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## Summary

**(Chapter 1)** This book is a contribution to transdisciplinary (especially human-science-based) sustainability research, i.e. research that follows substantial issues rather than disciplinary boundaries. It deals with resource and sink problems, climate change in particular, but also with the major effect of fossil fuels (and livestock farming) on various other environmental problems such as biodiversity loss, disturbed nitrogen cycles, soil degradation, etc. In particular, it deals with the conditions of social change, effective political and legal instruments and well-founded and balanced normative objectives, i.e. questions of justice.

In methodological terms, research on transformation and change, or on motives of human behaviour in general, faces particular challenges because common methods for acquiring scientific knowledge such as surveys or experiments are less reliable than generally assumed, and the pursuit of quantifiable and reproducible facts as well as formalised models and scenarios also contain many pitfalls. This is solved by a new pluralistic approach in the present book, with a strong focus on informal qualitative perspectives. This has also consequences for the research on instruments for transformation and change.

As a definition, justice means the rightness of the order of human coexistence, just as truth refers to the correctness of factual statements. Social distributive justice as a category of material distribution issues is only one element of justice. Sustainability is defined as the political, ethical, and legal demand for more intertemporal and global justice, i.e. the need for sustainable ways of production and consumption. In contrast, a three-pillar concept of sustainability is misleading and askew for a number of reasons. Likewise, sustainability indicators are not a convincing alternative to an ethical-legal normativity, even if they are not oriented towards a pillar logic, for a number of reasons.

Taking stock, the usual fixation of the political debate on financial crises, economic growth, social security, war against terrorism and jobs as a constant distraction from the sustainability issue is proving to be problematic. On the other hand, the correct handle on various resource and sink problems is decisive for the lasting and global sustainability of lifestyles and economies. In order to comply with a 1.5-degrees-temperature limit set out in Article 2 para. 1 of the Paris Agreement (PA), fossil fuels will have to be phased out in the areas of electricity, heat, fuel, material use, and agriculture in two

decades. The phase-out of fossil fuels stands for avoiding the particular devastating consequences of climate change such as millions of deaths, wars and civil wars on resources such as food and water which are getting scarcer, migration flows, massive natural disasters, but also for avoiding exploding oil and gas prices, etc. Addressing fossil fuels – and livestock farming – also stands for tackling various environmental problems such as biodiversity loss, disturbed nitrogen cycles or questions of public health. The countries of the EU are by no means “pioneers” in terms of per capita ecological footprint and supposed reductions (which have so far been exclusively the result of arithmetic tricks). The situation is similar for various environmental areas.

As regards sustainability strategies, the purely technological approaches of consistency and efficiency alone (!) are not sufficient. A debate on this only makes sense, if measured against clear targets such as those set out in Article 2 para. 1 PA. With regard to that, the sustainability challenge is simply too great for a purely technological approach. Sometimes, there is also a lack of possible technological options, especially for environmental problems beyond climate change. Behavioural changes (frugality) must therefore always be taken into account, on a voluntarily basis or not, also because of the manifold ambivalences and possibly also overestimations of renewable resources as well as some ecologically and economically rather unsustainable technical options such as carbon capture and storage (CCS), nuclear energy, geo-engineering or massive afforestation. Frugality does not stand for a normative idea of a good life; as such it would not be tenable ethically and legally under the auspices of liberal democracy. A possible overall concept for consistency, efficiency and frugality in relation to the energy-climate topic will be developed during the course of this book.

The necessity of frugality puts sustainability in a tense relationship to the growth idea that dominates everything today, because new technologies are (possibly) growth-compatible, whereas a reduction in the demand for services and products poses a big challenge for growth. The hope that a mere “decoupling” of economic growth and environmental consumption is sufficient implies – in view of the insufficient scope of conceivable technical measures – accepting far-reaching threats to humanity. “Qualitative growth” of a seemingly non-material nature is unlikely to solve these problems. According to all experience such an allegedly non-material growth is partly itself materially shaped. Furthermore, the idea of constantly (and thus exponentially) improving social care services, knowledge of music, enjoyment of nature, health, enjoyment of art, etc. seems extremely difficult.

