DISTRIBUTABILITY PROBLEMS AND CHALLENGES TO THE FUTURE RESOLUTION OF RESPONSIBILITY CONFLICTS

Hans Lenk, University of Karlsruhe

We can understand human beings as normative beings which means that they are morally distinguished from other creatures by the capacity to bear, acknowledge, consciously identify, and accept responsibilities for their individual and group actions and role fulfillments and, beyond this, for the lives, limits, and well-being of other humans and creatures as well as, and increasingly for the state and development of ecosystems. Humans are, so to speak, the moral beings. Yet, moral responsibility is but one sort of responsibility which might be located within a rather complex realm of different responsibilities. For example, those engendered by contracts or some other mutual agreements which might not necessarily be moral in a narrow sense, i.e., they might not affect the life, limbs, psyche, and well-being of other people or living beings in general. These might be called ethically neutral. But they are still normative, and prima facie, to be abided by the respective persons who have taken on these responsibilities. In addition, these ethically neutral responsibilities might conflict with moral duties and ethically relevant obligations.

Here, a differentiation of different sorts, types and levels of responsibility seems required for decision making—especially in the increasingly complex interconnected and globalized societies we must anticipate.

ENGINEERING AND MANAGEMENT ETHICS—TWO HATS?

Should a manager just follow up with managerial and economic strategies for maximizing profit in the implementation of new and risky operations and strategies? Or, should risk for lives and limbs of other people and technologies be avoided? Is safety to be valued first—even at the cost of economic development and profit maximization? Should an engineer in middle management "blow the whistle," and warn the public about expected risks? Should loyalty to the firm,

supervisors, or career override moral responsibility concerning the safety of the public? Must moral responsibility take precedence over contractual responsibilities, even recognizing that contracts have a moral dimension insofar as we are morally obliged to obey the law. There is also a question of whether moral responsibilities in economic or technological matters are identical or overlapping, or maybe at odds with each other.

An affirmative answer would amount to the thesis that moral judgments in economic or technological matters could be in conflict with each other, or at least within some region of overlap. Indeed, one could argue that ethical problems in economic matters are more far-reaching than ethical problems in technology because there are many problems in the economic management and distribution of jobs, etc., which are not directly relevant to or influenced by technological factors. However, basically there is a large overlap between the two fields, and as far as technology is involved, and technological implementation at stake within economic decision making, the problems of ethical relevance in both fields are pretty much the same or at least closely connected with each other.

Evidently this close relationship has been ignored in the analysis of the moral responsibilities of safety managers. This might be dramatically illustrated by the analysis of the 1986 Challenger catastrophe. Seventy-three seconds after take-off from Cape Canaveral the manned spaceship exploded and seven astronauts lost their lives. A direct cause was a brittle sealing ring of rubber which, according to expectation and warnings from the engineers at Morton Thiokol, broke under the conditions of temperatures below freezing. One day before take-off the engineers, most notably Allen MacDonald, the project leader, and Roger Boisjoly, the expert on sealing rings, had argued against launching on the next day. They informed NASA about the danger that the sealing rings could break at such low temperatures. They were assisted by the deputy director of the engineering department, Robert Lund, who also informed Jerry Mason, a superordinate engineer at Morton Thiokol. Mason, however, silenced Lund, and finished the debate by saying, "Take off your engineering hat and put on your management hat." Lund gave in and gave his consent to launch to the project leader of NASA, who then okayed the take-off without mentioning any doubts. The catastrophic accident ensued. (Later on, the engineers who had issued the warnings, MacDonald and Boisjoly, were transferred to another department, an action they deemed a kind of quasi- punishment after the fact.)

In any case, the example shows immediately how intriguing the problems of responsibility, its interpretation, and its distribution are: Who was responsible in this case? Everybody who had been involved? Just NASA, no one individually? Each to a certain degree? How much, then?

Indeed, do managers decide differently from engineers? Is this a case where apparently ethical aspects of decision-making and factual judging diverge for the ethics of technology and economics?

Generally speaking, we can make the following points about the overlap between ethical problems in technology and in economy:

1. Problems of ethical relevance in technology and economics are so closely connected that it does not seem appropriate to separate them, in particular, with respect to control and responsibility for technological and economic development. Thus, the ethics of economics has a larger scope than the ethics of technology; specific problems of ethical relevance in economics as, for example, joblessness, are certainly also engendered or at least influenced by technology.

2. Production, consumption, and exchange processes, as well as technological and economic development in general, are processes in which a multitude of agents are interacting, co-acting, and acting in parallel. These complex actions and interactions have multiple, overlapping dimensions—technical, economic, social, and political—which can only be separated from an analytical point of view. Therefore, only an integrative, interdisciplinary perspective on these processes is adequate. This is all the more true since economics and technology do not figure as autonomous fields or subsystems with their own dynamics, but they are initiated by human beings and have to be controlled as well as shaped by their respective agents, groups, and institutions. In all of these contexts, individual and collective agents have to bear responsibilities for their actions impacting the affected individuals and systems, including responsibilities for the developments and the maintenance, indeed survival, of the respective ecological systems.

3. The relevant agents, units of agency, and enterprises, are socio-economical in character. They are socio-technical systems of action and institutionalized forms of actions, and are shaped by norms and value-orientations.

Any technical or economical action, particularly of entrepreneurs, is a fortiori a social action and has to be judged under the perspectives of social and moral responsibility. The special emphasis on ethical problems of economics and technology is only analytically differentiated. (Even the labeling of goods or things, as well as systems, as means of production and products or systems and artifacts, are perspectival in some sense.) Certainly there are differences in role-taking and respective responsibility. And there are conflicts of values pertaining to special responsibilities. But, in general, there is a close interconnection between both of them: The prominent cases of ethics of technology, like the Pinto case, also involve the ethics of economics.

