (but institutional governance) also feeding back to L4 for example in the form of institutions lobbying government for legal change benefitting their industry sectors, particularly in respect of issues such as climate change. Therefore, the whole system is interconnected: for example, changes in social norms occurring at the level of embeddedness have in the past generated sufficient traction to exert a 'ripple effect' institutionalising pro-environmental or other values to shift societal norms and behaviours including shaping corporate responses (L3) new legislation (L4) (Everard et al. 2016).

Solid vertical arrows in Figure 1 identify constraints imposed by each level on others, dashed vertical arrows identifying feedbacks. Williamson (2000) mainly neglects the feedbacks. However, in relation to sustainable economy analysis, it would be foolhardy to ignore feedbacks as, for example, L2 aspects can demonstrate value creation also influencing upwards and downwards, and L3 (governance decisions) can implement voluntary commitments and/or petition for legislative change and invest in shaping public opinion at L4 and L1 (the latter are particularly important feedbacks in relation to frustrating progress on key global pressures such as climate change). When looking at the institutional economics of sustainable production and consumption, feedbacks are important even in short time spans (e.g. 1-5 years) and so need to be explicitly acknowledged and explored in institutional ecological economics.

Capitals

Economic decisions depend upon and exert an influence on multiple capitals (natural, manufactured, human, financial and social) to enable production and consumption. Institutional environment (formal rules, etc), governances (by existing businesses and markets), and embeddedness (e.g. new or existing culture etc) shape consumption and production decisions and the mix and proportions of different capitals drawn upon to service demands and generate production. To conceptualise this, a version of the 'five capitals' approach (Porritt 2007) is integrated into the framework to recognise the inputs and residuals (shown by horizontal arrows in Figure 1) of different forms of capital before and after consumption and production. Biodiversity constitutes a principal element of natural capital, and the balance of capitals as a whole ultimately indicate sustainability (further horizontal arrows also recognising implications of decisions and actions for biodiversity targets and meeting the UN Sustainable Development Goals). By integrating these facets, the framework described in Figure 1 conceptualises how production and consumption decisions are shaped by institutions, and how these in turn exert influence upon the five capitals (including biodiversity and sustainability). Essentially here, the foreground analysis is on how the institutional context shapes consumption and production

decisions, and the background analysis addresses changes in capitals with implications for sustainability and biodiversity outcomes.

Summary

The novel framework presented in this study provides an alternative approach to explore institutions and how they might lever, shape and drive change in the system (e.g. via social norms L1, change in consumption and production, structure of the economy and resource allocation (L2), change in governance L3, and change in the 'rules of the game' L4) to protect and restore biodiversity and attain a more sustainable economy. Use and preservation of the natural system needs to be balanced to underpin the economy, human health and wellbeing, and natural capital including the continued functioning of the supporting environment. This novel conceptual framing illustrates connections and changes in different capitals with institutional decisions and actions relating to consumption and production, culminating in biodiversity and sustainability impacts.

The established neoclassical model:

- Is mainly focused on maintaining/building manufactured capital, its own limited social capital (thriving business, happy customer/supplier relations) but above all boosting financial capital
- By largely overlooking natural capital it progresses by undermining/mining natural resources including biodiversity, largely assumed to be of zero worth beyond market values as consumed resources, as well as human and social capital (maximising efficiency denying labour rights, products with short lives and externalities, often expensive to run and own, and often harmful to the environment)

The sustainable model:

- Takes a balanced view of optimising outputs cross all capitals, including making a profit (financial capital)
- Natural capital, including biodiversity, is therefore seen as an asset with a vision that regards wider societal benefits and not just narrow utility and exchange value
- To achieve this at L2 (via modified consumption, production and resource allocation), requires greater inclusion of environmental, climate, ethical and other factors which ramifies up from L1, and needs also to progressively shape L4 (laws, formal and informal protocols, financial instruments including taxes and incentives) and induce a selection environment to encourage change and innovation in the functioning of markets and firms L3 (governance).

The above transition is what this model ideally informs.

4.3 The model of consumer and employee behaviour employed in the framework

When developing the framework, there is a need to situate where one stands in terms of economic theory and a model of consumer behaviour. The current framework follows the line of NIE and rejects the assumption that consumers are rational. Bounded rationality (Simon 1957), in which rational individuals select decisions that are satisfactory rather than optimal when faced with limitations (Sent 2017), is a more suitable model of consumer behaviour and has therefore been applied in this novel framework. The framework also follows Vatn (2005) in integrating the individual model into the wider perspective of social construction. This gives a more realistic, fluid and broader understanding that what is rational or the logic that prevails for individuals, has a context and institutional dependence, the focus is not only the individual but also the given context (e.g. the community) that informs their modes of thinking, feeling and action. This better addresses the often overlooked shared nature of social values (Kenter et al. 2015). Please see Appendix 2 for justifications and further discussion.

Regarding self-interest, psychologists have shown, that people most often have both self-regarding behaviours and other-regarding behaviours and, though there can be a tension between them, both are vital to survival (See Schwartz 1999 and 2006) and can be more or less dominant depending on context. Simon (1995) argues that there are often assumptions in new institutional economics approaches and work that employees within firms will shirk unless their actions contribute directly to their own economic self-interest (aligned with mainstream theory). Similarly, consumers or individuals in economics are predominantly assumed to be selfish and focused on maximising their own utility. However, this narrow view does not adequately recognise the evidence of a range of motivations; in particular, it neglects the motivations of other-regarding pro-environmental employees or sustainable consumers. The approach taken in this study therefore aligns with Paavola and Adger (2005) in rejecting narrow assumptions of maximising utility, replacing them instead by assuming a plurality of motivations. Paavola and Adger (2005) advocate recognising intra- and interpersonal pluralism[3] and, in this way, define their confidence in the use of motivational pluralism in economic analysis of the environment and sustainability. This approach, applied in our novel framework, also aligns with bounded rationality being context-specific and socially embedded, and is consistent with the model of consumer behaviour included as part of the framework above. Plurality of motivations can apply to consumers, employees and potentially entrepreneurs (social entrepreneurs, community business leaders, etc.)

[3] Paavola and Adger (2005, p.359) define intra and inter personal pluralism as: *"...intrapersonal pluralism means that agents may hold multiple values and have to decide which values are to inform their preferences in a choice situation." "Interpersonal pluralism means that agents may be informed by different values in the same choice situation, and arrive at either the same or different choices".*

4.5 Embeddedness

Williamson (2000) stated that Level 1 (embeddedness) comprises: informal institutions, customs, traditions, norms and religion, etc. Given the focus of this paper, there is a need to go into much more depth. This section of the paper starts by defining embeddedness and looking at the different but inter-related forms that it can take. In relation to embeddedness, the perspective that that has dominated recently derives from Economic Sociology: Granovetter's theory of embeddedness, his most important work on embeddedness, was published in 1985 (Smelser and Swedberg 2005) though the notion can be traced back to Karl Polanyi and Clifford Geertz[4] (Dequech 2003). The definition of embeddedness provided by Granovetter states that economic actions are "*embedded in concrete, ongoing systems of social relations*" (Granovetter 1985, 487). Granaovetter draws an important distinction between an actor's immediate connections (e.g. direct social encounters) and more distant ones (indirect social encounters), termed "*relational embeddedness*" and "*structural embeddedness*" (1990, pp.98-100; 1992, pp.34-37, cited by Smelser and Swedberg 2005). Granovetter applied the term "structural embeddedness" to indicate that not only the personal relations (the "*relational embeddedness*") are important, but also "*the structure of the overall network of relations*" (Granovetter 1990, as seen in Dequech 2003).

Granovetter's argument on embeddedness has been debated and criticised widely. Several scholars have identified that Granovetter omits considerations of many aspects of economic action, including a link to the macroeconomic level, culture and politics (Smelser and Swedberg 2005). Out of this further consideration important work was published by Zukin and DiMaggio (1990), where they identify wider forms of embeddedness of economic action: cognitive, cultural, structural and political. The four different forms of embeddedness comprise:

- Cognitive embeddedness (the ways in which structured regularities of mental processes limit the excise of economic reasoning (e.g. bounded rationality);
- Cultural embeddedness (the role of shared collective understandings in shaping economic strategies and goals);
- Structural embeddedness (contextualisation of economic exchange in patterns of ongoing interpersonal relations); and
- Political embeddedness (the manner in which economic institutions and decisions are shaped by a struggle for power that involves economic actors and non-market institutions).

Hofstede (1991;4) recognised that culture gives rise to patterns of thinking, feeling and action (mental programmes or the 'software of the mind' as seen in Scott 2013), forming the cultural embeddedness-based definition of institutions at level 1 in this paper (earlier defined as modes of thinking, feeling

[4] See for example Polanyi 1977.

and action)[5]. Given the papers focus on institutions, we need to understand how institutions at this level (cultural embeddedness) operate to affect human action[6]. Reading Dequech (2002 and 2003) there are five functions or mechanisms by which behavioural institutions can act:

1. The restrictive function of institutions (acting as constraints);
2. Cognitive function of institutions, this being the informational-cognitive function (the information that institutions provide to the individual) and
3. The deeper cognitive functions of institutions (their influence on people's perceptions of reality);
4. The valuative function (valuative aspect of culture, identifying culture as providing values and perception of what is of value).
5. The fourth function, the emotional function, said to relate to the expressive, or affective, aspect of culture.