The gradual transition to a post-growth society – not deliberately, but induced by effective environmental protection – raises a number of questions for the pension system, the state budget, companies, the banking system and especially for the labour market. Concepts for this are still in their infancy; even more so are concepts for the process of transition to a post-growth society. Whether such an economic form could still be called “capitalist” is questionable, but this issue should not be overemphasised. Notabene: Even if frugality is really necessary, a consistent change in sustainability is probably still more economical than a business-as-usual strategy, which would ultimately lead to catastrophic distortions.

In epistemological terms, theoretical, normative and instrumental rationality can be distinguished. Rationality conceived purely empirically by economists,

sociologists and others is misleadingly reduced to facts and preferably countable things. Also, in transdisciplinary sustainability research, another epistemological basis is the distinction of is and ought and – diagonally to this – an objective-subjective distinction. Facts are, in principle, objectively identifiable. Difficulties of proof and uncertainties also play an important role in sustainability issues, but they do not change this basic insight.

Law is ethics in concrete and sanction-reinforced form, while ethics is able to substantiate the basic principles of law on a universal level, if necessary. Beyond that, ethics adds little to the legal argumentation and balancing of different principles. Throughout the entire book, there is thus a parallelisation of statements from an ethical and legal perspective. Contrary to a widespread opinion, there is nothing normative about proposing policy options. Alleged non-objectivity of normativity is not convincing either.

**(Chapter 2)** Both the slow transition to new technologies and the lack of behavioural changes need explaining. This will only succeed if the many disciplines contributing to behavioural science (sociology, psychology, sociobiology, economics, ethnology, religious studies, history, etc.) are looked at together to form an overarching theory of individual and collective change. On the road to this transformation research, some fundamental methodological problems and categories must be taken into account (see above). The success or failure of the transformation towards more sustainability, which has essentially failed so far, can be explained, like any social condition, in looking at the complex interaction of individuals. Most important for analysing social change are complex interactions of various actors that culminate in vicious circles e.g. of politicians and voters as well as businesses and consumers. The sole emphasis on factors such as political and economic power or the role of consumers leads to abridging analyses. The complex interaction and vicious circles do not arise primarily from a lack of knowledge about sustainability. The relevance of knowledge to behaviour is widely overestimated and it is overlooked that factual knowledge does not prove normative objectives right or wrong.

Important, but sometimes also overestimated, are the factors of self-interest, path dependencies, problems with collective goods, and values – that assume a person who acts consciously and calculatingly throughout. The irrational and unconscious or semi-conscious factors that influence the behaviour of politicians, entrepreneurs, voters/consumers, lobbyists, media representatives, etc. are constantly overlooked. Such factors are conceptions of normality (not to be mistaken for values) and emotional factors such as convenience, habits, a lack of orientation in spatio-temporal distance, denial, a lack of thinking in complex causalities, dissonance of talking and acting, striving for recognition, etc.

All these factors are reflected within an individual and as a structure; the dispute over supposedly individualistic versus supposedly collectivist approaches to explaining behaviour and change is proving to be of little consequence. Generally speaking, having a look at real-life individuals instead of remaining too abstract, makes the real motives more transparent. The emergence of unsustainability can be seen as a prime example of these diverse motivational factors and conditions of social change.

Diagonally to the motivation factors mentioned above, it can be said that a lack of sustainability is based on a mixture of biological, cultural (including economic, e.g. capitalism-related), biographical and external factors. Findings from sociobiology and brain research can contribute to explaining human behaviour; neither their radical rejection nor their overestimation proves to be tenable. However, today, we see a historically unique situation of comprehensive danger to human livelihoods as a particular manifestation of self-interest, conceptions of normality, values, etc. This can only be explained by additional consideration of cultural factors. A special cultural aspect is the genesis of modern economics, natural science and technology in a complex interaction with originally religious, today often secularised values. The objection that people were – so the claim – in reality largely cooperative (or, even more so, altruistic) and only became what they are today through capitalism, proves to be crooked. Such an objection is empirically implausible, and it neglects the – in parts – biological nature of humans. In addition, it mixes the analysis of living conditions of today and the more recent past with living conditions of the Stone Age and forgets that sustainability is not about collaboration in a small group of hunter-gatherers but between billions of people that will never know each other. Furthermore, focussing on (the cultural factor of) capitalism neglects that an economic system consists of complex interactions of managers, workers, trade unions, consumers, politicians setting the framework for economic activities, and people voting these politicians into office.