4. There are differences in the emphasis of values and norms in technology, which is basically feasibility and safety-oriented and aimed at functional operability. By contrast, economic values, like profitability or marketability, are emphasized in the ethics of economics. However, feasibility, efficiency, and energy saving, certainly are guiding values in both realms. The "Guideline" ["Richtlinie"] No. 3780 of the German Engineers Association [Verein Deutscher Ingenieure], which analyzes values, concepts in technology assessment, emphasizes feasibility, functionality, efficiency, perfection, as technological values, as well as the respective economic values like profitability, wealth, etc. Other values like safety, health, environmental quality, development of personalities, and quality of society, are, in a way, characteristic for both fields: they play a certain kind of overriding function combining the technical and the economic values in the narrower sense.

5. Problems of coordinating and distributing activities, as well as responsibilities for these activities and their outcomes, certainly are to be found in both areas. We have also the effects of non-coordinated actions, like traffic jams or the problems of social traps in environmentalism, on both sides.

6. In addition, the interplay of normative and descriptive or theoretical questions is intriguing and characteristic of both fields.

7. The same is true for the dependence on individual agents and institutional or collective structures or organizations. There may be differences in the emphasis and perspectives with respect to leading values, but all of these allow of much overlap between both fields.

In sum, we can say that there are no autonomous or special theoretical disciplines of ethics of technology and ethics of economics, independent of one another, characterized by unique or specific, fundamental principles or criteria deviating from those of the other field and from ethics in general. There is no special ethics for technology or for economics, although there may be special problems and phenomena in these respective fields. It is only in practice that there has been a division of labor between teaching and researcher dealing with business ethics and with engineering ethics. In general, however, problems and phenomena of ethical relevance in technology and in economics are interconnected with each other to such a degree that both fields can only be analytically separated from each other. They have a considerable amount of identity or overlap. In modern industrial societies the ethics of economics cannot be analyzed in isolation without taking into consideration engineering ethics, and, vice versa, ethical problems of technological implementation in industrial societies are always closely connected to ethical questions of economics and social justice.

ADDRESSING PROBLEMS OF DISTRIBUTING RESPONSIBILITY

There is a nice case in the literature illustrating collective responsibility:

A vicar had accumulated a remarkable amount of accomplishments for a hamlet of wine-growers. The wine-growers decided therefore to donate a barrel of wine to him celebrating their thankfulness on a special occasion. Each wine-grower should contribute two litres of his best wine from his cellar. Consequently, everyone of these poured the two litres they had agreed on into the open barrel.

On the occasion of the respective celebration and after solemn speeches the barrel was opened and the first glass presented to the vicar. But the glass contained but pure water, and the festive mood changed to general shamefulness" (Jöhr 1976, 127).

It is not known whether the event mentioned in this example did really take place, but it is a very nice illustration of the problem of distributing responsibility. The example shows immediately how intriguing the problems of responsibility and its distribution are: Who is responsible in this case? Everybody? Not one individually? Each to a certain degree?

Problems of distributing responsibility are to be found today in particular in highly developed industrial societie shaped by technology and advanced economies. Individual action seems to disappear behind collective and group action. Group and collective action is, on the one hand, acting for and within organizations (corporate acting), and, on the other hand, the action of many actors under strategic and competitive conditions. Sometimes these actors can be quite independent of each other. With respect to collective actions there are at least two classes of distribution problems: 1) the problem of attributing and distributing responsibility within the organization, with respect to internal corporate segregation of work and role assignments, as well as with respect to the corporate division of labor and production; and 2) the problem of attributing responsibility in the case of non-corporate collective action (corporations or individuals), with respect to dynamic processes in the development of the markets and technologies.

Today, and for the near future, these problems have become extremely relevant and pressing. This is true, to be sure, not only because of the impact of new systems-technological phenomena and processes on their own, but also because of the high social interconnectivity of action systems and markets, and the evergrowing worldwide interrelatedness of societies in general.

As a rule, philosophy examines cases in which somebody fully and exclusively has to take responsibility. But are there not other cases of co-operative responsibility, collective/co-operative decisions, and collective action in general, that are gaining much more importance today in which someone carries full responsibility by sharing responsibility according to the degree of the individual co-operation or accountability? In other words, does the extent of the distribution of responsibility generally reduce the degree of moral responsibility?

As a provisional thesis, the following insight should be emphasized in regard to this problem: The center of the model of the distribution of responsibility is the question of the distribution of normative and descriptive responsibility—according to a theory of action—and the (equivalent) reduction of the collective responsibility to individual responsibility, which is dependent on the form of collective action and causation. The respective form of collective action is decisive and should, in the following, constitute a criterion for distinguishing various ways of attributing responsibility. A further point of emphasis concerns distribution in terms of the responsibility type. If one makes a distinction between

a duty to compensate and moral responsibility, then division as a means of solution is more likely in the former case than in the latter. Particularly relevant to the distribution of responsibility are negative formulations of preventative responsibility, (e.g., preservation), as well as the responsibility to avoid omissions and failures, which seems to be more suited to regulation by participatory forms of responsibility distribution. One also should distinguish necessary and sufficient conditions of the onset of consequences and damages, depending on the failed, omitted, or unintentionally neglected actions of several actors.

Basic problems of responsibility distribution not only arise out of non-corporate collective action of many actors (be they corporations or individuals), but also out of specific strategic conditions, particularly in capitalist processes where labor is divided and the labor that is in the labor market is external to corporations. The effects, results, and side effects of such actions have always had an increasingly explosive nature. Maybe the difficulty can be clarified with the help of examples and model hypotheses regarding of social traps, which until now were discussed mostly within the realm of individual rationality vs. collective irrationality (e.g., Prisoners' Dilemma, cf. Hardin 1968, Lenk and Maring 1990).