Adding the emotional function of institutions (5) these functioning's now align and reconcile closely with the classical institutional economist definition of institutions (by Kapp et al 2011), Mill's reference to "*modes of thinking, feeling and action*".

Kapp et al (2011) emphasises the criticality of these behavioural institutions and their functioning: *"defining institutions as patterns of behaviour is, of course, compatible with the popular identification as stabilised social arrangements and organisations. For it stands to reason that "habits of thought, feeling and action" will find a counterpart in social arrangements of a more or less formal character. Such arrangements, in turn, stabilize the habitual pattern of thought and behaviour. Therefore, there is no harm in referring to these social arrangements and organisations as institutions, providing it is understood that what is really under discussion are patterns of behaviour and not organizational charts or legal arrangements. Institutional economists consider these habitual patterns of thought and action to be of central importance in explaining and interpreting economic processes and development."*

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[5] The definitional relation between institutions and culture according to classical institutional economics is shown in Kapp et al (2011) who define culture as:

"the sum total of a complex of institutions and interrelated habitual models of thinking, acting, and feeling (including the corresponding valuations, norms, and interpretations of the world of a particular epoch)-thus comprises the man-made learned and transmitted adaptive tools which form the prerequisites of human life and survival. In order to survive and exist, each individual must learn and master the system of institutionalized behaviour patterns that his group or society transmits to him in the process of enculturation"

[6] Culture can be separated into two forms: constitutive forms of culture (e.g. categories and scripts) and regulatory ones e.g. values and norms (Di Maggio 1994). Dequech states that these distinctions seem to partially overlap and are not mutually exclusive (Dequech 2003). Dequech then identifies that this resonates with his own taxonomy of how institutions influence economic behaviour, which draws on the work of several institutional economists.

Behavioural institutions and their functioning are largely missing from NIE. Critically, the framework in Figure 1 now builds in behavioural institutions and their functioning at the level of embeddedness (missing in Williamson 2000) but recognises that they exert influence on other levels such as governance, for example via changing the goals and ambitions of entrepreneurs. Critically, our framework allows us to link the different forms of institutions in the economy (formal and informal behavioural) and therefore to better understand interaction and influence in relation to production and consumption decisions, capitals, sustainability and biodiversity. This is an important contribution. Particularly with the increasing realisation that some preferences (those most environmentally and socially damaging) cannot be taken as given, if society is to attain a safe, sustainable economy (others concur with this conclusion for reasons other than a sustainable economy, see Hodgson 2010 for example) and flourishing of biodiversity.

4.6 Resource throughput, allocation, employment and value creation (Level 2)

Activity at this level (consumption and production occurring) is largely shaped and conditioned by other levels, for example social preferences (demand and consumption) shaped by embeddedness at L1, but also by governance of firms and markets (L3, as shall be seen) via governance decisions of firms on production forms and marketing. L4 (the rules of the game) act as a constraint on what is produced and consumed, therefore influencing production and consumption and allocative outcomes at L2. For now, however we shall focus on L2.

Level 2 is where resource allocation and employment and value creation occur. Firstly, value has to be perceived by the consumer. Perceiving such value (at a given time) depends however on knowledge; cognitive capabilities and the modes of thinking, feeling and action of individuals at a given time (institutions at level 1). Consumers either perceive use or non-use value from the good or service. Use value refers to "*the specific quality of a new job, task, product or service as perceived by users in relation to their needs (and context)"* (Lepak et al 2007 p.182). Following Plottu and Plottu (2007), this can be extended to value reflecting the satisfaction that the individual derives from using the resource. Option value (Weisbroad 1964) is a separate and intermediate between use and non-use values, and is the value of conservation of an element in view of its possible future use. Following Krutilla (1967), there are two main types of non-use value: existence and bequest value. For the former, this is value that individuals perceive due to the existence of items or environmental assets that individuals enjoy. Bequest value is the belief that future generations will inherit an item or environmental asset of value to them. It should also be noted that value is co-created (Chandler and Vargo, 2011) and that value creation (use and non-use value) and value capture (monetary value exchanged for use/non-use value) occurs within a situated context, and is hence shaped by the system around it e.g. environment, culture,

markets and market conditions etc. (Vargo and Lusch, 2008; O'Cass and Ngo, 2011; Ng et al. 2013). It should however be noted that all the above values rely on human perception (shaped by L1) and that there are many externalities and forms of value that consumers and producers are neither able or willing to perceive (due to issues such as bounded rationality and priority of personal use and exchange value over other types). Incomes also act as a constraint of willingness to pay for such value. Therefore willingness to pay is not a good measure of value (or need) and results in sub optimal resource allocation for society and environment.

Once value is perceived consumers either choose to purchase or reject a good or service. This decision impacts resource allocation and translates into the goods and services being generated or not generated in the economy, ultimately driving production decisions (and intermediate consumption and resource extraction) in servicing the production. After purchase, exchange value results.[7]

Exchanges discussed above currently largely determine consumption and production and drive the allocation of resources in the economy, each having associated varying draw downs and impacts on various capitals (dependant on which products and services get made and the production method and technology of the time) and leaving a different capitals balance and impact of biodiversity and sustainability. The financial resource allocation (allocation of exchange value) is displayed below in the diagram of the circular flow of income in Figure 2. This provides a basic depiction of how economies function.

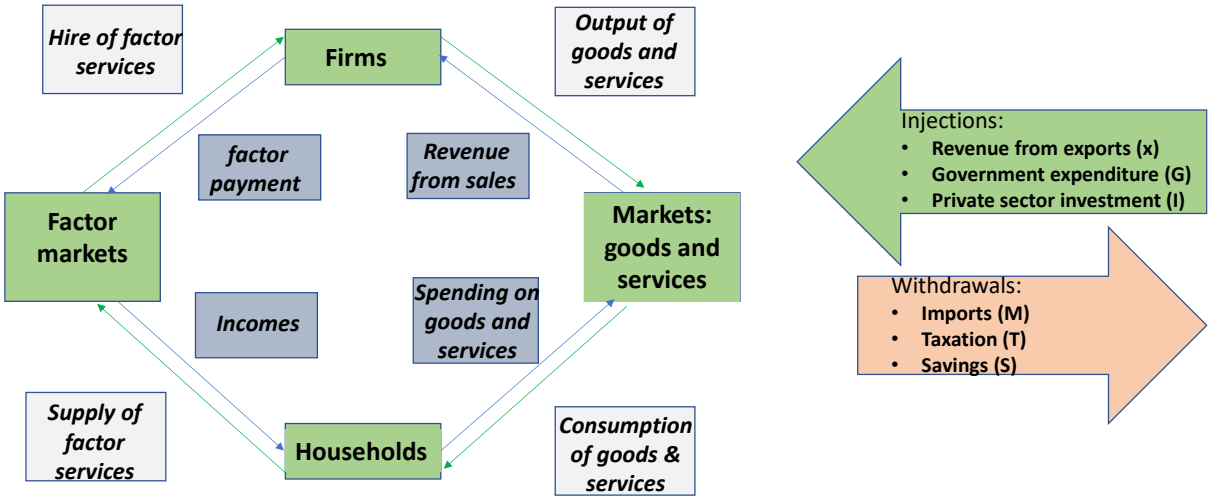

Figure 2: The circular flow of income (Mulhearne and Vane 2012)

GDP is the value of all the final goods and services produced (across all sectors) in a year. GDP measures the financial value of production (estimated by taking revenue and subtracting purchased

[7] Defined as: "*either the monetary amount realised at a certain point in time, when the exchange of the new task, good, service, or product takes place, or the amount paid by the user to the seller for the use value of the focal task, job, product, or service*" (Lepak et al 2007 p.182).

inputs and then adjusting for taxes and subsidies), which is equivalent to total expenditure on final goods and total income for a given year. Across many governments throughout the world and within mainstream economics, there is currently generally very little focus on the types of goods and services that should make up GPD (and their various draw down and impacts on the five capitals and biodiversity and sustainability), only a focus on being as close as possible to potential GDP and full employment as possible. Veblen's works and much institutional work identify that the pecuniary economic system fails to attain what they identify as instrumental value (discussed in Valentinov 2013). Instrumental value can be defined: the "generic ends of life" (cf. Sheehan and Tilman 1992, 200), or *"usefulness as seen from the point of view of generically human"* (Veblen [1899] 1994, 61). In institutional work, too much focus on ceremonial and pecuniary value, is seen as lagging progress towards longer term instrumental value[8]. The definition of instrumental value however focuses on human ends, the environment as a stakeholder is missing. Ecological economists must go beyond instrumental value and consider dis-value for the environment and biodiversity (see Bradley et al 2020) as a stakeholder.

