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Table des matières

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1. Background

The suggestion by today's politicians, economics experts or environmental protection practitioners that the problem of increasing air pollution in urban areas could be solved by giving suitable medication to bronchitis sufferers, pregnant women and children would be greeted with outright incredulity. Such an approach would be deemed utterly unsuitable. A similar reaction would greet suggestions to deal with industrial air pollution by means of high industrial chimneys and to tackle water pollution by introducing massive volumes of clean water into the waste water systems. And yet, when I was young, precisely these strategies were considered rational by the vast majority of environmental specialists and politicians. This was the era when collective value concepts which saw the black smoke belching out of industrial chimneys as the very expression of progress, obscuring the fact that they embodied a risk for the population, were only beginning to be described as "irrational". In fact, yesterday's visionaries, a small minority, who, to no avail, hailed the pills and high industrial chimneys as a purely symptomatic policy response, were generally dismissed as irrational zealots arguing on a "purely emotional" basis.

Historians, politicians and philosophers of science have recorded innumerable examples of this phenomenon whereby views previously held to be irrational are suddenly deemed rational and those previously believed rational no longer make sense from a contemporary perspective. All actions which justify the expectation that when carried out by everyone else they will not restrict another person's freedom (through damage) can be described as rational (Kant 1786, 85 B.A: 52). Thus, reason is defined by the perimeter which includes the acting and affected subjects and objects. This perimeter varies from place to place and throughout the time period involved. This variation is closely associated with how the subjects define themselves and their relationships with others. What is generally perceived as rational changes with the increase in collectively shared knowledge about relationships between acting subjects, the subjects and objects affected by this action and the spatial and temporal perimeter of the corresponding actions.

Such rationalities of action[1] constitute the learning and action-guiding reference systems (*référentiels* - Jobert, Müller 1987) which are accepted by the dominant actors as a valid theory and which undergo processes of accumulation and (more or less abrupt) transformation in the course of the life cycle of a public policy. The transformation of such reference systems has also been described extensively in political science (in connection with learning processes, for example, and other attempts to explain policy change - Kissling-Näf 1997).

It is not the aim of this essay to provide a new theory of policy change. What I am aiming to do is to record the factors which can be identified as constitutive to the changing rationalities of environmental policies, which is why it is possible to observe an exchange of rationalities within the transformation of these policies. Moreover, I will try to show that in an international comparison of policy with such exchanges of rationalities, these dimensions are subject to change on the basis of a recurring, internal "regularity".

I define the rationality of an environmental policy as the consensual internal agreement of the specific attributes of its basic elements[2] by the dominant institutional and social actors at a given time in a given policy area. These basic elements can be classified on the basis of the following dimensions:

- the definition of the problem and the policy aim (variable 0),
- the causal hypothesis/hypotheses (identification of target and affected groups - variable 1),
- the intervention hypothesis/hypotheses (instruments - variable 2),
- the main combinations of resources (variable 3),
- the institutional framework (variable 4) and
- the (institutional and substantial) linking of a specific environmental policy with other public policies (variable 5).

1 I am not using a legal concept of rationality here as held, for example, by Lübbe-Wolff 1996 (modernisation; improved "executability" of environmental law).

2 Cf. Weidner 1996: 512 ff., where, however, a different definition of basic elements is used (information, participation, equality of legal weaponry).

1. Background

The following three hypotheses will be examined and substantiated on the basis of a very schematic analysis (restricted to clean air policy) of the varying characteristics of these basic elements over four different periods:

1. The rationality of clean air policy does not exist. The basic elements have been subject to a gradual transformation, in which four major developmental trends can be observed in Western Europe over the past fifty years.

2. The basic elements of the reference system do not change in isolation. The real independent variable is the changing definition of the problem and aims. This transformation regularly gives rise to changes in the five other basic elements which follow a recurring internal rationality.

3. The observable transformation of the rationality of clean air policy is not linked with the constitutional framework conditions of these policies in individual countries. An autonomous line of development can be observed in this transformation of rationality which is independent of the country in which it occurs and which, in West European countries, at least, cannot be prematurely terminated through the omission of a phase.

