In Memory of Karl-Otto Apel: the challenge of a universalistic ethics of co-responsibility

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Abstract

On the basis of Karl-Otto Apels' diagnosis of the shortcomings of philosophical ethics in general, and any ethics of individual accountability in particular, I give an outline how these shortcoming are currently to be articulated in the context of ecological crisis and socio-technical change. This will be followed with three interpretations of Karl-Otto Apels' proposal for an ethics of collective co-responsibility. In conclusion, I will advocate that only a further social evolution of the systems of science, economy and law will enable a possible institutionalization of collective co-responsibility by means of a new innovation paradigm: responsible innovation.

Key words: collective co-responsibilility, discourse ethics, role responsibility, responsible innovation, ecological crisis.

Introduction

Karl-Otto Apel disagreed with his colleague Jürgen Habermas on whether the 'Discourse Principle' as explicated in *Between Facts and Norms* (Habermas, 1992) is in itself a neutral principle underlying any type of discourse. For Habermas the discourse principle allows switching seamlessly between theoretical and practical discourse whenever appropriate for the issue on the table. Furthermore, the discourse principle would not give any moral-ethical guidance. For Apel, however, the discourse principle itself cannot be otherwise understood as a normative principle requiring ultimately that one cannot retreat from discourse ('Der Diskurs soll sein') as one pleases in the course of freedom of action. He would make the case that this is morally unacceptable. For him, the discourse principle itself is normative in nature and consequently, the discourse principle prioritizes practical discourse over other types of discourse.

I will here not go into the debate on how to justify this position of Apel within moral theory, but point out to the consequences Apel himself took out of this circumstance, namely to make the additional attempt to found a 'macro' and universalistic ethics of co-responsibility (Apel, 1993) which depends on the normative nature of a discourse principle. For Apel, this had always been his approach from the first moment he outlined the apriority of the communication community at the end of 1960's as an immediate response to the 'paradox' of scientific value-neutrality. He consistently

argued that co-responsibility is anchored in any discourse, including scientific discourse (see also Apel's resume on this topic, in Apel (2000).

He took up the challenge to outline such an ethics of co-responsibility with reference to the ecological crisis in a context of socio-technical change with its ever-increasing complexity. Against the backdrop of this challenge, he identified two morally relevant circumstances:

1 Individuals can hardly be held individually accountable (*unzumutbar*) for the unpredictable consequences and side-consequences of our collective actions and global impacts of our social systems, such as the systems of economy and science. The ecological crisis was his main example to address the problem of individual unaccountability and formulate an ethics of co-responsibility.

2. The morally problematic consequences of collective human action in light of the ecological crises and socio-technical change are neither the direct and traceable results of actions of individuals nor can these consequences be traced back to the intentions of individuals.

Karl-Otto Apel believed that discourse ethics can overcome the short-comings of current ethical theories to address these morally relevant circumstances. The discourse theoretical attempt was to take on the issue of the ecological crises in context of sociotechnical change in terms of co-responsibility for the consequences and side-effects of our collective action. Below I will first outline the nature of the challenge both in terms of the short-comings of individual role responsibility and in terms of the applicability of ethics to socio-technological change and the conception of an ethics of collective co- responsibility. As conclusion, I will make the case that in fact three different readings of Apel provide alternative perspectives of the fruitfulness of Apel's approach to the complexity of ecological crisis in the context of socio-technological change.

1.*The shortcomings of individual role-responsibility in the context of socio-technical change*

In modernity we can observe a historically ever unfolding process of proliferation of professional occupation roles within which individuals primarily define their responsibilities. First, because of the professionalization of multiple tasks previously carried out in non-technical or private spheres, an enormous differentiation of new roles individuals can take in our society has taken place. The system of science provides a modest illustration, as it has broadened its functional specializations from research, development, design, and construction to include production, operation, management, and even sales engineers; and its content specialization to include biomechanical engineering, biomedical engineering, biochemical engineering, nanoengineering, and more. Stepping outside the technical fields, the unfortunate reductio ad absurdum in this trend is the role professionalization of virtually every work-related activity: janitors become maintenance professionals, friendship becomes professional grief counselling, one hires professional personal trainers to help one get the right exercise, etc. Although this development is primarily manifest as the quantitative proliferation of roles, it inevitably has qualitative implications.