Given the huge scale of missing values (instrumental value and dis-values) and the very clear environmental damage and environmental constraints that economies are now operating in. There is a very urgent need to restructure production and consumption decision so that the balance of use and impact on the five capitals, biodiversity and sustainability from consumption and production is substantially improved to benefit nature and society rather than just individual ends of consumers and business. Current management and policy of economies is failing to achieve this, and an urgent restructuring of economies is needed. Institutions at levels 1, 3, and 4 are key to this restructuring. There is a need for the economic institutions (particularly markets and firms) to factor in a wider set of short and longer-term value (some of which will be instrumental value but some not) and to avoid dis-value for society and environment. As identified above the approach of attempting to generate willingness to pay values for missing values and incorporate into the market is insufficient and futile to ensure the right capitals balance for environment and society.

The goal of restructuring is to move towards a sustainable economy that is: economically viable, provides high levels of wellbeing for its citizens and communities (partially through reducing inequalities), and be avoiding dis-value to society and the environment. In relation to physical material throughputs and pollutants, the framework aligns with the strong sustainability principles of Daly (2007):

1. That renewable resources should not be used at a faster rate than at which they can regenerate.

[8] Many classical institutionalists have been influenced by John Dewey's instrumental view, institutional economics has a key focus on instrumental value (Rutherford 2004).

2. Sustainable use of non-renewable resources means that non-renewables: benefits should be split between Y (current income) and I (investment) such that a renewable substitute is available at depletion
3. Pollution: waste discharges below assimilative capacity – cumulative pollutants set at zero (or as close as possible);
4. Macroeconomic controls: minimise matter/energy throughput in the economy in meeting needs, and account for population growth.

Building on the above, resource throughput at this level needs to be understood not just in terms of a narrow economic definition of resources but a broader view of the changes in (stocks and flows of) various capitals identified in Figure 1, and how then relate to meeting biodiversity and sustainable development. Staying within environmental constraints is intricately determined by good resource allocation and management of the economy, each £1 spent in the economy has an associated physical resource requirement, and it is the scale of material flows through economies (in response to expenditures) that drives key global environmental pressures (Allwood et al., 2011 ; Steffen et al., 2015). Therefore, activity at level 2 (shaped by levels 1, 3 and 4) determines the structure of the economy and changes in the five capitals, sustainability and human survival. Latest scientific evidence makes clear that shifts in consumption patterns and a focus away from just GDP are essential to ensure society stays within safe environmental limits (Jackson 2009; Wiedmann et al. 2020). We need to aim towards a sustainable restructuring of what contingents make up GDP.

4.7 Governance

Formal institutions at this level include markets, firms (or organisations) and hybrids. Williamson 2000, building on work by Commons states, "*Governance is an effort to craft order, thereby to mitigate conflict and realize mutual gains. So, conceived, a governance structure obviously reshapes incentives*" (p.599 line 3). Governance shapes the structure of firms and their activities. It can change the production function (the relationship of quantity of factors and inputs per production output) shaping outcomes for the economy at L2. Most work from NIE focuses on governance or the institutional environment (Williamson 2000). At the level of governance, a large literature of NIE deals with the evolution of particular organisational forms. Rutherford (2004) identifies that the focus is upon cost-reducing properties of certain organisational forms and organisational innovations (following Coase 1937 and Williamson 1975). The approach to the firm found in NIE is based on the concept of the firm as a set of long-term contracts between owners of a range of resources. These long-term contracts replace market relations between individual resource owners. A firm is therefore embedded in coalitions that, to continue, must provide some benefits to those who are part of the various coalitions over a purely market relationship or exchange transaction. When one looks at the forms of analysis conducted at level 3 in Williamson (2000), the focus is on cost reduction, economic efficiency and net economic

benefits (to a narrow group of stakeholders), with the focus and unit of analysis at the level of transactions. The focus of such work is to align the governance structure to the transactions of concern, so as to promote adaptation of autonomous and cooperative kinds that can be most economically efficient. As well as the limitations of the focus on outcomes in terms of exchange value (changes financial capital) discussed in section 4.6, Dugger (1983) and others (see Rutherford 2004, page 124) criticise this focus for overlooking the fact that the organisation of firms has other functions and responds to other factors than simply problems of agency and reduction of transaction costs.

In line with the broader definition of institutions used in this paper and the focus on a broader set of value. Markets and firms as institutions at this level shape incentives, but also value translation, creation and capture, and complementary modes of thinking, feeling and action of consumers, employees and entrepreneurs their values, goals (and as these become established habits and norms) that drive consumption and production of the firm. On the latter point, governance of markets and organisations as institutions impact value and values articulation and in so doing impacting both production and consumption decisions, draw down and impacts on capitals, biodiversity and sustainability.

4.7.2 Markets and their functioning as institutions

Building on the taxonomy of how institutions influence economic behaviour outlined by Dequech (2003) markets function and influence economic behaviour in two ways:

Firstly, this section treats with the informational-cognitive function of institutions (in the sense that markets provide information to individuals); Market prices: 1. help decisions of consumers and business purchasers and investors, i.e. when to buy inputs to production and how much? Which company to invest in by looking at historic market data to inform when to invest and what in and the likelihood of value return from investment (exchange value) etc. and 2. Market data helps consumers compare a producer's price (with the average market price at a reference point in time), and therefore whether they are perceived to be 'good' and of value (in exchange value terms).

With regards to the deeper cognitive functions of institutions (the second function) and their influence on people's perceptions of reality: Through communicating value, markets can communicate 'good' to the consumer or investor. These markets then influence perceptions of consumers and investors about what is good. For a company, the prices of their goods might be low, which for some consumers communicates 'good' to the consumer, the issue is this value articulation is often a false perception as most often the full value and dis-value of the product is not articulated in the market price. The solution to this problem advocated by environmental economists is to make sure that all positive and negative externalities are factored into the market price. This only works on aggregate as a theoretical approach, as it relies on a set of unrealistic assumptions, which huge difficulties and resource requirements in

actioning in practice on aggregate to resolve the problem, it also puts too much reliance on consumers and producers as rational actors and makes assumptions as to how they respond to price which do not always bear out in reality (see discussion above and other discussion in Centemeri 2009 and Martinez-Alier 1995 amongst others).

4.7.4 Organisations and their functioning as institutions

A focus and analysis of governance of firms for sustainability must take account of transaction costs and exchange values, but also other types of value and dis-value that occur with economic development. So, looking at optimum governance structures for sustainable economic development requires a focus on economic criteria (as might be measured in efficiency terms or exchange values form) but also the change in qualities (e.g. wellbeing; pollution attributes; associated ecosystem change; and social impact from production) that impact sustainable production. Consequently, reform of governance structure is required to promote a more integrated approach to value creation and sustainable development, as opposed to simple economic development. Whilst key aspects of NIE can still address economic efficiency aspects of different organisational forms for sustainable production, they constitute only part of the broader puzzle of promoting sustainable production and consumption.

Building on the taxonomy of how institutions influence economic behaviour outlined by Dequech (2003), firms function and influence economic behaviour in ways that mirror the different functions that institutions provide: Firstly this section treats with the informational-cognitive function (in the sense that firms provide information to individuals); this is both the information to individuals in the firm in order to organise production, but also the information that they provide to consumers (through information on product packaging, and resulting transmitted descriptive norms that their production and consumption may signify). There is also direct transmission of information via marketing messages to potential consumers via radio and TV etc. With regards to the latter, firms also provide the deeper cognitive functions of institutions (the second function outlined by Dequech 2003), their influence on people's perceptions of reality; effecting consumers via marketing tactics, and employees via company's training programmes about what it is that the employee should aspire to be and do within the firm. I.e. what mission, activities and goals they should be seeking to align with or optimise towards when operating within the firm. Related to this, it is also clear that many firms often induce a valuative function (valuative aspect of culture, identifying culture as providing values), i.e. the 'company culture', values and identity that employees operate within. Culture also has the potential to influence perceptions outside of the firm, via reputation. The fourth emotional function of institutions as outlined by Dequech (2003), said to relate to the expressive, or affective aspect of culture is also relevant. This may seem less apparent, but firms' products and services sometimes have the potential to transmit feeling, meaning and emotion, for example when consumers buy gifts (e.g. chocolates) to convey affection or gratitude (and products are often marketed to appeal in this way by firms) or to display a

certain identity or image of the consumer, e.g. buying a certain car as a consumer wants to convey by driving a certain car. In these examples, firms function as institutions in ways that match all of the four ways/functions that (institutions) can affect economic behaviour and create a set of informal (behavioural) complementary institutions 'modes of thinking, feeling and action' both inside and outside the firm and specific to the organisation. Firms act as formal institutions as often treated in NIE (with formal constraints e.g. contracts etc.) but also substantially impact informal institutions that influence employees (within the firm) and consumer behaviour and preferences (outside the firm). A key institutional micro-economic question that needs to be resolved are which informal values (attitudes, norms and habits) articulated by firms encourage consumption and production forms that creates substantial disvalue (or miss instrumental value) to environment and society? The framework highlights the need for an empirical research agenda at this level to look at how formal and informal institutions (at L3) lead to incentives and consumption and production modes of thinking, feeling and action and how these impacts the balance of capitals, biodiversity and sustainability.