2. Definition of the six basic elements

2.1. Definition of the problem and aim

The familiar phenomenon of limited awareness of the existence of a problem due to simple ignorance based on the absence of visible indicators is particularly applicable in the case of clean air policies. It is known that No_x, O_3 and (more recently) PM_{10} particulate matter are barely perceptible, either sensorily or directly, in concentrations which are damaging to health. Expensive measurement campaigns are needed to detect them. The same is even more true of the greenhouse gases which are mostly non-toxic. However, even where measurement data is available, perception varies significantly according to a range of individual[3], class-specific[4] and cultural[5] factors. Thus, the political evaluation of the "gravity" of the problem, the quality standards[6] to be attained and the extent of the concretization of these aims differ in an international and interregional comparison. Extensive literature containing international comparisons is available on this topic (Winter 1986; Schwager et al. 1989; Knoepfel, Descloux 1991). The status of knowledge about risks, climatic conditions, chemical transformation and long-term physical transportation play an important role in the definition of policy aims. Significant progress has been made over the past forty years with respect to knowledge in this area on a world-wide basis.

Nevertheless, the definition of the aim of a policy ultimately remains a political decision which will inevitably have both winners and losers. Along with the unequal distribution of the powers of definition among the key actors and their ability to identify "technical practical constraints" and even "natural laws"

3 The relationship of persons affected by the pollution to the source of the emissions, the nature of the emissions source, the emitter's attitude, susceptibilities to illness etc.

4 Environmental awareness, knowledge of the environment etc.

5 Anthropocentrism versus ecocentrism.

6 Immissions thresholds.

unchallenged (Bourdieu 1994: 101 ff.), not wanting to know, individual and collective value positions and individual feelings also have an equal role to play here. The former is often expressed in a technicist discourse of measurements (Weidner, Knoepfel 1979). In addition, target definitions usually have multiple levels which consist of positive (“alpine air”) or negative (“absence of health hazards”) formulations, abstract symbols capable of evoking consensus (“Blue Sky over the Ruhr " - German Social Democratic Party, 1961 - Brüggemann, Rommelspacher 1992) and highly technical chemical formulae (usually immission thresholds). As with other public policies, these formulations of the policy aim are expressed in the language of the problem and not in the language of the behaviour of the key actors which is relevant to the problem. I am referring here to policy outcomes to be aimed at in form of a desired value through the implementation of a series of political-administrative decisions (outputs) and correspondingly altered actor behaviour (impacts). This is particularly strongly reflected in the distinction made in clean air policy between immissions (target factors) and emissions (behavioural factors).

2.2. Causal hypothesis

As central factors of the causal model inherent in every public policy, the causal hypothesis formulates “conjectures about the basic structure causing the problem … It responds to the question as to who or what is to “blame” for the situation deemed politically intolerable or who or what is “objectively” responsible (without subjective blame). The response to this question defines the policy target group." (Knoepfel et al. 1997: 79). This consists of the group of actors “whose behaviour is viewed by the public policy as relevant for to resolution of the problem being approached. Thus, the policy undertakes to alter or stabilise the behaviour of the target group by means of suitable measures (e.g. bans or financial incentives)" (ibid.: 62). As opposed to this, the group of persons “directly or indirectly, positively or negatively affected by the attempt to solve the social problem in question in a particular way as part of a public policy " (ibid.: 63) is defined as the affected group.

In clean air policy, the causal hypothesis simply defines the groups of polluters whose behaviour shall be modified through the introduction of regulations for the

reduction of emissions. It is assumed that the emissions caused by these groups are responsible for certain immissions. Potential polluter groups today include industry, business, households (heating systems), agriculture (NO_x) and transport[7]. It is now known that in many cases these emission-producing activities are influenced by measures arising from other public policies (road building, tourism, regional planning etc.).