The findings of happiness research cannot serve as an objection either. They show that people can be happy with different levels of material wealth. However, there is no clear evidence that a change towards sustainability per se makes all people happier; nevertheless, the necessary transformation holds potential for happiness. Despite of all non-sustainable developments, however, the freedom- and wealth-creating effects of capitalist economic activity should not be overlooked.

Consequently, social change in general and transformation towards sustainability in particular are only possible through the interaction of different actors and by influencing those motivational factors which can at all be influenced. Self-interested economic-peace-political, ethical and eudaemonistic (luck-related) considerations could certainly motivate a genuine behavioural and technological change towards sustainability. But for this, self-interest calculations need to be reconsidered, values revised, knowledge used more strongly, path dependencies altered, problems with collective goods addressed, and above all conceptions of normality transformed. This requires a variety of activities by different actors, ranging from completely different policy approaches to the (not verbal or only occasional) establishment of a new day-to-day behaviour of people. Because of the interdependencies, one actor alone cannot bring about the sustainability change. Asking for the one and only relevant actor takes the debate to pointless chicken-and-egg games.

**(Chapter 3)** Non-sustainable societies can therefore be explained descriptively, but can sustainability be justified as a normative goal? The factual influence of values on our behaviour is limited. But when we ask what is normatively right, talking about values is the crucial level. Sustainability, in the sense of intertemporally and globally tenable ways of life and production, is a normative requirement. In order to

justify this ethically and legally, a new foundation of universal justice is necessary. Common ethical approaches, which are intended to show the possibility of objective normative statements, prove to be not very convincing on closer inspection. The present theory of universal justice explores the limits of normative rationality and demonstrates that there is considerable scope for balancing without rendering normative questions purely subjective. Furthermore, the area of good living proves to be rationally intangible.

The variant of universal justice developed here as the basis of ethics and law and thus also the concretisation of sustainability is a heterodox discourse ethics. It is designed as the basis of a revised ethical and law-interpretive conception of liberal democracy with human rights and separation of powers at the national, European and international level. In particular, the argument that there is no alternative and an elenctic argument justify (a) the possibility of reason in questions of normativity and (b) human dignity, i.e. the respect for the autonomy of the individual, and impartiality as (the only) universal principles of justice that logically cannot be denied without self-contradiction. This proves right not only in discourse, but also in practice and also vis-à-vis merely hypothetical discourse partners, i.e. vis-à-vis all human beings. These principles provide the basis for a comprehensive universal right to liberty, which is not limited to certain areas of life, to a democracy with separation of powers, and to a duty to guarantee all this legally.

This entire approach, centred around the liberal-democratic basic principles of reason, dignity, impartiality and freedom (and democracy with separation of powers), which in their (still unclear) connection appear for the first time with Kant, can be read as crucial modification of classical discourse ethics. In contrast, contextualistic, metaphysical and skeptic (including empiricist, e.g. utilitarian and cost-benefit-analytical) approaches which compete with a liberal-democratic universalism of discourse-ethical character prove to be unconvincing. This also applies to other versions of liberal-democratic theory such as those of Rawls or Sen.

In order to determine concrete sustainability contents, an interpretation of the concept of sustainability itself or of topoi such as a legal “state objective for environmental protection” is not very promising, because it remains too vague. Rather, a new ethical and legal interpretation of human rights in the sense of overcoming a primarily economy-oriented understanding of freedom makes sense. This provides an ethically and legally stable basis for sustainability while at the same time overcoming the incompleteness of liberal-democratic philosophies. All statements on justice are statements on the social level. Ethical obligations of the individual that go beyond the obligation to bring about a just – including sustainable – social order are difficult to imagine *inter alia* due to a lack of concreteness under the auspices of sustainability problems as quantity problems. This is one of the reasons why human rights are always conveyed through public authority, even if their origin lies in the relationship between individuals.

In general, human rights prove to be rights to freedom and to the elementary preconditions of freedom. A distinction of negative and positive freedom does not work. The ethical and legal interpretation that human rights only protect selected, supposedly particularly valuable freedom activities, is equally unconvincing. The

human-dignity principle (understood as the required respect for the autonomy of the individual, i.e. the principle of self-determination) and the impartiality principle (understood as the required independence from specific perspectives) are not fundamental rights, nor are they intended to say anything at all about a concrete ethical or legal individual case. Rather, they are the basis for justifying and interpreting freedom and thus also for a sustainability-oriented reinterpretation of freedom, of the rules of balancing, and of democratic institutions. All this and more applies to liberal-democratic nation states, to the EU and also to international institutions and organisations – also based on a further developed figure of general principles of international law.