4.8 Institutional environment

Governance structures, whether firms; markets or a hybrid public private enterprise are influenced and constrained by the institutional environment within which they reside (Williamson 2000). Williamson (2000) focus on economic outcomes resulting from the institutional environment. Behavioural institutions (and more formal institutions) at the level of embeddedness (L1) are however also influenced and constrained by the institutional environment. The institutional environment includes property rights; the laws and the law system, and other deigned rules of engagement developed by government. Essentially, the formal rules of the game are said to include Property rights, polity, judiciary and bureaucracy (policy and regulation etc.). Polity is defined as "*a form or process of civil governance or constitution*", judiciary is defined as: "*the judicial authorities of a country, judges collectively*"; and bureaucracy "*A system of government in which most of the important decisions are taken by state officials rather than elected representatives*" (Oxford English Dictionary 2019). Legal rules generate incentives or disincentives for actors' subject to the legal system to behave and act in certain ways (Korpbkin and Ulen 2000 as seen in Williamson 1991). J.R. Commons was key in developing the early movement in law and economics and brought important ideas to the study of institutional economics (as identified in Williamson 2000). Rutherford (2004) identifies the "Commons tradition", due to its emphasis on transactions, property rights, and organisations – has closer links with the NIE than does the Veblen-Ayres tradition". This said the approaches of Commons are somewhat different. Much work in NIE is focused on, Positive Political Theory (PPT) which is concerned with working out the economic and political ramifications of institutional environment features. Much of the economics of property rights is said to be of a Level 4 kind (level 2 in Williamson 2000). This said in relation to ensuring sustainable development (as opposed to just economic development) it is contended that there is a need to go beyond just a focus on property rights and their

definition and enforcement. This becomes clear when looking at the approaches that environmental and ecological law scholars are advocating to ensure sustainable development (See appendix 3). Interventions at this level have the potential to encourage or incentivise, prohibit, or create obligations on certain forms of production governance (occurring at L3) and consumptions (occurring at level 1). Tilting the selection environment towards sustainable consumption and production. It is useful at this point to identify a range of areas where one might make changes to institutional environment to encourage sustainable development. Key elements of legal systems are outlined below in Table 1.

Table 1: Structure and key elements of legal systems (Garver 2019)

System feature	Key elements
Context globally	• Worldview
	• Relationship with economic, political and socio-cultural systems
	• Relationship with ecological systems
	• Relationship with technological systems
Legal mechanisms	• Constitutions
	• Codes and statutes
	• Bills of rights
	• Executive decrees, orders, edits etc.
	• Administrative rules, regulations and orders
	• Judicial decisions (common law, civil law, etc)
	• Treaties and international agreements
	• Other international law
	• Legal plurality: culture, tradition, custom, etc. that informally yet constantly governs behaviour (M' Gonigle 2008)
Actors, agents and power structures (may exist at all scales from global to local)	• Governance regime (democracy, dictatorship, etc.)
	• Legislators/parliamentarians
	• Judicial/quasi-judicial (judges, arbitrators, etc.)
	• Commissions, independent bodies, auditors, etc.
	• Individual citizens
	• Juridical "persons" (e.g. corporations, "rights of nature")
	• Civil society
	• Public/government entities
Key arenas (may exist at all scales, from global to local)	• Basic rights and responsibilities
	• Property (private, public, common, things not "owned")
	• Finance, tax and money systems
	• Contracts
	• Corporations
	• Criminal justice and tort liability (non criminal)
	• Commerce and international trade
	• Environment and biodiversity
	• Energy and natural resources
	• Government, politics and elections
	• Health and social safety net
	• Education
	• Labor
	• Agriculture and food systems
	• Cities and urbanization
	• Transportation
	• International relations and security (e.g. armed conflict)
	• Art and creativity

Garver builds in the work of Meadows (1999) to identify leverage points, different places to intervene in the system where one could act to induce change for sustainability. In order to explore how changes in elements of the legal system could help create a selection environment for a sustainable economy, a range of changes and interventions are explored in Appendix 3 (applying Garver's 2019 to identify the relevant system leverage points). From analysis conducted in Appendix 3, it is clear that ecological and environmental law scholars have lots of ideas on how changes at this level might help ensure sustainable development and sustainable production and consumption, these changes act on different leverage points in the system. Alongside and beyond the current focus of NIE scholars on such things such as economic outcomes of alternative property rights arrangements, it is clear that there are many other potential interventions at this level that could be undertaken and much work to be done to explore potential of such interventions and a wider look a broader range of value impacted than purely exchange value (as well as broader range of associated stakeholders). There is a key role for institutional economists to engage to evaluate the effectiveness of such approaches and potential impacts on capitals, biodiversity and sustainability ex ante and ex post.

5 Discussion

The framework developed in this paper integrates insights from classical and new institutional analysis, therefore the paper merits a discussion of the compatibility.

5.1 Compatibility of classical and new institutional economics within this novel framework

Rutherford (2004) argues that the extreme positions in both NIE and classical institutional economics are untenable. An extensive work on the subject of compatibility of the two schools of thought was undertaken by Rutherford (2004), this research informing our novel and integrative approach to sustainable production and consumption. Although NIE and classical institutional economics have differences, Rutherford (2004, page 5) identifies aspects of commonality, for example: "*Many individualists do recognise that the social whole deeply influences the individual, while many holists do agree that only individuals, not institutions, can act as agents of change. Similarly, even "behaviouralists" like Veblen do not entirely exclude rational choice and economizing behaviour, while "Among more orthodox economists there is an increasing recognition of the limits to optimising behaviour and the significance of "rule following"".*

Our novel framework focuses on institutions, their production and consumption ramifications, and consequent impacts on biodiversity and sustainability. It takes a middle ground rather than an extreme position, seeking to build in behaviourist institutional insights from classical institutional economics into Williamson (2000) in a broadly reconcilable way to address sustainable production and consumption. The Williamson (2000) model forms the broad shell of the framework but, as

Williamson (2000) and NIE largely neglect embeddedness, our framework integrates a classical institutional economics understanding of institutions (with a behavioural focus) at this level and looks at value and resource allocation (L2) in a broader way appropriate to ensuring sustainability and biodiversity (also more aligned with the classical school). The paper carries through these broader understandings of institutions, value and resources allocation into discussions in later levels of the framework.

5.2.1 Self-interest and other-regarding behaviours:

The Williamson (2000) framework largely assumes self-interest, selfishness and opportunism of human actors (broadly in line with mainstream economics). Rutherford (2004) identifies the need in institutional economics for a broader conception of human motivation accommodating both those aspects that respond to self-interest and wider motivations driven by other ideals or psychological needs. Similarly, psychologists have shown that people most often have both self-regarding behaviours and other-regarding behaviours, and that there can be a tension between them, yet both are vital to survival (See Schwartz 2006 and Schwartz 1999) and are exercised in different ways dependent on context. Jackson (2009) argues that other-regarding behaviours are particularly important for sustainable development, and that these need to be emphasised for the development of a more sustainable economy. The framework developed in this paper therefore integrates inter- and intrapersonal pluralism as a more realistic baseline. This is recognised by Paavola and Adger (2005, p.359) as, *"intrapersonal pluralism means that agents may hold multiple values and have to decide which values are to inform their preferences in a choice situation." "Interpersonal pluralism means that agents may be informed by different values in the same choice situation, and arrive at either the same or different choices"*. This allows that, in some situations, assumptions that people are opportunistic and selfish do hold (aligned with NIE), so in this sense this plural approach is compatible, but does not tie the analyst into always assuming self-interest, selfishness and opportunism but can recognise wider values and context.

5.2.2 Formalism:

Classical institutional economics rejects the more orthodox neoclassical forms of theory and model building as overly formal, abstract and narrow. Much of Williamson's work is arguably more formal than some classical institutional economics work, but Williamson has at times been criticised for a lack of formalism by more neoclassical oriented economists. Williamson points to greater formalism as a goal, but expresses the view that formalism can result in losses and is not desired at any cost. See discussions in Rutherford (2004 p.23). Interestingly work from Mitchell is informative in this respect. Mitchell (1928, pages 413-415) considered the scientific method to consist of: "*the patient process of observation and testing – always critical testing – of the relations between the working hypothesis and the processes observed," as contrasted with the method of orthodox economics of "trying to think out*

a deductive scheme and then….verifying that". The framework developed in this study has walked a similar line of trying to formalise where possible at this point, for example in defining institutions, models of consumer and employee behaviour and bounded rationality, but is arguably not over-formalised in order to propose an institutional economics framework with the flexibility necessary to address novel forms of sustainable development as opposed to established narrower economic development. This avoids 'locking in' the framework to rigid and unhelpful formalisations but, where evidence is available, the framework incorporates relevant formalised approaches.

5.2.3 Rationality:

Most mainstream economic approaches interpret rationality in maximising or optimizing terms (Rutherford 2004). Williamson (2000) endorses bounded rationality, which has now become prevalent in NIE. To classical institutional economics, habit and rule-following behaviour can be quite at odds with orthodox notions of rational maximisation, and yet rationality is not eliminated. Classical institutional economics has never rejected the idea of rationality in any wholesale way (Rutherford 2004). To many classical institutional economics scholars, business habits and routines are better adapted or more rational owing to a well-defined end (profit). However, Veblen ([1909] 1961: 238) makes the point that rationality in pecuniary matters is something that is particularly encouraged by the prevailing institutions and customs of business enterprise (context). The current framework is compatible with Williamson (2000) and many aspects of NIE as it assumes bounded rationality but, to make it compatible with the classical school of thought, it incorporates Vatn's (2005) approach of integrating the individual model into the wider perspective of social construction.