Analysis of many public policies has shown that they were working on the basis of "incorrect" causal hypotheses and thus "from the outset … were condemned to inefficiency. (...) Powerful social groups can often offload their responsibility on to weaker members of society and this is why the formulation of these basic causal hypotheses is always linked with political evaluations and the nature of the perception of the problem. In many cases, however, science is unable to provide adequately guaranteed information about the mechanisms which cause the problem" (ibid.: 79). Moreover, we know from clean-air policy that the different emitter groups are very concerned about equality among target groups. If industry is to reduce its emissions, the state must also follow suit with its waste incineration plants; if transport is challenged, business must also be called to account etc.[8].

The definition of the affected group, i.e. persons who expect an improvement[9] in the quality of their lives as a result of the reduction in emissions, also varies in accordance with the causal hypothesis. If industrial emissions are reduced, the (other) industrial operations involved and the residents in industrial zones can breathe a sigh of relief. If air quality control activities target transport, the inhabitants of major urban agglomerations and other transport users (pedestrians, cyclists etc.) benefit. If clean air policy falls into line with the (eco-

7 Fuel-operated motor vehicles, aeroplanes, ships, locomotives etc.

8 A good example: the Swiss cantons' clean air measurement plans in which a contribution is requested of all groups. Cf. Imhof 1994.

9 Or a deterioration (the case of those who profit from air pollution, e.g. sanatoria, environmental doctors etc.). This group is not dealt with under the heading "those affected by policies" in this study despite the fact that it is not insignificant for local coalitions or coalition exchanges.

centric) relief of sensitive ecosystems, the flowers and forests will benefit and if climate protection becomes a component of air quality conservation, the potential affected groups have yet to be identified in either geographical or temporal terms (potential victims of climatic change). These groups, which vary qualitatively and quantitatively and are linked with the definition of the causal hypothesis, are extremely important for the efficacy of policy implementation. For they are the first to demand the observation of the policy aims by the state and emitters in political and even legal terms.

2.3. Intervention hypothesis

In addition to the causal hypothesis, the causal model on which a public policy is based also contains intervention hypotheses. This indicates the starting points at which, in the opinion of the key actors, state action on the causal mechanism giving rise to the problem should take effect (Knoepfel et al. 1997: 80). Intervention hypotheses in clean air policy can be classified on two levels: firstly, they respond the question as where intervention should take place in the process of damage caused by air pollutants. They range from the protection of objects (e.g. lime input into acidified lakes, the renovation of damaged structures and works of art, the planting of more resistant tree species in forestry) and the modification of the distribution of air pollutants (e.g. industrial chimneys policy) to emissions retention regulations for production processes (e.g. filter technology), regulations for technological optimization (e.g. fluidised-bed combustion) and actual input control (air quality requirements for the composition of fuels). Secondly, intervention hypotheses provide information about the optimum modes of control (regulative, incentive, persuasive, self-regulative).

Both types of intervention hypothesis are linked to the problem perception and causal hypotheses. Thus, an industrial chimney policy is only viewed as rational, if as opposed to their production it is the unfavourable spatial-temporal distribution of the pollutants that is seen as causing air pollution. The intervention

will in turn vary according to the size of the target group and the precise extent to which it can be identified[10].

The intervention hypothesis often implicitly states the nature of the involvement of the target and affected groups in the political-administrative processes of the application of instruments (adaptation of the rights of participation of target or affected groups depending on the mode of regulation).