Ethically and legally (also on a transnational level), as normative essence of sustainability, there is a right to the elementary preconditions of freedom. This means conditions such as life, health, subsistence level in the form of food, water, security, climate stability, elementary education, absence of war and civil war, etc. The protection of other freedom-promoting conditions, on the other hand, has no ethical or legal human-rights status, but nevertheless deserves recognition, albeit not as a duty of the public authorities to act. This is where sustainability concerns are located if they are not elementary to freedom. – The possible alternative to the existing concept of freedom, which would be an ethics of capabilities or need, is rejected due to a number of logical and legal issues, problems of application, and illiberal tendencies.

The freedom outlined in this way, including its elementary preconditions, deserves legal and ethical protection also intertemporally and globally, and thus leads to a human-rights-based theory of sustainability. In particular, arguments for this intertemporal and global extension can be formulated under aspects of potentiality and freedom protection where freedom is endangered. Counterarguments against an intertemporal-global protection of fundamental rights such as the future-individual paradox or the reference to unknown preferences of future generations are ultimately not convincing. The precautionary principle can be classified as a sub-aspect of human rights; it reflects their protection even in uncertain, long-term and multi-causal risk situations. Furthermore, freedom also contains protection by the state, not only defense against the state. These insights are not rendered irrelevant by certain widespread objections to such a multipolar understanding of freedom (e.g. in relation to democracy and the separation of powers). The classical distinctions of action and omission and also deontology versus consequentialism thus latently lose their object. Only in view of all of these steps it is possible to interpret human rights in a manner which includes the protection against climate change, dwindling resources, etc. and thus concrete normative sustainability criteria become conceivable.

Environmental-ethical pathocentrism or eco-centrism can make no additional contribution to the normative theory of sustainability issues, since these approaches prove to be untenable at closer inspection. Nevertheless, environmental protection has a comprehensive ethical and legal justification. In general, freedom is limited only by freedom and the preconditions of freedom of other people, not by any form of common good or the like, which should rather be rejected as a concept. Questions

of the good life elude regulation, which is why the ethical and legal justification of sustainability measures does not refer to the subsequent possibly greater happiness of those whose freedom is restricted. Discourses on frugality and nudging, for example, are often based on false assumptions in this respect. Main issues of the welfare state can be identified as sustainability phenomena, taking the threat of climate change into account, although the possibility of objectively answering distributional questions is often overestimated.

Ethical and legal decisions can only be understood as a balancing situation (between various freedoms, elementary preconditions of freedom, further freedom-promoting conditions and everything that can be derived from all of that). Any sustainability decision is thus marked by normative and factual uncertainties (which is usually overlooked). Concrete problems such as “strong versus weak sustainability” or the relevance of a specific argument can only be meaningfully resolved within this theoretical framework.

The ethical and legal theory of sustainability is also developed as a transformed theory of democracy and of balance of powers. The main victims of today’s unsustainability are not voters of today’s parliaments and governments, but future generations and people in other countries. Sustainability is thus in conflict with democracy, to which it – on the other hand – has an affinity because of the necessity of discourses and learning processes (which also rules out any kind of eco-dictatorship). Institutional innovations compared to the existence of democracies based on separation of powers are only indicated to a limited extent in the context of sustainability. The most important point is to establish liberal-democratic institutions on an international level in addition to the national sphere.

The right balancing rules, which are the very basis for normative sustainability statements, can be obtained through a legal and ethical balancing theory, which goes beyond traditional legal and ethical approaches and sociological risk theory. These balancing rules outline the scope of normatively rational statements which are possible to make e.g. on sustainability and which are based on liberal-democratic principles. Rules of procedure and fact-finding rules can also be derived, as can a new human-rights understanding of the precautionary principle in law and ethics. There are also rules for taking new findings in valuations and facts into account.