We all know that undesirable effects may occur when a large number of actors act only to promote their own interests. Particular components that on their own are relatively harmless can together result in damages or even the loss of highly appreciated commons or public property. It is characteristic of these damages that property rights, i.e., individual rights to use resources, are poorly defined or not defined at all, or that they are not observed at all.

Externalities are characterized by an incongruity between that outcome for which one is actually responsible and that for which one is made responsible (liable). To avoid such external social costs, these results must be internalized—incorporated into the "production functions" of a business.

Distribution of responsibility comes in at least two forms. In regard to this problem, two sub-problems emerge: First, the question of distribution of responsibility for, or in view of, cumulative and synergetic damages; and, second, the question of responsibility for unforeseen or unforeseeable consequences. With regard to moral judgment, it follows from these sub-problems that personal

responsibility in many situations cannot, in general, be attributed to an individual agent alone, nor, under many circumstances, can the cause be attributed to a single domain. Not only in the sense of task and role responsibility, but also in the moral and legal sense, do the concerned individuals bear a co-responsibility, corresponding to their active, potential or formal participation, to their constituting or influential shares (to be determined in each individual case). An extension of operationally manageable models of the distribution of (co-) responsibility is,—considering the consequences of collective action—imperative. Appeals to the avoidance of social trap situations alone are not very useful. One should also introduce operationally available and efficient measures, such as legal sanctions (product liability, collective responsibility, etc.), financial incentives to change production, and the determination of property rights for public goods, etc. The following rule could serve as a guideline: As many laws, regulations and prohibitions as necessary; as much incentive, individual initiative and individual responsibility as possible.

A different aspect of the problems of responsibility distribution concerns the external responsibility of corporations—i.e., the corporation and some or all of its employees (representative responsibility vs. participatory responsibility), corporation employees alone (reducible to the specific types of responsibility); internal responsibility and co-responsibility; the delegation of responsibility; and varying types of responsibility.

Moral responsibility—this is my main and leading hypothesis—in regard to corporate action, is usually differentiable and ramified. It is corporations as such, corporate members, or the corporation and its members among others, that can be held morally responsible. The attribution of individual moral responsibility must be separately justified in each case. In general, one should make a distinction between external responsibility of corporations and corresponding internal responsibility distribution.

Beside role or task-specific responsibilities, legal and corporate action responsibilities, corporations and institutions have a moral responsibility or an accountability analogous to moral responsibility. This moral responsibility can also be understood as a higher level responsibility; it would exist in addition to, and independent of, specific individual responsibilities of individual corporate members. Individual responsibility and corporate responsibility do not have the

same meaning. They cannot simply be mutually reduced to one another. The responsibility of one kind or type does not replace the other, although, in general, these analytically distinguished model concepts may overlap in social reality.

Corporations can act intentionally, though in a manner non-reducible to individual action. That is, they act in the secondary sense, on a higher level of social fiction, on a symbolic or semantically structured and interpreted plane. Nonetheless their actions, and the consequences of their actions, are no less real than a person's actions. Such corporate responsibility, that is not equivalent to the immediately bearable, direct, personal responsibility, applies to businesses, the state, and corporations, as well as to technical and scientific organizations. Until now, the traditional a priori attribution of moral responsibility to natural persons appeared to be an insurmountable barrier to the attribution of moral responsibility to corporations and situations. Must that be so? We think not. Rather, the exclusive limitation to the individualistic model must be thwarted. Should one not rather develop a hierarchical model that adequately and differentially puts the responsibilities on the various levels?

Making or holding corporations responsible may also constitute a first step toward attributing responsibility in corporate action. The "corporation internal" distribution problem can be dealt with in a second step. The latter is difficult to deal with according to responsibility types. The following working hypotheses are formulated to address this point:

1. Only general distribution rules can be laid down with certainty.

2. These rules ideally are to be applied to each individual case with extra provisos regarding the special conditions.

3. The distribution of responsibility is determined by the structures of the organization, "decision making structures" (Internal Decision Units) and principles (individual and collective instances and units; unanimity or majority principles). (This applies to the social structure in general, too.)

4. The distribution of responsibility externally—in view of third parties, society and for their relevant instances—is dependent on corporate structure, on the influence and control of individuals, on the contributions of (individual)

agents, and, in general, on the internal distribution of responsibility (in the sense of competency and task distribution and role-structure).

5. The distribution of responsibility internally for the fulfillment of tasks and roles with respect to colleagues, also is primarily determined by the corporate structure. It primarily depends on accountability to superiors and a special case of the role and task responsibility. (The observation of these duties generally is legally required, usually in the form of a contract; it can also be morally required.)

6. Tasks and competencies, and their accompanying responsibilities can be delegated. The responsibility of the delegating person does not (necessarily) end there. In general, however, moral responsibility, cannot be delegated.

7. The (normative) responsibility for the consequences of actions is primarily a result of the individual contributions of action and production. The individual Director or the Chief Executive Officer, as well as the performer or executive, would indeed act. (The performance of an order or a command does not, however, generally exculpate the performer.) The distribution of such external or internal responsibility, which assumes other responsibility distributions, results from the respective contribution to the action or production and from the involvement of the actor or contributor.

8. Role and task responsibility results from formal as well as informal roles and tasks; the responsibility and its (external or internal) distribution depends on corporate structure, hierarchy and position.