5.2.4 Holism versus individualism

Methodological individualism can be summarised in three statements from Rutherford (2004, page 31):

i.) *"Only individuals have aims and interests;*

ii.) *The social system, and changes to it, result from the actions of individuals; and*

iii.) *All large-scale sociological phenomena are ultimately to be explained in terms of theories that refer only to individuals, their dispositions, beliefs, resources, and interrelations."*

Individualism is the professed methodology of NIE; but individualism in NIE also varies (Rutherford 2004). Holism is focused on the social influences that bear on individual action, and holists tends to emphasise the priority of the social over the individual. Further, Rutherford (2004) identifies that the proponents of classical institutional economics are self-professed holists, but what they mean by holism varies to some extent. For example, Veblen stressed the importance of dealing with human action within the context of the surrounding institutions. Rutherford (2004, p. 94) further states:

"*Veblen believed that social customs', conventions, and norms played a large role in shaping the goals, aspirations, and behaviours of individual members of a society. In Veblen's view, such conventions and norms initially grow out of the "habits of life"., of the group, patterns of thought and behaviour that are derived primarily from the then prevalent methods of livelihood. Material and technological conditions shape patters of life and these in turn become conventionalised. Habits of life also include certain ways of thinking that become conventional. These include the community's technological knowledge and commonly held values and beliefs*." Rutherford identifies that, one may agree or disagree with the details of Veblen's work, but virtually all of his work that deals with action within a given institutional system is entirely compatible with the methodological principles of institutional individualism. This study employs a behavioural definition of institutions by Kapp 2011, as it is relatively more up-to-date and a good fit for the framework, and also integrates the individual model into the wider perspective of social construction (following Vatn 2005). In this regard, it is compatible with the individual focus of Williamson (2000) but acknowledges a strong role for social context and social construction in informing preferences, and consequent production and consumption behaviour.

5.2.5 Maximisation:

Classical institutional economics consistently rejects the dogmatic maximising perspective, habit, 'rules of thumb' and other proxies replacing exact calculation. By contrast, much NIE appears to assume maximising behaviour, though Williamson's (2000) work is less focused on assumptions of maximising behaviour than some other NIE approaches.

The integrated framework advanced in this paper is more aligned with the classical institutional economics school of thought in not assuming that people are always seeking to maximise their own utility, although in some cases they may tend to do so. Although larger firms may be more targeted on profit maximisation, Webber et al. (2017) and Leonhardt et al. (2017) provide examples supporting a view that many small and medium sized firms, which make up the bulk of the economy, are often not purely profit-maximising in practice. As argued previously, other-regarding behaviours exist in both production and consumption, and are important in building of a sustainable economy. The predominant mainstream economics assumption that the goal of firms is to maximise profit is inconsistent with sustainable production or sustainable development (see Bradley et al. 2020), particularly when many externalities (and dis-value) are very difficult to factor in (if not impossible) in monetary exchange values terms.

5.2.6 Success criteria:

NIE tends to explain institutional change in overall economic efficiency or net benefits. Building on pareto efficiency implies that resources are allocated in the most economically efficient manner

without making anyone worse off (or the more workable solution whereby if people are made worse off, then they are compensated). In relation to sustainable development, measuring success in this way does not substantially explore or address issues of inequality. In the classical institutional economics literature, the success criteria are different. From reading, the Veblen and Ayres stream of work, seem focused on investigating institutions and institutional change (and more predominantly informal institutions) to ensure instrumental value comes forth and not just pecuniary value. In Common's work, institutions are seen largely as the outcome of formal and informal processes of conflict resolution, the criterion of success being whether the institution has generated a "reasonable value" or "workable mutuality" out of conflict.

The current framework proposes that success for sustainable development needs to include economic viability, but also considerations of the five capitals balance (before) and arising after production and consumption and the instrumental value and dis-value generated. So, in this sense the framework of the current paper advocates assessing a range of outcomes in terms of value changes and how, cultural shifts (at L1), innovation in governance structures (at L3) and changes in the institutional environment (L4), might result in a better capitals balance for biodiversity and sustainability.

5.2.7 The role of government:

NIE and CIE both stress the role of democracy (Rutherford 2004), also recognised in the novel integrative framework proposed in this paper. NIE is more favourably disposed towards markets and less government involvement generally, whilst classical institutional economics is more favourably disposed towards government intervention (and those such as the Veblen school of thought are often highly critical and suspicious of businesses) as summarised by Rutherford (2004). The novel integrative framework proposed in this paper takes a middle ground, arguing that both markets and government are important and necessary to accelerate progress towards a sustainable economy, but only in the right selection environment with an appropriate institutional environment, and social embeddedness that can emphasise both self-regarding and other-regarding behaviours. Businesses can sometimes be key drivers in the move towards a more sustainable economy, but in the current institutional environment and social embeddedness of our economies and with current economic management and policy, often individualistic, materialist values are over-encouraged, and excessive use and consumption of materials and pollution in meeting short terms needs occurs which inhibits a sustainable economy. In essence, businesses and markets (in the current context) are too often at the driving seat of ecological and biodiversity degradation rather than driving sustainable solutions. Literature such as Ashford and Hall (2011) show that if designed well and carefully, some types of government intervention such as careful regulatory interventions can result in radical innovation (as opposed to incremental change) by businesses for improvement of the environment, whilst substantially reducing longer-term cost curves. A practical example of this is the introduction of feed-

in tariffs driving innovation and investment in renewable energy technologies and their practical installation to replace more polluting energy sources (Mendonça, 2017).

Taxation-based economic instruments can also play roles in sustainable transformation though, to be fully effective, tax revenues should ideally to hypothecated into incentives optimally driving change (Bachus et al. 2019). However, simple taxation should not be relied upon as an approach alone for reasons laid out in the paper. Regulations also serve a clear and enforceable governance levers and signals to drive environmental outcomes; arguably in the current context of the climate change and biodiversity crisis, this is what is most urgently required as, for example, the urgency of addressing climate change requires an ambitious and systems-wide response with careful design. In putting in place and selecting policies and intervention, economic cost and efficiency is an important criterion, but should not be raised above and to the detriment of achieving ecological and sustainability goals which have huge social costs if not adequately addressed.

5.2.8 Evolution vs design:

In both NIE and classical institutional economics scholars recognise that institutional change can be deliberately designed and enforced or may evolve in unplanned or "spontaneous" processes. Different writers and groups have, however, placed very different emphasis on the two. Many writers in NIE have put heavy emphasis on evolutionary processes, but arguments on deliberative institutional adjustments are far from being absent (Rutherford 2004).

Within classical institutional economics, Veblen gave most attention to non-deliberative processes, whereas Commons emphasises the opposite. Neither excludes the other process from their analysis. The emphasis of Veblen behaviouralist approach is on non-deliberative processes by which institutions and institutional systems develop. Rutherford (2004) identifies the language of natural selection to be used by Veblen to describe certain processes, however he identifies that Veblen does not discus judicial or political processes in much detail but clarifies that institutional systems are stabilised by the formal establishing of social conventions and norms in law and constitutions ([1919} 1964:17-18).

Rutherford (2004) identifies that the outcomes of competition depend on the nature of that competition and the criteria of "success". Rutherford further states that the social or aggregate consequences of decentralised individual actions may be undesired. In relation to ensuring sustainability, both play a large role causing the unsustainability of economies. The dominant focus of 'success' in mainstream economics (i.e. individual utility and the narrow focus on profit maximisation and economic welfare) and the diffuse pollution problem and ecosystem loss from many small individual actions, are key in contributing to key global environmental pressures. Sustainable economies require a broder focus on what success is, and systems modelling and perspective that then

lead to social, institutional changes that influence consumption and production behaviours in the system and feedback to staying within environmental constraints.

6 Conclusions

The novel framework developed in this paper builds upon the pre-existing framework of Williamson (2000). NIE as set out by Williamson (2000) does not focus on Embeddedness (L1) and takes consumer preferences as given. To stay within environmental constraints, not all social preferences can be taken as given and cultural shift towards sustainable consumption and production are required for those most ecologically damaging forms of consumption and production. This requires changes in in many facets of societal preferences, including technology innovation and deployment. Therefore, it is timely to build this level of the framework with an institutional economics focus drawing in classical institutional economics understandings and conceptualisations with a more behaviouralist understanding of institutions.

For Williamson (2000), analysis and focus at the level of Resource allocation and employment is of a neoclassical kind, getting marginal conditions right. Welfare is seen in purely economic (exchange value terms) in attaining efficient market allocation, increasing overall surplus (consumer and producer) and economic growth. The mainstream economics framework has led to a very strong focus on economic efficiency. Most often, environmental and societal value are missing in the efficiency calculus and are difficult/impossible to price and factor in, even if the assumptions such as rationality were robust (which they are not).