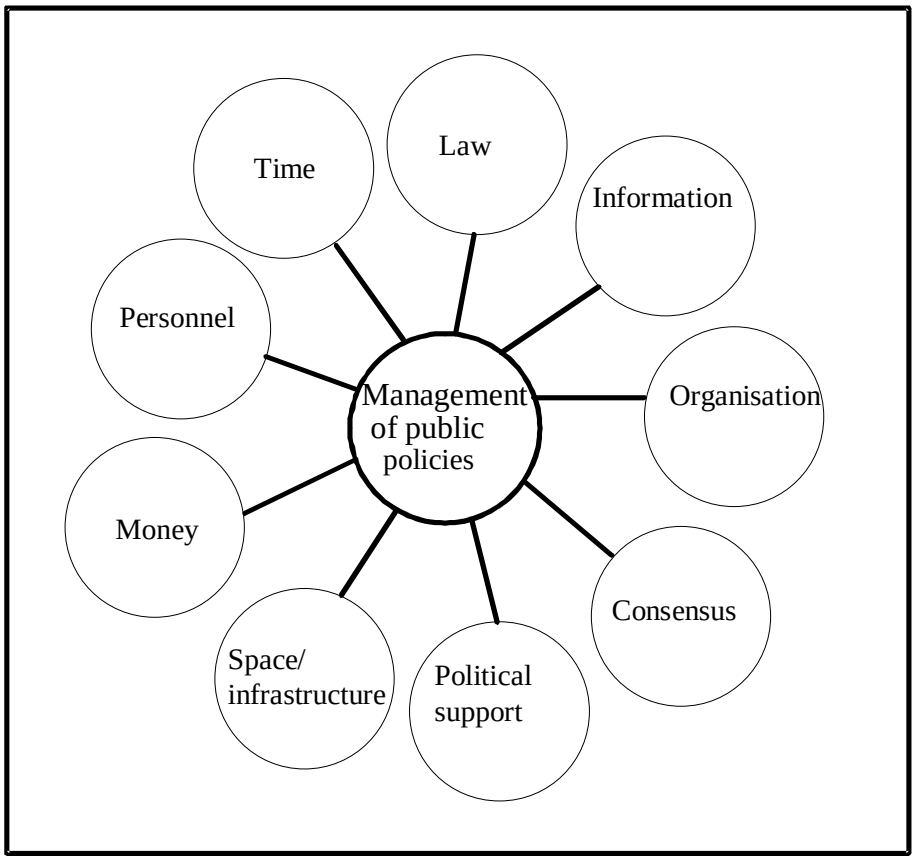
2.4. Resources

Like the social actors, the institutional (official) actors involved in official policies work with a set of available resources which they combine or substitute in different ways, depending on the aims pursued. The management of public policies consists of the production, storage and sustainable management or renewal of each of these individual resources (personnel, financial and legal management etc.) and in their instrument-specific combination with respect to the production of effective policy outputs at the site of implementation[11]. State actors in clean air policy also have access to the standard set of nine resources which are represented schematically in Figure 1.

10 Small identifiable target groups: regulative interventions or self-regulation; large target groups that are difficult to identify: incentive or persuasive modes.

11 Knoepfel et al. 1997: 73 ff.

Figure 1: The nine resources available to state actors in public policy



These potential available resources are:

- a set of more or less concrete substantial legal regulations (for example, immissions standards, emissions product or process standards) used as a source of orientation by implementation agencies and target groups;

- information, such as emission inventories, immission observations, damage data and also information about the structure of polluting activities and, finally, data on policy monitoring (output profile, changes in emitter behaviour);
- organisation, for example a definite, more or less efficient structural and procedural organisation of the responsible administration, established co-ordination processes with other administrations or external structures for the supervision of emitters and the contact with environmental organisations;
- money, which is a type of universal resource with which other resources such as information, organisation and personnel can be produced and which also acts as a basic resource for policies which work on an incentive basis (subsidies, other transfer payments);
- personnel, which in the case of clean-air policy must have (in many cases academic) professional qualifications in the areas of atmospheric physics, pollutants chemistry, biology and economics and requires relevant training;
- consensus in the sense of secondary legitimization of state action through performance (Knoepfel 1996: 160 f.), which is reflected, for example, in the willingness of emitters to implement (voluntary) behavioural modifications or of the environmental organisations to participate in constructive dialogue and which requires active maintenance;
- political support, which in contrast to target and affected groups' consensus is found in the political area of the primary legitimization of public policies and is expressed, for example in the willingness of the legislator to increase the resources of law, money and personnel; this resource also requires intensive management;

- time, which, in the case of environmental policy, has a role to play in both the upholding and failure to uphold deadlines for adaptations, and in its general expression as the allocation of scarce administrative time for certain problems (at the cost of the resolution of other problems);
- space, which in the case of clean air policy consists in the possibility of accessing executive events and enables the spatial concentration of outputs without specific spatial opposition (resource: spatially concentrated consensus or dissent).