9. Moral responsibility (in a strict sense), as simply directly and personally attributable responsibility in view of external or internal addressees, is made topical by its own action and possibilities of action. Moral responsibility is a function of power, influence and knowledge. Co-responsibility is determined correspondingly by the strategic placement of an individual in a corporation. It increases with increased formal authority of the bearer and the level or position within the hierarchy or corporate decision making structure. The moral responsibility of one individual can be larger, smaller or equally large as that of another. However, the distribution of responsibility is not suited to percentage analysis; it is better suited to comparative statements. Moral responsibility is not

really divisible; it is open to sharing though. It can be borne solely (exclusively) or jointly (each person fully or partly). In distributing moral responsibility it is necessary to take seriously the moral accountability even in view of a growing number of participants (which, factually might, tend to minimize each persons share of responsibility).

10. The legal distribution of responsibility is dealt with separately according to legal or natural persons, to the respective civil or criminal law, and to legal aspects of administration or the state or constitutional approaches. In this way the legal person is, as a rule, liable to third parties for those who act on his or her behalf, according to (German) civil law, though not according to (German) criminal law. Internally speaking, the corporation may have claims against natural persons (e.g., members). This is not the case with corporations which are not "legal persons" according to (German) civil law.

The division of labor in corporations and large-scale projects, on the one hand, and the coordination of actions through markets on the other—but especially unwanted and yet unseen combinations of unfavorable factors, which are inclined to result in catastrophes, or even subliminal negligence or carelessness, as with the so-called "normal catastrophes" analyzed by Perrow (1987)—will complicate the attribution of (unwanted) consequences of actions, and the attribution of responsibility in all its kinds. The individualistic concepts of ethics in philosophy, technology, and economics do not suffice to tackle these problems. They are obviously not adequate since they usually focus almost exclusively on individual actions and not on collective and corporate forms of actions or structural and systematic contexts. Thus far, ethical approaches have, indeed, been too much oriented toward individual persons; they have not paid enough attention to social action. They are not yet adequately adjusted to "socioethics" and social philosophy. This has been mentioned quite a while ago (Lenk 1979, 69ff.).

So far the problems of complex constellations of causes and the problems of responsibility have been discussed only in a very generalized way in the philosophical literature. Jurisprudence, by contrast, has considered them in a much more detailed manner and has, indeed, come up with some very interesting approaches for solutions which are of interest for philosophy as well. Yet, as a resumé—and in a modifying and restricting sense—one has to point out that the principle of causation faces difficult problems if it is taken as the only

precondition for the attribution of responsibility. These difficulties result primarily from the fact that there are various forms of collective action.

Moreover, it is impossible to individualize causal factors within synergetic and cumulative processes largely because of the formation of groups and the effects of adverse combinations of many intruding factors. To a large extent, legal regulations (de lege lata) fail as means to obtaining adequate precautions or even solutions when faced with ecological damages and damages that occur far from the sources of emission. Often a need for legal regulations is acknowledged, yet for strategic environmental planning and policy-making reasons it has thus far only insufficiently been considered. Nor until now has it been rendered controllable or sanctionable. In the literature one finds discussion of joint (and several) liabilities, including a mutual right to compensation through the formation of sensitive areas and feedback loops of dangerous products and strict liability, the turn-about of the burden of proof, high probabilities of causation, compensation through special public funds, (structural) incentives for the internalization of external effects, environmental emission bonuses to be bought by corporations, etc. The main difficulties for legal solutions are, among others, the extant non-liability connected with permitted subliminal (damaging) individual actions, and the definition of limiting and threshold values.

Today, and in the near future, these problems will be extremely relevant and pressing, and not only because of the impact of new systems-technological phenomena and processes on their own. This is not—it seems to me—the only characteristic of the current situation in the super-industrial world generating a new kind of ethical problem related to technological progress. The most decisive new perspective for a new interpretation or a new application of ethics is, beyond any doubt, the immense growth in the technological power of human beings. Due to some specific facts, it requires new ethical perspectives with wider scope. Such facts are, for example:

The number of people affected by technological measures or their side effects has increased tremendously.

Those affected frequently do not directly interact, in the same context of action, with the other—sometimes intervening—agents.

Natural systems have become an object of human action, at least in a negative way. The human being can permanently disturb or destroy them by his or her technological measures.

Without a doubt, this is a new ethical situation: Humans never before possessed the power, globally or regionally, to destroy all life in an ecological system, or to debase it decisively by technological manipulations. Since some of these encroachments are not controllable, and may be irreversible, nature—both as an ecological system and in terms of particular species—should gain a new ethical relevance within the new dimensions of technological power. In the past, ethics was essentially anthropocentrically oriented around actions, interactions, and their consequences among humans. Ethics must now gain an ecological relevance, giving significance to other forms of life (as, for example, in Schweitzer's "ethics of reverence for life"). Taking into account possibly irreversible, harmful effects (e.g., changes of climate, injuries by radiation, technological erosion, overfertilizing and the respective phosphate and nitrate-triggered impacts on rivers, lakes and even seas, cf., the algae problem in recent summers occurring off the coast of Norway and Denmark or the ozone hole in the Antarctic). The fate of our species is also at stake, but not only our species.

This issue is particularly pressing with respect to the usage of limited land. Given the diminished resources of nature and its respective systems, ecosystems and species, for maintaining ecological balances, for survival conditions of future generations, for maintaining, regenerating and utilizing resources, and for the responsibility of side effects and remote consequences of actions, which are dramatically gaining increasing moral and political relevance, land usage is a grave concern.