Second, and in parallel, the area for which an individual may be held responsible has been narrowed, as may be illustrated with an example from the sciences that would apply equally well to engineering. In the 1700s there were natural philosophers who pursued natural science. In the 1800s William Whewell coined the term "scientist," and initially there were simply scientists as such (separate from philosophers). This was followed by a period in which it was possible be a physicist, chemist, or biologist. Today, however, not even the term microbiologist is sufficiently

descriptive of a scientific role. As a result, some individual scientists may only be proficient in research they conduct on one specific micro-organism, perhaps only in relation to a restricted number of biochemical processes in that micro-organism. Individual scientists increasingly "know more and more about less and less," and thus can hardly foresee the consequences of their discoveries for related fields, let alone the possible applications that could result from interactions with other fields. Such an excessive differentiation of roles implies both a formal and a substantial delimitation in individual role responsibility.

Third, the number of roles that any one individual may possibly fill has dramatically increased. Synchronically, one person may well be a structural engineer (that is, a kind of civil engineer) doing research on earthquake remediation, a grant or contract administrator, a professor of engineering, a student advisor or mentor, an academic administrator (as department head or dean), an author -- not to mention a spouse, parent, citizen, consumer, and more. Diachronically, the same person may alter all these roles and/or complement them with literally hundreds of others. Moreover, the interchangeability of individuals and roles has expanded along with individual mobility, both temporally and geographically. This means, practically, that responsibility is more identified with a role than with a person, thereby complicating the responsible organization of professional tasks while significantly diminishing technical professional ethical commitments – loyalty to organisations has become to be an old-fashioned concept.

Fourth, contemporary society is not only characterized by the differentiation of roles but also by the intensified institutionalization of the social-institutional spheres in which the role differentiation takes place. Science, engineering, economics, education, politics, art, and more have all become so institutionally distinct that they largely determine the conditions for their own functioning. Regulation, insofar as it occurs, must increasingly take place internally within each sphere. Scientists regulate science, engineers engineering, economists the economy, and so on.

As a result of this four-dimensional transformation of role differentiation space, technical roles may be said to have become increasingly less robust at the same time that opportunities for role conflict have only intensified, proliferated, and specialized, with individuals more freely floating between roles, although large role aggregates are more rigidly separated from each other than ever before in history. The result is a multifaceted undermining of that very role responsibility which has been the traditional basis of social order -- and for which it is dubious that principle responsibility alone is able to compensate.

2. *The challenge of the applicability of ethics to socio-technological change and the conception of an ethics of Collective co- Responsibility*

Individuals assume responsibility for the consequences of their actions if, and only if, they can intentionally direct those actions and reasonably assess the consequences, both intended and unintended. However, it is frequently the case that the consequences of scientific- technological advance cannot be traced back to the intentions of particular individuals. The consequences of technological innovation are usually the result of collective action or effects of societal systems, such as our market-based economy, rather than resulting from the actions of individuals. This situation is a challenge both for the academic discipline of ethics and for actual practice. Science and engineering exist, in the first instance, within scientific and technological systems, but are then transplanted – by

means of complicated transformations and usages – into system-specific logics of the economy, politics, and law. None of these system logics are traceable to the intentions of individuals, nor is the possibility of unintended consequences always assessable. The old idea that we have to analyse the negative consequences of scientific and technological discovery by identifying scientists with bad intentions (e.g. creation of Frankenstein etc.) is not an adequate resemblance of actual research practices, which are conducted in large teams and under scrutiny of an ever more globally networked community of scientists.