Recognising these limitations at L2, the novel framework developed in this paper reconciles the four facets of:

(1) recognition of value in broader terms acknowledging limitations of a narrow focus on exchange values;

(2) recognition of complexity and the broad range of relevant stakeholders that need to be addressed;

(3) definition of the different types of value relevant and important to sustainable development (instrumental value and dis-value to society and the environment and conceptualisation of the five capitals that change substantially depending on the forms of production and consumption that proceed) whilst acknowledging that consumers do not perceive all value (and therefore willingness to pay estimates are a poor proxy); and

(4) acceptance that markets operating as institutions do not and cannot adequately capture such value in exchange value form; acknowledging these limitations, means that interventions

at levels 1, levels 3 and 4 to ensure sustainable economy become particularly important in ensuring a better capitals balance, biodiversity and sustainability.

At L3 the paper recognised limitations of existing new institutional economics analysis of firms and markets and explored a wider conception of firms and markets as value and values articulating institutions, building on the wider conception of value and institutions developed at levels 1 and 2 of the paper.

At L4 it was recognised that there is a need for other forms of intervention beyond financial incentives and rearrangement of property rights to ensure a sustainable economy and biodiversity. At L4, there is a need to look at a range of solutions, including for example various key element of the legal system.

From the conceptual developments of this paper, it becomes clear that a sustainable economy will require shifts in culturally embedded perspectives and values (at L1); alongside changes in understandings of value, its measurement and articulation in operational practice (L2); innovation in governance of markets and firms for better value articulation and focus upon a different set of values and wider set of value and capitals (L3); and changes in the institutional environment (L4) beyond property rights, to ensure a selection environment where sustainable production and consumption can flourish protective of biodiversity and other core capitals. This paper defines this as the 'institutional economics approaches to address externalities and bring about more sustainable economy'. These solutions are quite different to those proposed by conventional environmental economics but required to make an orderly and rapid transition to a sustainable economy.

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Appendix 1

The different types of capitals are defined as follows:

Manufactured capital: *"Manufactured (or human-made) capital is what is traditionally considered as capital: produced assets that are used to produce other goods and services. Some examples are machines, tools, buildings and infrastructure."* (Ekins 2008, p. 66). This also importantly includes technologies. In Williamson (2000) there is no direct specification of the role of technology (or infrastructure) in shaping and interacting with institutions (surprising given that technology was a key focus in the earlier classical school). Technology can play a central role in shaping production and

consumption decisions (which shape the mix of other capitals used in production) but also impacts institutions directly (particularly at levels L1 and L3) and institutions can help or hinder technological progress and use. For example classical institutional economists such as Veblen and Ayres showed how informal institutions (at the level of embeddedness) can speed up or slow down technological progress. Therefore technologies, institutions and sustainability are a key part of the research agenda. Technology and physical infrastructure are captured by inclusion of manufactured capital. Classical institutional economists have varied in their perspective on technology and the faith they put in it, to improve the human condition, quite a number of institutionalists however, like Ayres saw technological progress as key to achieving instrumental value. Classical institutional economists such as Ayres investigated how common perceptions, norms and various forms of informal institutions may hold back technological progress and the attainment of instrumental value[9]. A more prominent role for technology aligns with the importance that classical institutional economists gave to scientific knowledge informing economic decisions, which is urgently needed once again.

Natural capital: *"In addition to traditional natural resources, such as timber, water, and energy and mineral reserves, natural capital includes natural assets that are not easily valued monetarily, such as biodiversity, endangered species and the ecosystems that perform ecological services (e.g. air and water filtration). Natural capital can be considered as the components of nature that can be linked directly or indirectly with human welfare."* (Ekins 2008, p. 66). There is no consideration of natural capital and ecosystems in Williamson 2000, so incorporation here makes explicit as this must be included for the integrative framework.

Human capital: "*Human capital generally refers to the health, well-being and productive potential of individual people. Types of human capital include mental and physical health, education, motivation and work skills. These elements not only contribute to a happy, healthy society, but also improve the opportunities for economic development through a productive workforce.*" (Ekins 2008, p. 66). Again, this does not function at large in Williamson 2000, given relevance to production, consumption and sustainability, explicit incorporation is required.

Social capital is defined in many different ways in the literature, but for the current paper the following definition is applied: 'the ability of actors to secure benefits by virtue of membership in social networks

[9] Technology is important, but it can be argued that classical institutional economists such as Ayres had too much faith in technology in social provisioning, and almost a blind faith in the improvement of the human condition via technological progress (see Rutherford, p.140). Many environmental problems have been caused by too much faith in technological progress alone to solve human problems, alongside a lack of systems thinking and a precautionary approach (see Carson 1962 with the example of Pesticides).

or other social structures' (Portes 1998, p. 6).[10] It can also be seen in terms of trust and co-operation that emerges in an economy, social capital is key to ensuring a well functioing economy. For the current framework with its foreground focus on institutions, social capital is a quality that can arises from a given social embeddedness, governance of markets and firms and the specific institutional environment, yet resource allocation and employment outcomes (L2) can also impact, particularly if economic outcomes at this level lead to inequalities (social capital may be reduced). Social capital is key to the economics of biodiversity (Dasgupta 2021). Therefore, it is made explicit in our institutional economics framework.

Financial capital *"plays an important role in our economy by reflecting the productive power of the other types of capital, and enabling them to be owned and traded. However, unlike the other types, it has no intrinsic value; whether in shares, bonds or banknotes, its value is purely representational of natural, human, social or manufactured capital"* (Forum for the future 2000 as seen in Porritt).

Appendix 2

This definition and approach is coherent and aligned with empirical evidence on factors determining human behaviour. Vatn (2005, page 204) says of the integration of the individualistic model into the wider perspective of social construction that, "*The core assumptions of neoclassical economics are rational choice as maximisation, stable preferences and equilibrium states (Becker, 1976 and Eggertsson, 1990). Rationality is understood in individualistic terms. It demands that preferences are complete, transitive and continuous (Hausmann, 1992). Furthermore, to be termed rational, choices must be in accordance with what is preferred the most by the individual. As a logical consequence of the strong version of methodological individualism[2] that underpins this model, preferences are treated as stable or at least as given"*.

[10] The definition of social capital in Ekins 2008 is not suitable for the current paper due to the overlap with embeddedness and institutional environment, instead we use the definition by Portes 1998 and Thomas 1996. Ekins 2008 define as follows: "Social capital, like human capital, is related to human well-being, but on a societal rather than individual level. It consists of the social networks that support an efficient, cohesive society, and facilitate social and intellectual interactions among its members. Social capital refers to those stocks of social trust, norms and networks that people can draw upon to solve common problems and create social cohesion. Examples of social capital include neighbourhood associations, civic organizations and co-operatives. The political and legal structures that promote political stability, democracy, government efficiency and social justice (all of which are good for productivity as well as being desirable in themselves) are also part of social capital."

NIE applies broadly the same model of consumer behaviour as the neo-classical paradigm but, importantly, rejects assumptions of rationality as mentioned, accepting that actors have limited cognitive ability and lack full information, it also rejects the assumption of zero transaction costs, therefore coming closer to reality (Vatn, 2005).

For the social constructivist perspective, (sociology and classical institutional economics) behaviour is dominantly understood as socially created, implying that choices reflect, rules, norms and expectations built into the institutions of a society. Vatn (2005, p.206) identifies the origin of these perspectives as coming from: *"Rousseau (1762/1968), later to the sociologist Emile Durkheim (e.g, Durkheim, 1893 and Durkheim, 1895) and the founder of 'classical' institutional economics Thorstein Veblen (e.g. Veblen, 1898 and Veblen, 1899).* Within modern sociology, two main traditions exist: the cognitive and the normative (Vatn 2005).

Vatn (2005) cites Berger and Luckman (1967) as being basic to the cognitive position. With regards to the development of cognitive models/structures, a core example provided by (Vatn 2005, p.207) developed through dialectical process is that, "*There are three phases in this dialectic process. First, we have externalization, implying that subjectively constructed typifications like a 'meal' or a 'measurement scale' are expressed; next we have objectivation where these typifications retain existence independent of those creating them and stand out as facts or 'things'; finally, there is internalization, the phase in which these social constructs are taken up and reproduced by others. Through objectification and social constructs take on a form of 'naturality'. They become given and hard to observe as socially constructed. For those growing up, they are just there. According to Berger and Luckmann it is the sharing of the classification, the common acceptance of a typification, which makes it an institution"*.

Vatn (2005) identifies this as a very different understanding of institutions as compared to that of NIE, but one that is emphasized by classical institutional economists. Also, they are important in creating the individual and provide necessary meaning to actions that one undertakes, Social identity is produced thereby (Vatn cites Scott 1995).

Vatn (2005) explains that the normative perspective shares the idea of symbolic interaction, but has a stronger emphasis on creating common values and pressures faced by individuals in fulfilling certain obligations and expectations. Vatn cites March and Olsen (1989) as representing a relatively recent version of the position: "*behaviour is contained or dictated by cultural dicta and social norms. Action is often based more on identifying the normatively appropriate behaviour than on calculating the return expected from alternative choices*" (March and Olsen, 1989:22). Rationality is to do what is

appropriate. The perspective taken and illustrated by Vatn and his synthesis is that the logic of the situation is institutionally formed.