In the interplay of the powers (nationally and transnationally), the violation of balancing rules leads to an obligation to make a new decision in compliance with the previously violated rule – and thus ultimately to an obligation to (significantly) more sustainability. Violated rules in terms of sustainability concern e.g. the factual basis of climate policy to date and the polluter pays principle. The most important rule for the context of sustainability is the prohibition to ruin the basis of balancing as such by depriving its physical foundations. In spite of all remaining leeway, this already carries a human rights obligation similar to the extent of the 1.5 degrees temperature limit in Article 2 para. 1 PA. A partly similar statement can be made for other resource and sink challenges, but not for all of them. If using further balancing rules such as the polluter pays principle and economic capacity, it is also possible to give some indications as to how the efforts and costs of mitigation and adaptation should be distributed globally.

All this is also meant as an alternative to the economic cost-benefit analysis, which ultimately represents an empiricist ethics in disguise. It is not only based on a (hidden) untenable normative basic theory and has unsolvable application problems. It also finds itself in insoluble conflicts with a liberal-democratic legal system that does not allocate rights according to solvency and does not primarily organise votes as plebiscitary snapshots.

**(Chapter 4)** On the basis of the normative theory of sustainability just laid out, effective implementation measures can be identified. In a first step, a number of promising starting points can be identified for individual and entrepreneurial action as well as for educational measures. Education, voluntary corporate social responsibility (CSR) and consumer engagement can play a role, but they cannot eliminate the need to contain capitalist economic activity and daily life through effective policy instruments, especially with regard to sustainability. Knowledge and intrinsic (self-interested or value-driven) motivation alone cannot trigger the necessary transformation. At the level of the individual person or company, it is also not possible to prescribe sufficiently precisely what each of the actors has to achieve individually. In addition, there are some general governance problems with regard to addressing single actions (such as shifting effects and rebound effects: see below).

At the political level, there has been an impressive collection of sustainability programmes and declarations on an international, EU and national level to date, although this collection is conflicting with the still large ecological footprint per capita. This also applies to the much-discussed stipulations in the UN Framework Convention on Climate Change (UNFCCC), in the Kyoto Protocol and now in the Paris Agreement, which sets a very ambitious temperature limit, but falls far short in all details of establishing instruments of implementation. The previous sustainability governance in terms of command-and-control law, information law, subsidy law, and procurement law offers a diverse picture which, overall, is not very effective measured against the ambitious (!) objectives (and only this way the effectiveness of instruments can be analysed). Keywords for severe governance problems especially with regard to sustainability include direct and indirect rebound effects (which also include wealth effects), resource-related, sectoral, and spatial shifting effects, lack of rigour, enforcement problems and problems of depictability. These governance problems can only be solved if sustainability issues are consistently understood as (mostly) quantity problems and which require ambitious quantity limits. Thus, those need to be established as core instrument of sustainability policy.

The most promising approach of quantity governance in terms of sustainability would be a cap (and trade) approach or a similarly structured levies on central noxious agents. Given this is construed in a substantially and geographically broad way and with a clear orientation towards ambitious goals, the above-mentioned governance problems can be solved. Furthermore, the diagnosed motivational situations of citizens, companies and politicians (self-interest, conceptions or normality, etc.) can be adequately addressed – in a freedom- and democracy-friendly manner. Questions such as “certificate markets or levies”, “overall market or submarkets” or “cost-efficiency” are mostly overestimated, as is the question of which instruments

should be labelled as economic or regulatory. The idea that the controlling effect of prices is only limited (allegedly due to price elasticity of demand) is based on several false assumptions. The existing EU emissions trading system (ETS) in the climate sector, however, solves almost none of the problems just listed, and neither do various tax approaches.

The key instrument for climate protection as well as for other environmental problems would be a strict cap on fossil fuels in line with the temperature limit in Article 2 para. 1 PA. This could be achieved by means of a completely revised emissions trading scheme that integrates all fossil fuels (instead of merely some industrial sectors) and commits to strict caps and closed loopholes. This could be started by the EU and other willing states and thus gradually removing fossil fuels from the market within two decades. For individual citizens and businesses, this would result in increasing and soon relatively massive price incentives in favour of more efficiency, more renewable resources and, as is mostly neglected, frugality (whose necessity due to the very ambitious target is typically ignored in the economic discourse). The approach could gradually be extended to a global scale. The revenues of the system would essentially contribute to financing mitigation and adaptation in the participating countries of the Global South. An important complementary instrument are border adjustments towards non-willing states for imports and exports. Shifting effects for emissions or resource consumption (and competitive disadvantages) are thus avoided, and pressure is exerted on other states to participate in the system. At the same time, the economic viability of an effective sustainability policy can be demonstrated, ultimately paving the way for later global agreements.