Scientists who have knowledge of possible ethically problematic applications and who are subject to criticism may also rightly point out that they in fact anticipated entirely different applications at the point of their creation. They don't feel a sense of immediate accountability. This sense of the scientist is reinforced by our conventional ethics of responsibility which limits our sense of accountability and responsibility within the immediate scope of our professional occupation. Scientists and engineers may even ultimately claim that the possible applications of their work are not part of their occupational role responsibilities as scientists or engineers. (The scope of an ethics of science and engineering is rather different than an ethics of role responsibility limited to the roles of professionals in the scientific system.) What is required, it seems, is some transformed notion of responsibility beyond the simple multiplication of roles or the expansion of existing occupational role responsibilities to encompass intended or unintentional impacts on public safety, health, and welfare. Indeed, technoscientific applications may remain ethically problematic even in cases where scientists and engineers have the best possible intentions and users do not have any conscious intention to misuse or abuse. This situation constitutes a major ethical challenge we face today. Karl-Otto Apel rightly called for an ethics of collective co-responsibility in order to respond to this problem. Such a collective ethics arises from reflection on the social processes in which technological decision making is embedded. That is, any new ethics must deal with the same substance as the old role responsibility ethics, namely with values and norms that either enable or restrict or delimit human action and thus enable or guide traditional decision making.

At this point, Apel makes the case for a new macro ethics which states that the reach of our values and norms will go beyond occupational roles and their allocation to particular individuals.

One could read Apel here in three interpretations. The first interpretation is that his proposal for a an ethics of co-responsibility for the consequence of our collective actions can be seen as an institutionalization of a discourse (Apel made reference the legitimacy and necessity of the '*thousand dialogues and conferences'*, Apel, 1993, p.24) which should address the issues individuals as such cannot be accounted for but who share co-responsibility by minimally entering into a global discourse on the issues different cultures are confronted with.

A second interpretation, and a possible extension of the first interpretation, is to establish new discursive procedures which would facilitate (global)decision making mechanisms, among other at UN levels.

A third interpretation is that our social systems which are at the origin of de-alienating individuals from our sense of responsibility, have to further evolve themselves in order to better reflect what an ethics of co-responsibility calls for and provide new mechanisms to enable and assign role-responsibilities.

Below I sketch the type of argumentation consistent with each of these interpretations and make the case that only the third interpretation would be the ultimate proper response. The open question

remains then in how far we can expect the evolution of these social systems to be ethics-driven and whether we need a morally charged discourse principle to justify the required change.

First interpretation: a call for public debate

To be co-responsible includes being personally responsive. The norms of specific technical professions are, in isolation, insufficient because they arise from restricted perspectives. A true ethics of co-responsibility must be interdisciplinary and even inter-cultural in order to provide a standard of justice for evaluating and balancing conflicting occupational role responsibilities. If we fail to provide such an ethics, we inevitably continue to aggravate culture clashes and hostile responses to particular (globalized) technologies. An ethics of collective co-responsibility should involve free (international) public debate in which all should participate. It is unethical and even unreasonable to make any one individual responsible for the consequences and/or (adverse) side effects of our collective (especially technological) actions. It is, however, ethical and reasonable to expect informed and concerned individuals to engage in public debate on such collective actions (subject, of course, to the particularities of each situation), or at least to make this a default position from which persons must give reasons for being excused. The moral obligation to engage in a collective debate which shapes the context for collective decision-making rests upon everyone's shoulders. It is not just engineers who perform social experimentation; in some senses all human beings are engineers insofar as they are caught up in and committed to the modern project. If we trace, for instance, the history of environmental challenges, we see that many issues which depend on the involvement of personally responsible professionals were first identified and articulated within the public sphere (Carson's famous Silent Spring for example). Public deliberation does not itself primarily aim at creating reasonable consensus; rather, it serves, amongst other activities, to present different relevant issues to autonomous systems and subsystems of society - that is, to politics, law, science, etc. The discourses of politics, law, science, etc. are then called upon to respond to such issues raised in public debate. An appropriate response by the appropriate subsystem to publicly identified and articulated issues may thus constitute a successful socio-ethical response. Conversely, responsible representatives of the subsystems are drivers for new debates when they publicize aspects of an issue that cannot be fruitfully resolved within the limits of specialized discourse. The continuous interaction between autonomous subsystem discourses and a critically aware public provides an antidote for frozen societal contradictions between opposing interests, stakeholders, or cultural prejudices. It also articulates a form of ethical reflexivity.