Depending on the problem perception and causal hypothesis, clean-air policies require the above-listed resources to varying degrees. Thus, typical combinations of resources can be identified for the four phases described in this study.

2.5. The political-administrative arrangement and institutional framework conditions

Political-administrative arrangement is the term used to describe the complete set of institutional actors who are key players in the formulation and implementation of a specific public policy at different national levels. These actors form a structure consisting of procedural co-operation and co-ordination regulations which are centralised or fragmented (horizontal or vertical) to a greater or lesser extent, or more or less open *vis à vis* social actors (Knoepfel et al. 1997: 93 ff.). The institutional actors involved belong to more or less well established, hierarchically structured local-authority, regional or central administrations (administrative institutions), which are characterised by their constitutive task, specific public interests, professional profiles and patterns of perception. Experience has shown that the political-administrative arrangements of clean-air policies vary along the fragmentation-integration axis both vertically (distinctive vertical integration or fragmentation) and horizontally (fragmentation on the basis of emitter groups, industrial, traffic-related etc. clean-air policy). Similar distinctions exist with respect to their openness to target groups, and

particularly also affected groups (environmental organisations), and with respect to the institutional roots of their main actors (health policy, trade/plants/factory inspectorate, foreign trade policy and environmental policy).

With respect to the institutional framwork conditions, the variance initially occurs at the distribution of competence on the different state levels, to which the key actors of the political-administrative arrangement belong. Thus, specifically local policies can be distinguished from more regional, central-state or even EU policies. This distinction is also directly linked with the nature of the problem perception and the resulting perimeter which, depending on the valid rationality, marks out the recorded actions of subjects and their effects on objects in space and time (Larrue, Knoepfel 1998: 186 ff.). In addition to protection policy aspects, trade-policy aspects also have a role to play in this perception ("competition neutrality"). The general status of knowledge of atmospheric physics or chemistry is of importance here.

2.6. External links with other public policies

Like environmental policy in general, clean-air policies also have a varying need to be linked with the other public policies regulating productive or reproductive activities which generate air pollutants (interpolicy co-operation; Knoepfel 1995: 212 f.). The extent of this interpolicy co-operation with other major public policies varies according to the perception of the problem and the causal hypothesis. Minor isolated clean-air policies are found, for example, wherever air pollution is perceived as a local problem with a limited perimeter. Moreover, it is possible to find highly integrated policies at the level of both legislation and political-administrative arrangements which penetrate deeply into energy, transport and even agricultural and forestry policy. A similar situation applies for the linking of major clean-air policies with institutional public policies. Clean air can indeed become a driving force for institutional reorganisation in the implementation areas. This is the case, for example, if clean air policy succeeds in conjunction with mobility policy in agglomerations in forming new and autonomous political-administrative institutions out of urban and outer conurbation authorities. In this case, environmental policy becomes the forerunner policy for institutional

reorganisation (Klöti et al. 1993; Knoepfel et al. 1995: 390 f.). It is possible to observe a similar situation arising under the opposite conditions when the transfer of competence for environmental policy from the central state to the regions is a significant factor behind the formation and consolidation of regional bodies in previously predominantly centralist states (e.g., France, Spain and Italy).

3. Different clean air policy rationalities

It is possible to identify the four distinct rationalities described below for clean air policies in West European countries between the 1960s and the turn of the century. This presentation does not aim to provide an empirical account of these four phases and for this reason is rather schematic. Its purpose is to present the basic patterns of the different rationalities and not a detailed and precise description of these phases. Most of the empirical material can be found in Knoepfel, Weidner 1980 and 1986, Héritier et al. 1994 and Jänicke, Weidner 1996.