The major points that Vatn's paper brings out, is the role of institutional factors in: the process of preference formation; and the logic/ rationality that is applied; and the recognition that one can integrate the individualistic model into the wider perspective of social constructivism. The latter points are critical to the current paper and framework due to recognising the importance of understanding how institutions (in their various forms) shape both consumption and production decisions, but also because it allows a framework (that has a model of consumer behaviour at its heart) that can span NIE and disciplines with a stronger behavioural insight (classic institutional economics). The model of consumer behaviour chosen allows integrated, interdisciplinary understandings to be incorporated into the framework and in application.

Appendix 3

Ross (2010) explores three legislative models for sustainable development. A first focuses on implementing binding legal procedures considered vital to implement sustainable development fully, such as creating strategy, reports on progress and wide consultation on processes. Current approaches typically put in place an obligation in statute form and follow up with either detailed guidelines or regulation. As always, getting the balance right is said to be critical. In the latter respect, the Wales Act 2006 is said to give too much discretion, whilst the list of principles used by Canadian government in the Quebec statute provides too much detail and prescription, which undermines legitimacy and enforceability. Ross (2010) concludes that putting in place obligations to produce a strategy and to pursue other steps such as action plans, spending reviews, indicators and targets would be a major progression forward in making the 'sustainable development toolkit' operational, applying the systems approach of Garver 2019, to this study this would provide ***new information*** and potentially ***negative feedbacks*** as well as ***dampening positive feedbacks*** between development and environmental degradation). Although it is said that this may not be enough to ensure a cultural change in government.

A second model explored in Ross (2010) aims to enhance the status of the sustainable development strategy by introducing a substantive duty across government to ensure its activities in integrating sustainable development are consistent with objectives and principles identified in the strategy. The latter approach ensures legal status, provides a clear point of reference for those implementing the strategy with obligations for implementing and improves understanding of sustainable development. It however, stops short of explicitly identifying the role of sustainable development in the workings of government. Ross identifies that that not doing the latter misses out on important symbolic benefits, and fails to address directly any inconsistencies in interpretation and application of sustainable

development. The third approach is said to be to make sustainable development the central organising principle of governance in the UK. For this model to be operational, two additional legislative provisions are needed. Firstly, a clear declaration of purpose, by government about the role of sustainable development in all of its activities. The statement in the most recent Welsh strategy is said to work well in this regard (identified in their paper). Then legislation must impose meaningful substantive duties on all government bodies and it is said that such duties should do more than simply 'have regard to' or 'take account of' sustainable development. Ross identifies that there is a precedent for a stronger approach in previous states such as the example wording: 'contribute to the achievement of sustainable development'. In this sense sustainable development is at the core of government and the central organising principle, strong enough to potentially take on the role of legal rule and hence provide a framework for decision making across all government (Ross 2010). Applying Garver 2019 to this approach, essentially the leverage point here is ***goal change***, but also what comes with this is potential for change in ***mindset***, ***rules*** and ***new system structures*** to enable. The Autor concludes that it is time for the UK administrations to give sustainable development legal backing, and identify that most importantly legal recognition will improve the education value of the strategy and heighten its status in the public eye (***mindset leverage point***).

Abbott and Marchant (2010) investigate five mechanisms for introducing institutional innovations to inject sustainability more directly into the process by which laws, regulation and policies are adopted and reviewed and enhance responsibilities of major units of government to further sustainability. There focus is on US Federal government. The five mechanisms are: 1.) An executive order; 2.) A sustainability impact assessment 3. A non -partisan Congressional Joint Committee on Sustainability; 3.) A federal Sustainability Commission; and 5.) A Sustainability Law Reform Commission.

It is said that a strengthened executive order on sustainability would complement the existing environmental justice executive order in that both extend beyond traditional environmental protection to consider ethical and social impacts (***new information flows*** potentially resulting in new strategy and policy that ***dampens positive feedbacks*** between development and reduced sustainability). However, it is identified that an executive order does not provide the same long-term stability and certainty as a statute (Rodgers 2001).

The new concept of a sustainability impact assessment (extension of EIA) provides a vehicle for institutionalising stronger consideration of sustainability across the federal government. These assessments are applied on proposed projects, and are static. They however, could be made dynamic. A more dramatic enhancement is said to be to extend the EIA beyond individual agency projects to include policies, programs and conceptual activities. A process referred to as strategic environmental assessment (SEA) allowing one to assess environment/sustainability issues as part of an overall

economic policy etc (***new information*** leverage point, such new information may halt development or adjust it – ***dampening positive feedbacks*** between development and environmental degradation etc.). For various reasons explained in the paper, strategic environmental assessment might be a better approach than project-based sustainability impact assessment to incorporate sustainability. Limitations of EIA as well as benefits are discussed extensively, issues with SEA are also flagged up.

It is stated that: "*A joint Committee on Sustainability, drawn from both houses of Congress, would focus Congressional attention on sustainability issues that cut across many areas of law – and thus across the jurisdiction of multiple committees – elevating those issues in the Congressional Structure to a degree of prominence currently reserved for economic matters*." (Abbott and Marchant 2010, p.1930)

A Sustainability Law Reform commission is an independent body with legal as well as sustainability expertise that would review existing federal law from the perspective of sustainability and recommend amendments, enactments and repeals – so having an ex post perspective (***negative feedback*** *and* ***dampening positive feedback***). It would be an advisory body but could have significant subjective effects, for example through contributing to attitude/cultural changes within federal agencies and on the public (social evolution and potential changes in ***system structure*** leverage point). In commonwealth countries, the commission approach has been the most widely adopted. A key feature is the substantial degree of independence from government, parties and other political actors (as well as interest groups). In the article it is said that such organisations might even put forward areas where there is a need for new law/legislation and vision, as well as amendment/revision.

A sustainability Commission is an advisory body tasked with addressing a wide range of sustainability issues and hence a wide range of government agencies. Such an organisation could advocate and help executive departments/independent agencies develop appropriate sustainability policy, programs and regulation to address governments own operations and society at large. It could advise on sustainability legislation (***new information*** leverage point). Ex post it is said that such a commission could be authorised to review existing statutes, regulations and programmes from a sustainability perspective and in this way act as a ***negative feedback*** (leverage point) to enact change for sustainability if necessary. The commission could also educate the public (Abbott and Marchant 2010) and effect business and government strategy. The UK Sustainable Development Commission in 2009 provides good evidence of this, where they laid out the links between prosperity and growth in a report and this led to the book by Jackson (2009) on 'Prosperity without growth?' This had substantial impact on business, government, academic and society ***mindset*** (leverage point) and questioning conventional economic growth (**key leverage point**) as the main policy goal.

Abbott and Marchant (2010) then compare the five mechanisms, identifying that they vary substantially on multiple dimensions (institutional structure; function; authority and type of law and

policy addressed). In their conclusions they state that they do not necessarily recommend uptake of all five mechanisms but that implementation of two or more could provide useful synergy. They also conclude that these institutional innovations alone are insufficient and one must define and operationalise sustainability principles in strategies, priorities, implementation of legal ***rules*** and ***indicators*** **(leverage points**).

Ashford and Hall (2011) investigate the relationship between environmental regulation, innovation, and sustainable development within a situation of increasingly globalised economies. They contend that the most crucial problem in achieving sustainability is lock-in or path dependency as a result of firstly, the failure to envision, design, and implement policies that achieve co-optimisation, mutual reinforcement of social goals, and secondly the issue of entrenched economic and political interest that gain the present system proliferating current unsustainable trends. The paper argues that industrial policy, environmental law and policy, and trade initiatives must expand the practice of integrated multi-purpose policy design. One of the key messages of the paper is that revolutionary technological innovation required to address sustainable development requires stimulation through environmental, health, safety, economic, and labour market regulation. This said, the current author notes that economic instruments such as taxation can have dynamic efficiency benefits on producer behaviour (but that that this may not necessarily lead to significant innovation in technology).

The authors have argued from previous empirical evidence, that significant rather than marginal innovation may require displacement of incumbent firms and their technologies (Ashford et al 1979 and Ashford et al 1985). Synthesising empirical evidence and literature Ashford and Hall (2011) identify that trade can take two diametrically-opposed pathways, one of innovation-driven competition versus traditional cost cutting competition and these two pathways are said to have different implications for economic development, environmental quality and employment. Ashford and Hall (2011) identify changes in socio-technical systems as difficult and suggest creative use of government intervention as more promising in sustainable industrial transformations than marginal incentivising policies such as providing tax credits for adopting green technology which are said to leverage firms short term economic self-interest rather than deeper organisational on societal changes. They argue in developing a sustainable economy that change needs to be more systematic, multidimensional, and disruptive as opposed to incremental. It is said that this capacity to change towards sustainability can be enhanced by appropriate legal and policy interventions. They argue that addressing lock in and path dependence requires legal interventions not only to enhance capacity, but encourage willingness, opportunity and motivation to change on the part of incumbents and new entrants. They advocate that strong regulation (the **leverage point here is *rules***) can spur technologies, organisational, institutional, and social innovation, that result in economic and trade advantages which exceed shorter term gains from cost-cutting and trade expansion through neo-liberal policies that would otherwise weaken environmental and labour protection. They also identify that

deeper changes are more likely to come from new entrants as opposed to incumbents (Ashford and Hall 2011) and that such new entrants often bring entirely new technologies with consequent dramatic reductions in costs whilst improving performance (completely different cost curves). In this way helping ensure long term shifts to more beneficial cost curves and ensuring longer term instrumental value (of which classical institutional economists are particularly interested). New regulation takes time to implement so effects can be ***delayed*** and occur at a later point in the system. Additionally, new entrants with alternative technologies, improved performance and cost structure can ***reduce positive feedback*** between growth of the economy and environmental impact.