Karl-Otto Apel may have preferred this explication as the primary response to the necessity of developing an ethics of co-responsibility as he would argue that co-responsibility is already anchored and pre-supposed in the discourses of a communication community that "functions as a meta-institution vis a vis all human institutions and societal subsystems" (Apel, 1992, page 20). Apels' major claim underlying his introduction of a 'part B' of discourse ethics was too approximate an ideal communication community in the vain of a Kantian inspired regulative idea.

Second interpretation: Develop deliberative procedures for transpersonal technology and impact assessment mechanisms at interfaces of science, policy and society

To be collectively co-responsible involves developing transpersonal assessment mechanisms. Although the institution of public realm discussion and its interaction with the above-mentioned professionalized subsystems makes it possible for individuals to be co-responsible, these deliberations are in many cases insufficiently specific for the resolution of the challenges which technological development confronts us with – that is, they do not always lead to the implementation of sufficiently robust national or international policies. The assessment mechanisms need to be transpersonal, for example by going beyond an analysis solely informed by the possible intentions of use or misuse of applications by individuals. Therefore, different kinds of specific deliberative procedures – for instance deliberative technology assessment procedures – must be established to complement general public debate and to provide an interface between a particular subsystem and the political decision-making process. We may have to think about permanent assessment mechanisms within the policy making context that enable to make proper sense out of a variety of scientific advice and complexity. The implementation of ethics codes by corporations also constitutes an interface between the economic sector, science, and stakeholder interest groups, while national ethics committees are often meant to be intermediaries between legal and political system. Experiments with such boundary activities or associations have had varying degrees of success. They nevertheless represent important experiments for enabling citizens to act as co-responsible agents in the context of technological decision making.

Collective co-responsibility may be based on fundamental constitutional principles or, eventually, entail constitutional change to incorporate relevant principles. The initiation of new forms of public debate and the development of transpersonal science and technology assessment processes may eventually require constitutional adjustment. Indeed, the adoption of specific deliberative principles in our constitutions must not be ruled out. The implementation of the precautionary principle – which is inscribed in the European Treaty and which now also guides important international environmental deliberations (including Climate Change negotiations and issue of biodiversity etc) – is an example of a relatively recent constitutional change in the context of the European Treaty. This principle lowers the threshold at which governments may take action to intervene in the scientific or technological innovation process. The principle can be invoked if there is reasonable concern regarding harm to human health and/or the environment, in the light of persisting scientific uncertainty or lack of scientific consensus. The implementation of such a principle requires new and badly needed intermediate deliberative science-policy structures. It imposes an obligation of continuing to seek scientific evidence and enables an ongoing interaction with the public on the acceptability of plausible adverse effects and the chosen level of protection. The principle gives an incentive for companies to become more proactive and necessarily shapes their technoscientific research programs in specific ways. All in all, such a principle enforces the establishment of discursive procedures in the interface of science, policy and society

This interpretation would probably also have made sense to Apel as he notably has emphasized that the process of globalisation requires further institutionalisation of a discourse with universally recognised principles of justice, solidarity and co-responsibility (Apel, 2000, p 138ff) which are currently lacking (and in current times, so far they exist are under threat to be seriously weakened by nationalistic tendencies).

The third interpretation: Call for a further evolvement of the social systems of science, economy and law.