A quantity-controlling approach can be even advantageous from the point of view of social distribution, especially on a global scale, but also with regard to social inequalities within industrialised countries. It addresses both the long-term fatal social impacts of climate change and resource depletion as well as poverty reduction in developing countries. In addition, the model favours the establishment of administrative, educational and welfare institutions in developing countries, which will probably lead to slower population growth (which, like demographic change in general, is overinflated as a cause of problems and too little recognised as their consequence). Furthermore, in the North and South, permanently available and affordable energy is secured, a global race to the bottom in terms of eco-social standards is avoided, and positive effects on the labour market are also likely. In addition, compensation on a global scale and to a lesser extent also for the socially weaker in the industrialised countries is conceivable from the revenues of a quantity governance system. Global concepts for resource and sink problems can thus be linked to combatting poverty.

If an integrated solution is to be sought for various environmental problems (climate, biodiversity, nitrogen, phosphorus, soils, water), a rapid phasing-out of fossil fuels is key. But a cap for livestock farming is similarly important. In connection with capping fossil fuels, this would trigger far-reaching changes also in agriculture, e.g. in the direction of organic farming, pasture farming and significantly lower consumption of animal food, which would in total greatly relieve biodiversity, soils,

water, nitrogen (and phosphorus) cycles and public health. Other pricing instruments are also conceivable, at least for soils.

In addition, in order to avoid hot spot problems and path dependencies, a number of supplementary command-and-control rules and prohibitions remain important in the area of sustainability, for example as additional tool to save biodiversity. This would, however, be more selective and, moreover, would involve stricter and more stringent regulatory law in terms of content and enforcement than is currently the case. The same applies to informational and planning instruments. In contrast, direct pricing of control variables that are difficult to grasp, such as biodiversity, is not very effective.

A sustainability policy that is pursued by a group of willing states has to assert itself against a global, borderless world economy. Cross-border free trade in particular has typical social and ecological defects and calls for regulatory containment of capitalist economic activity. This is true not only in terms of sustainability (in order to avoid shifting effects) but also in terms of democracy which is put under pressure by globalisation minimising the decisive power of domestic parliaments (legally and factually). The current state of establishing global liberal-democratic institutions is ethically and legally only partially compatible with the justification of a universal, global and intertemporal liberal-democratic law and ethics. At least, a sustainability pioneering role of some states is not prohibited under international trade law, including border adjustments for imports and exports. All in all, a categorical rejection of free market systems remains unconvincing even considering the concept of free trade.

The theory of sustainability presented in this book offers some new aspects (based on my earlier publications, especially those in German), which are of considerable importance for various human sciences:

1. A revised justification for a (heterodox discourse-ethical) universalism is offered, i.e. for why and to what extent normative questions can be objectively decided with reasons.
2. A new concept of freedom is offered, which on the one hand is comprehensive and on the other hand does not lack the legal background and the differentiation that is necessary to make it matter.
3. On the basis of these points, a system of liberal-democratic decision-making is developed which neither overestimates the exact decidability of single questions nor is restricted to very vague statements like many ethicists, nor does it rely on cost-benefit-analyses (which are easily attackable). This includes clearly derived outer boundaries of balancing.
4. A complex behavioural theory (based on methodological triangulation) is offered on how human motivation and individual and social change work without the constraints of economic, sociobiological, sociological etc. approaches – without an unconvincing dichotomy of individual versus structure – and without relying too heavily on experiments and surveys.
5. Several typical governance problems (e.g. different types of shifting effects) are identified as core problems of effective governance in achieving given policy

objectives. Economic instruments have the major ability to solve those governance problems, to address human motivation adequately, to focus on easily graspable governance units such as fossil fuels, and to, therefore, meet ambitious sustainability objectives. This is the case given that they are established on a broad geographical and substantial scale – beyond previous considerations on economic efficiency.