3.1. Clean air policies of the 1960s

Air pollution was initially perceived as a neighbourhood and later local problem involving emissions of smoke, soot and eventually sulphur dioxide which in conjunction with bad weather conditions (inversion) could cause nuisance, damage to health and, in extreme cases, increased morbidity[12]. The problem perception was, therefore, clearly anthropocentric. The cause was identified as outdated commercial and industrial plants and coal or oil-fired household heating systems emitting the above-listed pollutants into the atmosphere at low levels. The problem was mainly observed in poorly ventilated neighbourhoods and “working-class areas” generally located in north-eastern locations near industrial zones. Increased morbidity caused reduced productivity and this translated into a burden on the public health budget. The aim of this policy in Germany was a "Blue Sky over the Ruhr " (German Social Democratic Party 1961 - Brüggemann, Rommelspacher 1992). Quantified immissions limits were only defined in a few cases.

Emissions from household heating systems and commercial plants and from inner-city industrial plants situated too close to residential areas were identified by the causal hypothesis as the cause of the increased concentrations of

[12] The most important trigger in international terms was probably the smog disaster of 1952 in London.

pollutants in the air. Thus, the target groups of the clean-air policies that emerged were coal and oil-heated households and commercial and industrial operations in urban areas. The poor basic health of employees was also identified as the cause of the problem (nutrition low in vitamins, too little fresh air from holidays etc.). The affected groups included the residents of particularly afflicted neighbourhoods who are at risk from air-pollution (elderly people, pregnant women, children, asthmatics) and also industrial and commercial plants (productivity losses) and certain economic sectors, for which clean air is an important resource (hospitals, tourism, food industry etc.).

The central intervention hypothesis for these clean-air policies focused on improving the spatial-temporal distribution of the pollutants in the air (transmission hypothesis). Thus, what emerged included the infamous industrial chimneys, regional-planning decentralisation (transfer of industry from urban areas) and smog-alarm policies. These smog-alarm policies required a reduction in the output of large heating installations in the event of inversion weather conditions or the conversion of these installations to fuels producing lower levels of pollutants. The core content of these policies remained applicable until the 1990s[13]. They were intended to control the structure of emissions sources in space and time. They imposed agglomeration-specific fuel regulations on the large group of home-heating emitters and individual directives for the increase of chimney heights on the relatively small number of large-scale emitters. The central mode of intervention was police clauses and bans.

The most important resource of this air pollution control - conceived as “minor police public-health policies” - is the law, the regulative density of which was increased over time[14]. Information also assumed increasing significance as a resource, as this kind of immissions-oriented intervention policy requires

[13] According to the new French clean-air and energy act (*Loi du 30 décembre 1996 sur l'air et l'utilisation rationnelle de l'énergie* = Law of December 30th 1996 on air and the rational use of energy).

[14] At the end of this period, state standards for authorised immissions, emissions and fuels defined by private standardisation associations gradually replaced the general police regulation which initially served as a legal basis.

knowledge of the (portable or noxious) content of the air pollutants in the surrounding air. Such policies proved, therefore, to be increasingly expensive (resource money) and they required the services of specially trained personnel (emergence of the job of "air quality controller"). Special administrative units for air quality control and for the employment of existing organisations in the intermediary area between the state and society (e.g. the "official" chimney sweep) were established in major cities.

The small political-administrative arrangements, which initially had a strong institutional roots in the urban health authorities, began to fragment. The established (often regional) industry and trade inspection boards defended their territory for the control of trade and industry practices against the health boards which began to move in on this domain. This initial cell division of air quality control arrangements would be responsible for the corresponding fragmentation over several decades. Conversely, this development of an industrial and commercial clean-air policy resulted in the emergence of a socio-political emphasis through the assignment of its control to the industry and trade inspection boards. For this meant that the traditional protection of workers within companies was, so to speak, extended out to the surrounding area ("protection of the surrounding area") and this surrounding area mainly consisted of working-class neighbourhoods. It was, no doubt, in this way, that clean-air issues made their way into social-democratic party programmes and onto the trade-union agenda. Thus, it is easy to understand how the political-administrative arrangements of clean-air policies in the 1960s were relatively open to trade-unions and socio-political health organisations supported by the trade unions (particularly in France and England).