This interpretation was not particularly followed by Karl-Otto Apel as his pre-occupation was to provide the perspective of a foundation of an ethics of co-responsibility rather than providing social political solutions. Yet, I believe this interpretation may well provide the most adequate perspective for the institutionalisation of an ethics of co-responsibility rather than to remain solely at the level of being an advocate of the 'thousands of dialogues and conferences.

This may point out to a deficit of the thinking of the Frankfurter Schule and their late followers. Rather than expecting from our social systems such as the economy and science to evolve further in a socially desirable way and thus to provide improved social functions, the common thinking was to be rather suspicious of the capacities of these systems to further evolve. Initially they may have perhaps to be too easily black boxed as the causes for 'verdinglichung' or 'colonisation' of our life world. Habermas, rightly so, did highlight and criticised the shortcomings of traditional Marxist analysis which even assumed the autonomy of a self-reproducing economic system. However, it seems then, that in a post-Marxian analysis the hopes were fully put on possible changes of and by the political system. The responsibility for social change seems to be primarily focussed on the political system to provide (legal binding) constraints to, for example, the economic system so that negative side-effects are controlled or that socially desirable outcomes are more likely to be produced by the economic system. The focus on social political constrains of the economic system may well have been fed by the motive not to duplicate the failure of state socialism which destroyed the apparent benefits of a liberal market economy.

This is a problematic state of affairs of critical theory. First, virtual all our major societal changes have been induced by socio-technological innovation, surely not a result of a self-reproducing autonomous economic system but because of an absence of proper public governance. At the same time, socio-technological change has been unpredictable: the major technology-induced has been unpredicted, and individuals have felt more than ever, to be subject of change rather than agent of change. For critical theory, it is a blind spot to ignore the current dynamics of innovation in relation to the crises we face and the capacity to understand societal change as such.

However, following the diagnosis of Apel, the intertwined scientific and economic systems is both the cause and the solution for the current crisis. I will give below a short outline of an innovation paradigm: responsible innovation which is driven by an ethics of collective co-responsibility.

The necessity for a new innovation paradigm should be seen a response to current major deficits in the global science and innovation system and refers to the necessity for a further evolution of these social systems Currently, national states and supranational bodies such as the EU are responsible for the governance of the risks, quality and efficacy of products which are publicly authorized for the market. They constitute the so called "market-hurdles 'for new products. However, there is no public actor responsible for what we want to get out of science and technology. The 'benefits' of science and technological developments is left over the 'market' which presupposes the following:

a) Market success equals benefits for consumers
b) Innovation is inherently good: any innovation can count as 'good' innovation.

c) Innovation cannot be given a direction, as it is unpredictable and unmanageable.
d) Ethics is only a functional constraint for innovation. The political system can limit, restrict or ban products from entering the market by an evaluative form of ethics which prescribes what we should not do or not allow, rather than what we wish for.

The first deficit here is that we do not have a public governance mechanism which allows for deliberation and enabling and assigning of responsibilities concerning what type of innovations which are socially desirable. Success on the market may indicate benefits for particular groups of consumers but does not a socially desirable outcome in terms of constitution of a public good. A first departure point for a vision of responsible innovation is therefore to advance governance mechanisms that could drive innovations to societally desirable ends, which helps to constitute, re-new or preserve public goods. In other words, instead of an exclusive focus on the risks and (ethical) constraints of new technologies, the question of directing or redirecting research and innovation towards societally desirable ends must be given importance in research and innovation programmes. This implies that we not only have to have professional bodies for risk assessment but also professional bodies that should look into the type of outcomes we want to get out of research and innovation processes, and the establishment of governance mechanisms that should give some direction to –- or steer –- the innovation process

Market failure of delivering on societal desirable innovations

Innovations often overwhelm people, and virtually no new transformative technological innovations have been predicted in advance. Even at the early stage of technology development, such as in the case of nanotechnology, the first marketed products were not of the kind experts initially predicted. The first products involving nanotechnology were cosmetics, despite expectations centring on healthcare and environmentally sound applications. Although new technologies are generally hyped in their beginning phases, with high expectations on outcomes (such as 'nanobots' that are capable of cleaning our arteries), alongside economic benefits, the reality kicks in with disappointing products such as nano socks that you don't need to wash for a couple of weeks or teddy bears for children that remain equally hygienic for long term use.