6. It is shown that (in addition to human rights) binding obligations under international environmental law, such as those under Article 2 para. 1 PA or under the CBD, trigger much more far-reaching obligations in one or two decades than generally assumed.
7. It is shown that the timely complete phase-out of fossil fuels in all sectors (not only electricity, but also heat, mobility, agriculture or plastics) as well as the drastic limitation of livestock farming provides a particularly large problem-solving capacity for various environmental problems.
8. A necessary (but not the only) sustainability strategy is frugality; its post-growth implications are considerable but not insoluble.
9. One should stop believing the empiricist fairy tale that human scientific research can and must be based solely on facts – or even on quantifiable and reproducible facts.

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## Glossary

**Balancing** means weighing different normative goods. It is inevitable with regard to normative decisions, ethically and legally. However, the economic cost-benefit analysis is not a convincing balancing theory (Chaps. 3.5 and 3.9).

**Balancing rules** can be derived from the liberal basic principles of reason, dignity, impartiality, freedom, democracy and separation of powers. They frame the scope of objective statements possible regarding normativity (Chap. 3.6).

**Capitalism** does not consist solely of the principle of growth, nor is it identical with market economy. The criticism of capitalism partly makes false assumptions and overlooks its potentials (Chaps. 1.4, 2.6, and 4.11).

**Command-and-control law** – working with bans and obligations – is susceptible to certain governance problems because it focuses on individual products, investments or activities. Nevertheless, it must provide essential additions to economic policy instruments for sustainability (Chap. 4.10).

**Cooperation** can be driven by self-interest or altruism. Some overestimate and some underestimate the importance of cooperation for human behaviour, inter alia with regard to sustainability (Chap. 2.6).

**Culture and biology** are the background to all motivational factors – the dispute over sociobiology shows that the dominant desire to latently deny one of the two factors is flawed (Chaps. 2.3 and 2.5).

**Consistency, (technological) efficiency and frugality** represent three sustainability strategies. The first two focus on technically smarter production and consumption (consistency, for example through recycling). Frugality, on the other hand, focuses on less production and consumption.

**Corporate social responsibility and sustainable consumption** as an instrument of sustainability rely on voluntary action by companies and consumers. These approaches take too little account of the interaction between the actors, the motivational situation and the difficulties of concretization on the level of single actors (Chap. 4.2).

**Economic policy instruments** working by means of direct or indirect pricing of resources or sinks – can be designed as quantity control and thus adequately address sustainability as a quantity problem – and they also fit better with human motivation and the liberal basic principles than other governance instruments.

- Empiricism** means an epistemology and at the same time a sceptic theory of justice, which are both not able to convince in essential respects (Chaps. 1.6, 1.7, 3.1, and 3.9).
- Environmental humanities** means research in disciplines such as economics, law, philosophy, political science, sociology, cultural studies, ethnology, etc. on questions of environment and sustainability – preferably from a transdisciplinary perspective (Preface, Chaps. 1.1 and 1.7).
- Epistemology** means the theory of what can be objectively recognised in facts and, if necessary, in norms. This also includes basic distinctions such as objective versus subjective, is versus ought, genesis versus validity (which do not coincide) – and a critique of some aspects of constructivism (Chap. 1.6).
- Fossil fuels** (oil, coal, gas) are the main driver of various environmental problems such as climate change, loss of biodiversity, human diseases, disturbed nitrogen cycles etc. due to their omnipresence in electricity, heat, mobility, plastics and in the agricultural sector (Chaps. 1.2 and 1.3).
- Free trade** and WTO can – in principle – fit well with free democracy, but only with constitutional and sustainable framing (Chap. 4.11).
- Freedom** is the object of human rights. Under the auspices of sustainability, the understanding of freedom must be expanded, inter alia to include the elementary preconditions of freedom, an intertemporal and global dimension and an element of precaution (Chaps. 3.2, 3.3, and 3.4).
- Good life** (roughly equivalent to happiness) is the antonym to justice and describes an area that is legally and ethically inaccessible to any regulation (Chap. 3.4).
- Governance** is about effective means – i.e. policy instruments – to implement policy objectives (and to balance them against other values or objectives) and sustainability strategies resulting from the objectives (Chaps. 1.7 and 4.1).
- Governance problems** such as rebound effects or shifting effects are typical obstacles to effective sustainability policy that can be empirically measured and derived from behavioural research (Chap. 4.4).
- Happiness** is empirically investigated in happiness research. The findings are ambivalent in terms of sustainability – and there is nothing normatively that can be said about happiness in liberal democracy (Chaps. 2.6 and 3.4).
- Human rights** mean (ethically and in national, European and international law) the rights to freedom and the elementary preconditions of freedom. Human rights and fundamental rights are synonymous for the purposes of this book (Chaps. 1.7 and 3.2).
- Individual versus structure** (or micro versus macro) is a popular distinction in research on behaviour and societies (Chap. 2.1), but it is ultimately not feasible.
- Interconnectedness** refers to the way politicians, citizens, consumers, entrepreneurs and other actors influence and depend on each other. It is thus a chicken-and-egg game to ask for the main responsible entity (Chaps. 2.1 and 4.2).
- Integrated solutions** for various sustainability challenges such as climate change, biodiversity loss or disturbed nitrogen cycles are necessary. What is needed is addressing the overarching drivers such as fossil fuels and livestock farming (Chap. 4.9).