With respect to the first class of distribution problems, we would like to mention only two theses here (cf. Lenk 1985) and point to some actual discussions:

1. Responsibility is a function of power, impact and knowledge. The more strategically central one's position is in terms of power, influence and knowledge, the higher his or her responsibility would be. This is an idea which can be worked out in more detail by using distributive models in graph theory and

predistribution assignments of rights and duties according to different levels. The Analytic Hierarchy Process of Thomas Saaty, for example, differentiates levels of power and associated social values in public decision making. In cooperation with the former Science Advisor of North Carolina, Earl MacCormac, we have set out to apply such concepts to the problem of distributing responsibilities according to strategic centrality in social responsibility systems. A person is co-responsible, or assigned/attributed co-responsibility, in as much as he or she is actively participating in an action system, or can possibly destroy or disturb the system. His or her responsibilities grow with centrality and the respective degree of influence. The basic idea is that every potential actor in the system is co-responsible in proportion to their practical influence. It is not only one leading position holder who would be responsible for everything in the action system. On the other hand, nobody who has no potential influence on the system is to be held responsible. With respect to moral co-responsibility, though, there should be no vanishing effect amounting to the well-known 'Large Committee Irresponsibility": The more people are on the committee, the less responsibility every member has. Moral co-responsibility cannot be a case of group distribution, trade-off or bargaining. It does and should not vanish with growing numbers of participants. There is still much work to be done to combine the influence-oriented differentiation of co-responsibility and this non-vanishing effect. (Another problem of adequately distributing responsibility with respect to corporate action should be mentioned here: Frequently, in complex organizations the decision maker is not identical with the literal actor who carries out the action itself.)

2. As came out rather recently, besides legal responsibilities, corporations seem also to bear moral responsibilities (particularly if they do not want to improve dangerous conditions as, for example, the management of Convair in the DC-10 case (Eddy/Potter/Page 1976) or the case of the Air New Zealand crash on Mount Erebus (French 1984, Chapter 11). This is certainly a type of moral responsibility different from an individual's moral responsibility. Corporate moral responsibility frequently coincides, but need not be identical with the moral co-responsibility of members of a decision making board. Corporate moral responsibility, therefore, is analytically not to be confounded with moral co-responsibility of group members partaking in a collective action or decision making process. Therefore, moral responsibility is analytically to be separated from corporate acting: Responsibility may fall either on the corporation as an institution, or on members of the corporation—the latter not only as role-takers,

but particularly as individual persons—or both.

In addition, generally speaking, one should distinguish the external responsibility for the organization and corporate action from the internal problem of responsibility distribution. The same is true with respect to institutional moral responsibility as opposed to personal moral responsibility, although certainly an indirect connection obtains which must be traced and analyzed case-by-case, and which does not amount to a general definitional reduction of corporate responsibility to solely individualistic terms or factors.

Besides role or task-specific responsibility, legal responsibility and responsibility for actions, corporations and institutions also often harbor a moral responsibility or a responsibility that is analogous to a moral one. This moral responsibility must be understood as a "secondary" responsibility (on a secondary level of action and effect, so to speak). It may exist beside, and remain partially independent from, the specific responsibilities of individual members of the corporation, although relationships between these different types do usually exist, as mentioned above.

Individual and corporate responsibilities do not refer to the same moral phenomena; they cannot simply be reduced to the same meaning, yet they do relate to each other. One of these responsibilities does not substitute for the other.

Rendering or making corporations responsible may represent a first step towards attributing responsibility for corporate actions. The problem of distributing responsibility in corporations has to be approached, then, with a further step. Here we must differentiate the various types of responsibility as mentioned. However, division of labor will complicate the perception and acceptance of responsibility as well as the attribution of respective consequences of a technology to an individual's marginal part within the totality (cf. Ropohl 1985, 565). Thus, the abilities to perceive and differentiate responsibilities need to be improved as well.

We must differentiate between the problem of co-responsibility, i.e., the distribution of responsibility to individuals in corporate and non-corporate action, and the problem of whether or not corporations as such can be attributed a specific responsibility at all. The former topic consists of the question of whether

and how the various kinds of collective responsibility can be referred or reduced to individuals. (The moral responsibility of individuals should not, as we saw, be replaced or diluted by collective responsibility. Individuals can be co-responsible.) This does not mean that collective responsibility is apt to be totally resolved or diluted into individual responsibilities in each case. Not every responsibility can be completely resolved into the respective individuals' singular responsibilities. Collective responsibilities may exist, that are not reducible to individual responsibilities "without remainder," although they are at least connected with individual responsibilities and should be of relevance for these. The analysis of these intriguing connections is an important task for moral philosophy which indeed presupposes the careful elaboration of different types and levels without which the interconnections could not be traced, identified, and analyzed.

The second problem of distributing responsibility does not result from collective corporate action by itself, but only if many individuals act under strategic (competitive) conditions, if negative external, synergistic and/or cumulative effects occur. Indeed, "strategic conditions" means that the final result is dependent on the (relatively independent) action of many individual actors. Synergistic and cumulative effects would only result if different components have a joint and mutually escalating impact. The individual components might by themselves be (relatively) harmless, i.e., remain under a certain threshold-value, but result in the deterioration or even loss of a highly valued common good (think of the example of the continental European forest "dying" from pollution by acid rain and erosion).