There seems to be a general mismatch between the pace of 'new' products entering the market and the societal significance of those products. Notably in areas where our innovation system relies on a handful of multinational companies such in the medical and agrobusiness fields, innovations are not delivering on societal expectations. In the pharmaceutical field, the economic rationale results in counter intuitive research and innovation priorities in the private sector: medicines that can treat rather than cure chronic diseases are preferable from an economic point of view.

Although market-innovations are very effective when they concern efficiency gains as they immediately reflect an economic rationale that honours better outcomes for lower costs, we cannot expect innovations to come equally quickly to the market when they require transformative changes, such as a change of infrastructure or a transition towards a new energy system which is infringing on vested interests. Such changes are difficult to conceive without heavy public investment. A second departure point for a vision of responsible innovation is therefore to compensate for existing market deficits and allocate new governance roles for public bodies and stakeholders. The deficit of markets is immediately linked to a further articulation of this deficit: the non-alignment of innova-

tions with broadly shared public values in specific innovation contexts where transformative change has become societally desirable, virtually across all topics touching on sustainable development and / or issues that are dependent on a knowledge commons.

Third deficit: Aligning innovation with broadly shared public values and expectations

Under the European Framework programme for Research and Innovation Horizon 2020, a number of 'Grand Societal Challenges' have been defined, which followed the call in the Lund Declaration for a Europe that 'must focus on the Grand Societal Challenges of our time' (Lund Declaration 2009 during the Swedish EU presidency). Sustainable solutions are sought in areas such as "global warming, tightening supplies of energy, water and food, ageing societies, public health, pandemics and security (ibid, p.1).

Arguably, the Grand Societal Challenges of our time reflect several normative anchor points of the Treaty in relation to the 'promotion of scientific and technological advance' and which thus is legitimate. However, the promotion of scientific and technological advance has until now served as a goal in itself. The promotion of scientific and technological advance has not been coupled to other, all interrelated, normative anchor points such as 'ensuring a high level of protection' that, 'sustainable development', 'competitive social market economy' that drive all other EU policies. It does not require much political initiative to couple the promotion of scientific and technological advance with all other major normative anchor points in the EU treaty to give a broader base for the justification of research and innovation beyond assumed economic benefits and increase of competitiveness.

The Lund Declaration states that in order to be responsive the European Research Area must develop 'processes for the identification of Grand Societal Challenges, which gain political support and gradually move away from the current thematic approaches, towards a structure where research priorities are based on these Grand Societal Challenges'. It hopes to give direction to research and innovation in the form of 'broad areas of issue-oriented research in relevant fields' (ibid, p.1). It calls for (amongst other things), broad stakeholder involvement and the establishment of public-private partnerships.

The macro-economic justification for investment in research and innovation emphasizes that innovation is the "only answer" to tackle societal challenges: "Returning to growth and higher levels of employment, combating climate change and moving towards a low-carbon society" (Commission of the European Communities, 2011, p. 3). This approach implicitly assumes that access to and availability of finance for research and innovation will automatically lead to the creations of jobs and economic growth, thereby taking on the societal challenges along the way. The more innovation, the better. The faster it becomes available, the better. In this macro-economic model, innovation is assumed to be rudderless but inherently good, since it produces prosperity and jobs and meets societal challenges addressed through market demand.