**Justice** means the rightness of social order and human behaviour. In contrast, truth means the accuracy of statements about facts. Social distributive justice is a sub-aspect of justice regarding distributional issues (Chaps. 1.6 and 1.7).

**Knowledge and values** are constantly overestimated as motivational factors of human behaviour. But if one does not ask descriptively what drives us in fact, but asks normatively what we should do, values are the sole yardstick (Chap. 2.2).

**Law and ethics** are normative systems, of which law is characterised by greater concreteness and the existence of state sanctions (Chaps. 1.7 and 3.1).

**Liberal democracy** is based on the liberal basic principles of reason, dignity, impartiality, freedom, (representative) democracy and separation of powers (Chaps. 3.2 and 3.5).

**Liberalism, scepticism, contextualism and metaphysics** are different basic approaches to the theory of justice. Only reason-based liberalism can convince (Chap. 3.1).

**Livestock farming** is – besides fossil fuels – the second major driver of various environmental problems (Chaps. 1.2 and 4.9).

**Marxism** is a theory which tries to overcome the distinction between is and ought, but without success – and which empirically and normatively encounters many frictions (Chaps. 2.6 and 3.1).

**Methodology** with regard to sustainability must be multi-methodical and qualitatively oriented in essential parts, for example when it comes to human behaviour and governance. The methodology is different when it comes to normative questions, e.g. the interpretation of the law (Chap. 1.7).

**Motivational factors** help explain the behaviour of citizens, consumers, politicians, entrepreneurs and other actors. They include e.g. self-interest, values, emotions, conceptions of normality, knowledge and structural conditions such as path dependencies and problems of collective goods (Chaps. 2.3 and 2.4).

**Paris Agreement** is the most important global environmental agreement, which is vague in many respects, but sets a very ambitious – and legally binding – climate target in its Article 2 (Chaps. 1.2 and 4.3).

**Ping-pong of change** means that social change is possible in an interplay of interdependent social actors such as politicians, citizens, consumers, managers, etc. (Chap. 2.7).

**Post-growth or degrowth** means an economy without economic growth or even with processes of shrinking – possibly necessary for sustainability, but with considerable and partly unsolved consequences (Chap. 1.4).

**Rationality or reason** means the ability to decide questions based on reasons. A distinction must be made between theoretical, instrumental and normative reason (Chap. 1.6).

**Sustainability** means the expansion of ethics, law and politics in intertemporal and global terms, i.e. intertemporal and global justice. In contrast, a three-pillar model of sustainability is not convincing (Chap. 1.5).

**Sustainability governance** seeks an effective implementation of (human-rights-based) sustainability goals. Caps for fossil fuels and livestock farming play a key role for that (Chap. 4.6).

**Sustainable Development Goals** have been established by the UN for a bouquet of relevant policy areas. They are legally non-binding and also partly contradictory (Chap. 4.3).

**Transdisciplinarity** means discussing science not from the perspective of a particular discipline (and its unquestioned dogmas), but on the basis of substantial problems – and thereby incorporating all disciplinary knowledge on these problems. Furthermore, transdisciplinarity is open to knowledge stocks outside the institutionalised scientific system, which is self-evident in an objective concept of rationality (Chap. 1.7).

**Uncertainty and risk** are characteristic of sustainability issues – with regard to both facts and norms. There are ethical and legal rules for dealing with them (Chaps. 3.6 and 3.7).

**Universalism** refers to justice in all societies – and globalism designates justice across borders between all societies (Chaps. 3.1 and 3.3).