The problem of distributing responsibility in these cases consists in the fact that side effects cannot be attributed to a single originator and that they usually could not be foreseen or predicted. We have two partial problems here: First, the question of participatory responsibility with respect to cumulative and synergistic and harmful effects; andsecond, the question how to responsibly deal with unforeseen or even unpredictable consequences. The first can be called the problem of distributing responsibility under strategic conditions. For instance, is the legal principle of attributing "causality" and responsibility (valid in Japan since the case of the Minamata disease), according to which the statistically assessed contribution to the common harm by relevant polluters in the vicinity, satisfactory? The burden of proof here lies, so to speak, on the side of the potential originator, the polluter, who has to prove that his or her emissions are

not harmful. This reversal of the burden of proof seems to be at least a controllable and operational measure for attribution wherever environmental damages are in question. In these cases usually land, water, and air use or misuse are combined. At least they can be forestalled or diminished in a controllable way by assigning sanctions. In that respect the Japanese legal principle of attributing causality might foster environmental protection. But there are methodological, legal, and moral problems connected with such a regulation. First of all, adjacency and guessing can never be a proof of a causal origin. In addition, an easier part of the problem concerns distributing responsibility in the cases of synergistic and cumulative damages, particularly those with below-threshold-contributions of individual actors. Another problem is how to distinguish between a descriptive assessment of causal origination and a normative attribution of responsibility, between causal responsibility and liability (Hart 1968). How could one possibly distinguish between the causal impact, the descriptive responsibility (Ladd 1975)—i.e., the descriptive attribution of responsibility—and the respective normative attribution of responsibility for contributions, the amount of which is individually ineffective below the threshold of harm? And how is one to distribute this kind of responsibility in general? Would it not be meaningful to postulate a normative collective responsibility for all pertinent corporations within the respective region for joint liability? However, this would impose a liability on all relevant corporations for the total damages. The impaired parties could sue for damages, seeking compensation and/or indemnification from any presumably participating corporation in court. Does this make sense, if connected with an overall generalization? This regulation has the advantage of dispensing with the proof of damage in respect of each singular damaging or aggrieving party—as for example, has a respective norm in German civil law requires (cf. BGB §§ 830 I, 840 I, 421, 426). This kind of regulation would, in some way independent of individual case argumentation, interpret all non-collective agents as one quasi corporate agent being liable in total. The internal distribution and compensation within this quasi-group of corporate agents would then be a problem of mutual bargaining among all aggrieved parties.

Social traps (see Lenk-Maring 1990) can arise within the context of joint (and severable) liabilities, especially with respect to liability funds. Such traps could and should be prevented through specific regulations, e.g., regulations of premia or (positive and/or negative) incentives in correspondence with the potential hazards and damages, rights to compensation against single parties, etc.

There also is a sort of social traps involved in abiding by or profiting from ethical codes: People who follow the rules must often deal with disadvantages, while those who transgress them can benefit from advantages (especially when the infringement can be hidden). Problems of control, sanction, trust and security also arise. These cannot be solved through codes alone. Additional institutional measures indeed are necessary.

Regarding responsibility conflicts in practice, there are no isolated solutions or suggestions for such cases. Instead, applicability rules or practical guidelines of an intermediate level should be developed. These rules should differentiate, for example, between moral ideals (covering virtues, as mentioned above) and (obligatory) moral rules (Hennessy/Gert 1985). A combination of individual and institutional measures is necessary: Further strengthening individual ethical competence is necessary. But it is not a sufficient step for the efficient solution of responsibility problems and conflicts. An implementation of ethical considerations in law and politics would supplement and enhance this step. In particular, the codes should explicitly set priorities and decision criteria, which would aid in the solution of the respective responsibility conflicts.

As mentioned above, most engineers and scientists nowadays work as dependent employees in industry. Consequently all of the respective company codes, principles of management, and guidelines for specific jobs, etc., are relevant to them. Such codes usually are discussed in business ethics. In practical job situations technology-related and science-oriented questions and problems are combined, so that a clean-cut separation of these is neither beneficial nor meaningful in this realm. Responsibility for technology and science (or research activity) is made concrete in corporate action. Therefore, business ethics and engineering ethics, as well as the external responsibility of the researcher, are closely related

Notwithstanding these arguments, another kind of liability with respect to product safety and hazards in terms of environmental damages of public goods, should be established. It should be noted that there is a European Community agreement (1985) with regard to product liability laws. Causal originators of damages then and now are liable in the sense of a strict liability in tort, whether of not they are really guilty in terms of intent, or only negligent. Causal origination already would ascertain descriptive causal responsibility, and, with respect to the

damage of a good to be protected, also would ascertain normative responsibility for the respective action and its consequences.

We hope this form of liability would serve as enough of a deterrent to prevent infringements. If, however, damages nevertheless occur, it would at least not be necessary to prove fault or guilt as a presupposition of any claim for compensation. These arguments are equally relevant for the second partial problem with regard to non-corporate action.

An additional important partial problem is the question of the possible distribution of responsibility for unforeseen or unforeseeable system impacts and side effects occurring by synergistic an cumulative effects. Here single agents cannot be held responsible alone, but the whole system would be quasi-responsible. A system, however, cannot bear responsibility. This is true even if computer scientists and some social philosophers of computer systems now tend to attribute moral and legal responsibility to information systems and locate the respective responsibility solely within the system itself. A German computer scientist, Klaus Haefner (1984), literally wanted to locate the responsibility "within the system." Since no one can survey and pursue all the ramifications of processes of decisions within the system, no single man would be able to be held responsible for the system decision. Is this true? However, if responsibility resides merely within the system and not with individual persons, they might all too easily shirk responsibility claiming "the system did it."

Because of their immense technical power, and the consequent inability to foresee the effects of technological developments, are humans not responsible for their technological work? Should they not take over responsibility for unforeseen or even unforeseeable side effects with respect to technological and big scientific projects? But how could they possibly do that? There is no way of being held morally responsible for something one does not know or could not know. In the sense of causal responsibility one can be held responsible in some sense, if an unintended damage occurs. The question, however, is whether one could be held responsible also in a normative-moral sense. The so-called principle of causation if interpreted in a moral and legal sense, would tend to assign normative responsibility too. One would have to answer for consequences in the sense of being liable to pay compensation, etc. The range and power of action seems to have multiplied to such a degree that anticipation cannot follow quickly enough or

pursue all the complex ramifications of impacts, consequences and side effects. This seems to be an intriguing dilemma of responsibility in our age of complex systems interactions and dynamic changes transgressing linear thinking and traditional causal disciplinary knowledge.