The Lund Declaration gives, however, an alternative justification for investing in research and innovation, primarily framing this in terms of responding to societal Grand Societal Challenges and further stating that "meeting the Grand Societal Challenges will be a prerequisite for continued economic growth and for improved chances to tackle key issues" (Lund Declaration 2009, p.2). Here, the assumption is that sustainable economic growth is only possible when particular societal objectives are met, in the form of responding to Grand Societal Challenges. Innovation is neither seen as

rudderless nor as inherently good. Economic prosperity and the anticipation that innovation yields positive anticipated impacts (such as the creation of jobs and growth) become dependent upon the social context. The Lund Declaration points out that measures are "needed to maximize the economic and societal impact of new knowledge" (ibid., p.2; italics by the author). The idea is clear; to steer the innovation process towards socially beneficial objectives.

Additional measures that go beyond removing barriers for research and innovation such as the availability of and access to finance for research and innovation then become necessary. The Lund Declaration defines a type of justification of investment in research and innovation towards particular positive outcomes. The Lund Declaration underlines a justification of research and innovation beyond economic terms. The question on how to define positive outcomes or "the right impacts" of innovation can be found in the normative anchor points in basic treaties and constitutions. This also brings an advantage for democratic governance: organisations and citizen can claim the proper implementation of policies by articulating the meaning of these anchor points in concrete situations.

The fourth deficit: no anticipatory governance in the science- policy interface

The issue of unintentional consequences of scientific and technological developments to which Apel referred to, can be traced back to, amongst other things, the limited capacity of the scientific system to know in advance the consequences of scientific discoveries and technological actions. Virtually all complex technological innovations of benefit to society are surrounded by scientific uncertainties and several degrees of ignorance. Instead of addressing the ethics of technology, then, it might be more appropriate to address the knowledge transfer between societal spheres (such as knowledge transfer between science and policy), given that quality of knowledge will, by and large, determine our success in using this knowledge within possible applications. At the same time, we constantly need forms of foresight (straightforward predictions about our future have been shown to be enormously imperfect) in which we evaluate the quality of our knowledge base and try to identify societal problems and new knowledge needs at an early stage.

Moreover, in the context of scientific uncertainty and production of knowledge by a range of different actors, we need knowledge assessment mechanisms which will assess the quality of available knowledge for the policy process. We are currently forced to act upon developments, such as Climate Change, while at the same time being uncertain about the quality and comprehensiveness of the available scientific knowledge and the status of public consensus. A deliberative approach to the policy-making process itself, would complement and connect with public debate as such. The outcomes of ongoing knowledge assessment should feed into other assessment mechanisms and into deliberation on the acceptability of risk, the choice of regulatory frameworks or the measures taken under those frameworks. Knowledge assessment following the result of foresight exercises would then be important tools in setting out arguments for the necessity and nature of future legislative actions.

Institutionalisation of collective co-responsibility as a driving force for socially desirable innovation

Responsible innovation constitutes a new paradigm for innovation, in which our social systems institutionalizes collective co-responsibility as a driving force for socially desirable innovation, by giving innovation a direction and whenever possible, shaping its characteristics. This can occur by acting upon the current deficits of the innovation system which reinforces the problematic assump-

tions that markets automatically deliver on normatively better innovations and that the benefits of technological developments are reduced to success on the market. Institutionalisation of collective co-responsibility becomes possible through institutional change (or evolution if you wish) of our social systems. The scientific and public policy sphere can evolve through establishing a science-policy interface which adopts the new function of knowledge assessment and foresight. The economic and scientific system can also further evolve by public governance which not only provides constraints for technological developments but also incentivizes research and innovation actions favouring particular socially desirable outcomes. This requires, among others, an alternative funding system for publicly funded research as well as socio-political innovations concerning the development of non-legislative actions such as code of conducts and public-private partnerships in order to overcome and compensate for market-failures in delivering socially desirable outcomes (see in further detail: Von Schomberg, 2019).

Collective co responsibility is a driving force for those developments and would signify a shift of a currently institutionalised ethics of 'constraints' to an institutionalisation of an ethics of collective co-responsibility under a new innovation paradigm. This would enable the normative design of our social systems and the technologies it produces. I am indebted to Apels thinking who inspired me to develop the concepts underlying responsible innovation.

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