The institutional assignment of these small clean-air policies was located at local level. It was only in cases where agglomeration associations already existed for regional-planning purposes that local initiatives ultimately led to the competence of conurbation associations (Greater London, *Deutsche Umlandverbände* etc.). This importance of the region is again an expression of the extent to which these clean-air policies were immission-oriented and thus also incorporated strong regional-planning components.

These minor police policies did not maintain systematic interpolicy-co-operation with either other substantial or institutional public policies. This proved even less necessary when as a result of the above-mentioned cell division, industrial and commercial clean-air policy become for the time being part of national industrial policy (France, Italy) or, in more economically liberal countries like Germany and Switzerland, they become national industrial inspection policies. As such, they remained firmly under the control of the factory inspectorates which are close to industry and trade unions in terms of their interests ("cosy relationship" of Alkali and Clean Air Inspectorate in Air Pollution Control - Hill 1983). "Outsiders" could only gain access through employee-friendly health associations. What emerged here was a closed interaction system, whose sole participants were the national inspection authorities and the emitters.

3.2. Clean air policies of the 1980s and early 1990s

At this point, the key actors considered the existing and additional total volumes of emitted air pollutants as a collective problem which needed to be brought under control. The decisive change in perception consisted in a shift from the previous immissions orientation to an emissions orientation in clean air policy. This can be explained by the fact that political and scientific arguments were increasingly based on the concept of ecosystems. Thus there was a shift in emphasis to the flow of materials through different environmental media. According to this perspective, on the basis of air chemistry transformation and atmospheric physics transportation processes, the emission of pollutants into the air gives rise to an additional burden on ecosystems. The evidence is found not only in the form of noxious immissions in the air in the immediate surroundings of source of emissions but also in pollutant-rich precipitation (acid rain) at a distance from the source which can lead to the pollution of surface waters and groundwater carriers, and ultimately to damage to soil ecosystems. The extended damage concept applied here includes not only the direct effect on human health but also the functionality of ecosystems close to and far away from the emissions activities. The main trigger for this new perception of the damage was the acidification of Scandinavian and Canadian surface waters and the alarming *Waldsterben* observed in northern Europe in the mid 1980s.

The aim of these clean air policies consisted in defining the global volume of air pollutants emitted and reducing these volumes by means of suitable control measures. SO_2 and dust particles were still the main pollutants, although NO_x and organic pollutants later took centre stage. The aim in urban agglomerations continued to centre on the definition of more precise immissions limits. Given the apparent impossibility of establishing valid correlations between absolutely defined emissions tonnages and the corresponding burden on ecosystems, absolute emission reduction quotas generally continued to apply (in % of the total volume when the quotas are defined) in the description of total target emissions volumes. The aims defined by the Swiss Council of Ministers, whereby SO_2 and NO_x emissions were to have been reduced to the levels of 1950 or 1960[15], were typical of the relative helplessness of such clean air policies. International regimes (pioneer: the Geneva Convention on long-range transboundary air pollution of 1979) also work with relative reductions quotas ("30% Club" etc.).

With the shift in the problem definition, the causal hypothesis also changed and all actual emitters of air pollutants were now seen as causing air pollution. This resulted in the disappearance of the former spatial (urban agglomerations) and temporal (inversion periods) restrictions. Reductions in emissions needed to be achieved "irrespective of the immissions situation and all over the country" ("prevention principle")[16]. The former spatial-temporal definition component of the target group survived, however, in that additional obligations for the reduction of emissions were imposed on emitters from agglomerations if the required immissions limit could not be adhered to, despite the application of country-wide emissions limits (supplementing the emissions-oriented basic strategy with an additional immissions-oriented strategy)[17]. Despite this universal intention of including all emissions activities in the definition of the target groups of clean-air

15 Cf. Swiss Council of Ministers 1986 (Clean Air Concept).

16 Article 11, Section 2 of the Federal Swiss Act on Environmental Protection of 7 October l983 is typical of this rationality (SR 814.01).