However, we have to be venturous, to enter new frontiers, in order to be able to discover, invent and test new scientific and technological solutions, and to uphold social progress in a mass society. But with respect to big science, big technology and their hazardous potential with regard to humanity and nature, we have to proceed very cautiously, taking into account system interrelations (notably non-linear ones) and system interactions and even potential occurrences or probabilities and risks of negative side effects. Perhaps Karl Popper's idea of a piece-meal social engineering and piece-meal technology, avoiding probably reversible unwanted consequences should be relevant here, and not only with respect to public goods.

Technology, technological progress and economic-industrial development, in combination with respective damages to land, air, and water, turn out to be multidimensional phenomena asking for interdisciplinary and complex approaches. This multidimensionality results from on-going interaction between diverse realms as well as the actions of many corporate and individual agents. This is leading to a great complexity of individual, collective and corporate contributions, involving different areas and social background factors. The exponential rate of technological development in terms of range, energy, interactive feedback phenomena, etc., is a familiar insight of traditional sociology of science. This insight is generally true for any multi-ramified and interdisciplinary interlocked social phenomena.

With respect to moral judgment, it seems clear that causal origination usually cannot be attributed to one single individual agent nor can causation be solely assigned to one single realm, if development and acceleration are dependent on a multiplicity of mutually interacting and escalating contributors. Nor can moral responsibility simply be attributed to the whole systems as such—not only with respect to different sorts of role and task responsibility, but also in moral and legal terms. Participating and contributing individual agents have to bear a co-responsibility according to their active, potential or actual or formal participation. For instance, in gene biology the exposure to artificially produced

bacteria cannot remain only the moral responsibility of individual scientists who could not possibly foresee or predict some harmful side effects. This is certainly an intriguing example, drastically increasing in prominence today and in the near future. Undoubtedly, all responsibility of researchers in science and technology has to be prevention-oriented, taking into account the possibly affected individuals, species, and ecosystems, whenever and wherever adverse developments and damaging effects can be pre-assessed and avoided. This is true with directly applied technological projects. Preventive responsibility is particularly important in these critical realms, situations and constellations.

With regard to responsibility in general, it is not only corporations and institutions in economics and industry which have to bear responsibility, but also the state and its respective decision makers. Corporate responsibility has to be connected with individual responsibility of the respective decision makers. This is true also for big technology projects, particularly if they are run by the state itself. There should be, not only a legal, but also a moral balance of powers, in terms of checks and controls similar to the traditional distribution of power between the legislative, executive, and judicial branches.

The central point, with respect to the problem of the distribution of responsibility, is the question concerning the normative and descriptive aspects of distribution as described in the theory of action, and the possibility of reducing collective responsibility to individual responsibility in relation to the form of collective actions and causes. Thus, the respective form of a collective action is of determining value, and figures as a criterion for the distinction of various attributions of responsibility. Another important point is that the distribution of responsibility is dependent on the kind of responsibility: If one differentiates between a legal liability for compensation and moral responsibility, a distribution is (more) easily attainable with the former, while it might not be so easy with the latter. In particular, the negative formulations of a responsibility for prevention of damages, and the preservation of states of well-being etc., are relevant to the distribution of responsibilities, as is the responsibility to prevent omissions, which is more easily accessible for a regulation of responsibility. One also should differentiate between the sufficient and the necessary conditions of a consequence or damage in relation to several involved persons' failures to act. So, an individual failure to act is causally sufficient for the occurrence of the consequence or damage, if non-omission of the act prevents this occurrence.

Again, the upshot of this, in terms of moral responsibility, might be formulated thus: The extension of individualistic responsibility is to be combined with the development of a socially proportionate co-responsibility, and with the establishment and institutional elaboration of corporate responsibility, and a new sensitivity of and for moral conscience. Types of responsibility have to be analyzed in a more differentiated way than hitherto (see, for example, Lenk 1992; 1991). Only in this way can we cope with the most complex structures of causal networks and far-ranging consequences of actions, be they individual, strategic, collective, or corporate. Concepts of a more social orientation of responsibility and conscience should be given most attention. Ethics and moral philosophy have to take seriously these new systemic challenges by technically multiplied possibilities and impacts of action of systems and networks. This does not mean that our traditional basic ethical and moral intuitions have to be denied. On the contrary, in so far as morality has to deal with the well-being of other humans and creatures (maybe even in the sense of Schweitzers' "reverence for life"), analytic and normative ethics have to pay attention to the ramifications of systemic impacts and action patterns. The accrued "incongruence of technical and ethical competency" should be diminished in the future (Lenk 1991, 167).

Therefore, an extension of our horizon of moral judgments, with respect to future generations, quasi-rights of nature, higher animal species, etc., is important, if not paramount for any ethical agenda.

Thus, there exists an ethical obligation for humans to take care that especially humankind—as well as other natural kinds dependent on the human power for intervention—does not get extinguished. It is true that individual beings, which have not yet been conceived, have no individual moral or legal right to be born, and one cannot impose an individual obligation on particular human couples to procreate, but it seems to be a sensible extrapolation from the constitutional rights of humankind, which are often only constructed as rights of repulse and protection, to develop a collective responsibility of today's living humans that they must not let their species be extinguished or destroyed. Humans not only have the negative responsibility to leave behind wholesome conditions of environment and life for future generations, which means they should not totally exploit non-regenerable raw materials and should refrain from lethal poisoning, depletion, and destruction of the environment. They collectively also have an obligation and responsibility to actively prevent this from happening and to work

for a future existence of humankind in life conditions worthy of human beings. This is at least a moral demand which originates in the integrity and continued existence of humankind, which are considered the highest desirable values by various ethical systems. Even a version of Kant's formal Categorical Imperative (AAIV, 341) refers to the actual content of the "principle of humankind and of any reasoning nature" as things in themselves.