Bosselmann (2010) Building on a range of literature, makes some strong observations and assertions in relation to dominant ***mindset, goals and paradigm*** (potential leverage points) in our current systems:

"*our capitalist culture has created a mythical belief that the economy matters more than anything else. Economic analysis has a privileged place in society's institutions and in public decision-making. As a consequence, decisions, some with deep moral implications, are now determined primarily by income and prices*".

"*Over time and in combination, anthropocentrism, individualism and economism have reinforced one another, nurturing the idea that a healthy environment is secondary to individual well-being*."

"*Typically, the environment is presented as a cost factor for the economy*"

(Bosselmann 2010, p. 2431)

The author also critically notes that the fragmentation of the environment into individual aspects is a common characteristic of environmental laws throughout the world and identifies to a degree this is inevitable (to ensure that laws are specific and enforceable on a case-by-case basis), yet they note that the lack of a foundational law that holds the environment as the foundation of life and the integrity of the ecological systems as non-negotiable is hugely problematic and observe that environmental law has largely not been effective in preserving ecosystem integrity. They state: "*By and large, administrators and judges have applied the Resource Management Act (of New Zealand) in a manner that limits or mitigates ecological damage, but does not prevent it in the first place. This is consistent with environmental laws and their application all around the world*." (Bosselmann 2010, p. 2433)

The author states: "*there is a fundamental human right to use and alter the environment rather than a right to use the environment in a sustainable manner*". Whether or not a use is sustainable should be clearly defined by law and not left to an "*overall judgement[24], i.e., the traditional viewpoint that juggles environmental, economic and social factors without giving priority to one over the other*." (Bosselmann 2010, p. 2432)

The author goes on to identify and state the following: "*Specific laws may prohibit incidents like felling a tree or killing an animal without reason, building a house without resource consent, uncontrolled discharge of waste, wastewater or chemicals. But these are exceptions to the basic right of individuals to use natural resources. In their accumulation, these user rights result in large-scale destruction of the global environment. At present, there is no general environmental rule that limits individual entitlements. Do we need such a rule? Absolutely yes. Can such a rule be defined and written into law? Again yes, as will be shown further below. Would it be socially acceptable? Hopefully. Would it be politically viable? Probably not. Or shall we say, not yet*." (Bosselmann 2010, p.2435).

Building on Bosselmann 2008, Bosselmann 2010 notes that if one traces the historical and philosophical foundations of sustainability from their beginnings and relate them to the corresponding developments of legal theory and practice one can see an increasing gap between individual entitlements and responsibility for the commons. They state that this can be observed in the way that John Locke's idea of property rights developed with the modern concept of private property isolating itself from any common property responsibilities (Bosselmann 2008).

The author puts forward that it should be possible to design a general ***rule*** (this is the **main leverage point addressed**) that draws a line in the sand and sets a bottom-line limitation on individual entitlements. It is said that such a rule would apply throughout the system of law and governance and would not be confined to a single Act. This is the papers major proposal and recommendation, ensuring the sustainability of ecological systems, it is said, must be the bottom-line, yardstick and benchmark. The author supports the proposal by identifying that historically, science and ethics all support the idea that development must respect ecological boundaries to avoid decline or collapse.

Rodrigues (2014) use discourse analysis to critically examine local movements (***self-organising as a leverage point***) to recognise 'the rights of nature'. It focuses on local Community Bills of Rights and localised Rights of Nature ordinances. The author argues that although such measures engender the conditions for human communities to challenge (***a negative feedback in terms of leverage point***) the use and damage to the environment by multi-national corporations, effectiveness is limited as a result of the narrow, ideological and anthropocentric conceptualisations of the 'natural environment' (***mindset leverage point***).

A key conclusion of the paper is also that most Bills are confined to towns and cities with small populations; such localisation is a key limitation to the potential 'rights of nature' to reverse or prevent further environmental degradation by unsustainable corporate activity, especially when the effects of that activity cannot be restricted to the municipality in which activity is proposed (Rodrigues 2014). Nature also sees no boundaries made by human jurisdiction. This said the authors

state that when people become involved in democratic decisions (***negative feedback leverage point***) to ensure the rights of nature at the local level, the potential for humans to change their relationship to nature can increase dramatically. An additional important conclusion is as follows: "*The challenge around language emphasised in this article reveals that, theoretically and in practice, enshrining 'rights' for 'nature' may be an effective discursive measure but an insufficient regulatory apparatus. At the same time, it is perhaps not reasonable to expect smaller-scale apparatus to resolve such deeply entrenched and difficult philosophical problems around; for example, what constitutes the non-human world, what responsibility humans have to the non-human world, and what measures can ensure adequate preservation and thriving of the non-human world in the face of increasingly destructive activity."* (Rodrigues 2014, p.192)

Garver (2013) similarly to Bosselmann 2010, states: "*The existing global complex of environmental institutions, from the global to the local level, has hardly prevented global ecological threats from worsening, and they seem unlikely to do so without radical reform*." (Garver 2013, p.234)

Garver acknowledges this and describes the inadequacies of environmental law (similarly to Bosselmann2010) in ensuring protection of the environment. Garver's response is to build on a range of existing literature (such as Berry 1999; Boyd 2004; Bosselmann 2008; Cullinan (2011). Boyd's (2004) notion of "sustainability law", Bosselmann's (2008) "Principle of sustainability" and Cullinan's (2011) "wild law" are all said to broadly capture Berry's 1999 ecological conception of law. Boyd is said to characterise sustainability law as "*a system of laws and policies that facilitate processes, products, and patterns of behaviour which are good for the planet*" (Boyd 2004, p.365). Garver states that for Boyd, "*Sustainability law would focus on transforming the relationship between humans and the natural environment from one based on minimising harm to one based on maximising harmony*" (Boyd 2004, pp. 364-365). It "*would be firmly rooted in science and the laws of nature, beginning with a clear understanding of the laws of thermodynamics and explicit recognition of the biophysical limits of the planet Earth*" (Boyd, pp. 364-365).

Building on such literature, the Garver 2013 puts forward a set of ecological law principles to replace as opposed to contribute towards environmental law. So fundamentally, applying Garver 2019 to this work, the approach here in not simply a ***change in rules***, but a fundamental change in to the elements ***world view; relationship with economic, political and socio-cultural systems; relationship with ecological systems; Juridical person and "rights of nature"*** the leverage points here are transformation in the ***paradigm, mindset and goals*** that would necessarily entail substantial changes in other leverage points of the system. Garver 2013 sets out ten principles for ecological law as follows (p.325- 329):

"*First, and most fundamentally, the rule of ecological law recognizes that humans are part of Earth's life systems, not separate from it*."

"*Second, legal regimes must be constrained by ecological considerations necessary to avoid catastrophic outcomes and promote the enhancement of life, with the socio-economic spheres fully contained within these ecological constraints*."

"*The planetary boundaries framework also makes clear that this approach must be systems-based which means that ecological law must track the interactive dynamics among the boundaries and the feedbacks, thresholds, non-linearity and other characteristics of the global social-ecological system. This systems-based approach must pay attention to both stocks and flows that are related to maintaining the earths life support capacity*."

"*Third, the rule of ecological law must permeate legal regimes and other disciplines like economics in a systemic, integrated way, and not be seen as a speciality area of law that applies to isolated problems*".

Fourth: "*The legal regime should support a radical re-focusing of the economy on reduction of its throughput of material and energy*."

"*Fifth, the rule of ecological law must be global, but distributed fairly using principles of proportionality and subsidiarity, with protection of the global commons and public goods paramount, and with constraints on property rights and individual choices as needed to keep the economy within ecological limits. A central challenge is to develop legal mechanisms for distributing global limits on the global aggregates of material and energy resources that the economy consumes*."

"*Sixth, the rule of ecological law must ensure fair sharing of resources among present and future generations of humans and other life forms*.

"*The focus on sufficient as opposed to maximum wealth implies a limit on inequality on wealth*.".

"*Seventh, the rule of ecological law must be binding (de jure or de facto) and supranational, with supremacy over sub-global legal regimes as necessary*."

"*Eight, a greatly expanded program of research and monitoring for improved understanding and continual adjustment of ecological boundaries and means for respecting them is needed to support the rule of ecological law, globally, regionally and locally*."