Judged morally, then, future generations' relative rights or quasi-rights to existence do exist, even though no singular existence of a non-conceived individual can be sued for on a moral or legal basis. Thus, certain general human and moral obligations transcend those which are individually or juridically based. Moral value commitments are more comprehensive and determining than moral or legal individual responsibilities. Morality is more than a singular individual responsibility or obligation.

Whether a summarily conducted extension of responsibility, with respect to side effects of collective action by corporations is enough, will be certainly a matter of debate. Peter French (1984, 132ff.) proposed an "Extended Principle of Accountability", according to which somebody is morally responsible not only for intentional acts, but also "for some of the unintended effects of…actions," which these persons "should have (known) or did know would occur." However, "being willing to do something…does not entail intending to do it." Even if an operational model in terms of legal compensation, for example, were introduced, it remains debatable whether this criterion might be really treated as a moral criterion of responsibility. French presents a second extension of the principle of responsibility, implying that a person "may be held accountable for those non-original or second effects that involve the actions of other persons that he obliquely or collaterally intended or was willing to have occur" or occurred. Paul Thompson goes even further: "Another strategy is to describe the act as one which risks the harmful consequence, and to assume that, in the absence of exculpatory circumstances, this is sufficient to serve as the basis for an ascription of moral responsibility" (Thompson 1985, 301). The decisive new approach here is "that in risking, one is doing something for which one may be held responsible" (Thompson 1985, 308, italics added). Imposing risk on somebody now is an action for which one is responsible. It no longer is, as in traditional economics for instance, just a probability distribution of action consequences or events and results which do not contain any objective evil (Thompson 1985, 307-9). "Causal

agency requirements are parts and parcel of risking" (Thompson 1985, 310). In this important causal connection of results and impacts and even unforeseeable side-effects of actions to the action of risk imposing, Thompson sees an advantage of his own approach compared to French's. For "some cases of morally untoward risking, however, will not be cases in which the agent was in any sense willing to countenance the harm that actually does materialize" (Thompson 1985, 309).

If we would like to follow this extension of risk assignment and responsibility attribution we have to develop operational models of distribution of and participation in responsibility with respect to collective actions. Simply ideal postulates without practical chances of realization by institutional measures would be insufficient. Just pleading to avoid social traps does not seem very useful either. Pleas are necessary, but they are not sufficient, per se., and not effective. One has to introduce operational procedures, measures and consequences such as legal sanctions, financial stimuli and incentives to change hazardous productions and products, public and moral institutional means of pillorying as well as guaranteeing of property rights and protection of public goods, combined with mechanisms of control and sanctioning, in order to be effective. A general guideline pertaining to institutional measures to be established could be: As many laws, precepts and decrees and prohibitions as necessary, as many incentives and stimuli for self-initiative and individual responsibility as possible. Even if this might sound rather global and vague, it might generate direction of a necessary moral reorientation in public matters of social trap constellations.

REFERENCES

Eddy, R., E. Potter and B. Page. 1976. Destination disaster. New York: Quadrangle/New York Times Book Co.

French, P.A. 1984. Collective and corporate responsibility. New York: Columbia University Press.

Haefner, K. 1984. Mensch und Computer im Jahre 2000. Basel and Boston: Birkhäuser.

Hardin, G. 1968. The tragedy of the commons. Science 162:1243-8.

Hart, H. L. A. 1968. Punishment and responsibility. Oxford: Oxford University Press.

Hennessey, J.S. and B. Gert. 1985. Moral rules and moral ideals: A useful distinction in business and professional practice. Journal of Business Ethics 4:105-15.

Jöhr, W.A. 1976. Die kollektive Selbstschädigung durch Verfolgung des eigenen Vorteils. In Wettbewerb, Konzentration und wirtschaftliche Macht, edited by F. Neumark, K. Thalheim, and H., Hölzler. Berlin: Duncker und Humblot.

Ladd, J. 1975. The ethics of participation. Nomos 16:98-125.

Lenk, H. 1979. Pragmatische Vernunft: Philosophie zwischen Wissenschaft und Praxis. Stuttgart:

P. Reclam.
_____. 1985. Mitverantwortung is anteilig zu tragen – auch in der Wissenschaft. In Entmoralisierung der Wissenschaften. Ethik der Wissenschaften, edited by H.M. Baumgartner and H. Staudinger. München: Fink.
_____. 1991. Real-world-contexts and types of responsibility. In Critical perspectives on non-academic science and engineering. Vol. 4 of Research and technology studies, edited by P.T. Durbin. Bethlehem: Lehigh University Press.
_____. 1992. Zwischen Wissenschaft und Ethik. Frankfurt am Main: Suhrkamp.
Lenk, H. and M. Maring. 1990. Responsibility for land use and the problem of social traps. In Socio-economic aspects of land use planning edited by D.B.S. Fitch and A. Pikalo. Frankfurt am Main and New York: P. Lang.
_____. 1990. Verantwortung und soziale Fallen. Ethik und Sozialwissenschaften 1:49-57.
Perrow, D. 1987. Normale Katastrophen. Frankfurt am Main
Ropohl, G. 1985. Die Idee des technischen Fortschritts. In Wissenschaft Sei(n) Lust: Festschrift für Hans Lenk. Karlsruhe
Thompson, P.B. 1985. Risking or being willing: Hamlet and the DC-10. The Journal of Value Inquiry 19:301-10.