17 For example, Article 9 of the Swiss Clean Air Decree of 16 December 1985 (SR 814.318.142.1) which requests more stringent emissions limits in the event of the immissions limits being exceeded.

policies, in practice there was a obvious concentration on industry, commerce and households and the transport sector was initially excluded in many countries.

This (as we are aware today, one-sided) causal hypothesis led to a concentration of clean-air measures on industrial and commercial processes and on the technological characteristics of type-tested household heating devices. This in turn triggered an unprecedented growth in technological innovations leading to the insight among target groups that measures for the conservation of air quality can have economic benefits arising from reductions in the use of materials and energy (ecological modernisation - Jänicke 1996). As a result, this causal hypothesis gained increasing acceptance among the target groups. It gave rise to new impulses in economic policy, led to the creation of employment and the establishment of an increasingly important ecology sector (ecobusiness - Benninghoff, Joerchel and Knoepfel 1997). This process was accelerated by the fact that new actors featured in the policy area of clean-air policies who were legitimated from a new expanded definition of the groups affected by the introduction of the relevant policies. The expansion of the target groups was accompanied by a corresponding universalization of the affected groups. The latter no longer consisted solely of local protective (trade union) organisations motivated by an interest in work practices but also included environmental protection organisations working on a national and European basis. The latter succeeded in establishing themselves as the defenders of the ecosystems. By the late 1980s, the initially sharp conflicts between the politically stigmatised target groups and the environmental organisations, formed by the protectors of nature and ecosystems, gradually abated. Partnerships were established ("co-operation principle"), in which reductions in emissions (in excess of the legal requirements) were traded for eco-acceptance. This shift in the nature of the affected groups, which were now mainly recruited among the educated middle classes, meant that clean-air policies relinquished their former socio-political bias.

Not least among the factors responsible for the above-mentioned growth in technological intervention was a new intervention hypothesis. This intervention hypothesis assumed that it would be easier to achieve changes in the behaviour of emitters if investment goods and service markets offer the required technologies in temporal harmony with the investment cycles of the different sectors thus enabling target groups to make savings in their economic calculations in the medium term. Global process technology and suitable control of material and energy input was to replace retention technology. This new intervention hypothesis was also reflected in changes in the modes of intervention. While bans and rules remained the preferred instruments, they were increasingly linked with the economic logic of the regulated target groups (negotiation of generally formulated emissions standards within the specific production conditions of different sectors). State regulative output also took long-term operational planning, the capacity of companies for self-regulation and the anticipation of technological innovations in the area of clean air into account. The provision of technical information (persuasive intervention mode) and the direct promotion of new clean air technologies and their application through financial incentives (incentive intervention modes) gained in significance. Conversely, direct regulative intervention was rejected in favour of contract-like agreements between authorities and companies (Knoepfel 1998).

Environmental law, which ds was extended (new pollutants), intensified (clarifications) and made more stringent with respect to emissions standar, remained the main resource availed of by the official regulative instances. Contrary to the opinion of some politicians, deregulation was not in sight at the end of the period. Moreover, the resources money (direct subsidies or tax relief for new environmental technologies) and time (adaptation of deadlines for redevelopment and introduction of technical innovations to the investment cycles in the different sectors) gained considerably in significance. By the mid-1980s, clean air policies in some countries enjoyed maximum levels of the resource of political support ("*Waldsterben* effect"). The importance of the resource of consensus was initially underestimated. This initially applied in the relationship between the administration and the target groups who, in the early 1980s, were successful in their opposition to supposedly excessive environmental requirements. The same applies for the environmental organisations which

staged politically highly visible front-line conflicts with administrations and companies concerning individual projects and planned legislation around the mid 1980s. It was not until the end of the period, that due to the increased environmental awareness and the political and scientific weight of environmental arguments there was clear consolidation of the position of the environmental organisations in the “iron triangle” involving the state, emitters and environmental organisations. This turning point led to a gain in significance for the resource of consensus, also in the relationship between the state and the environmental organisations.

The partial "despatialization" which accompanied the universalization of the emissions limitation strategy and the concentration on industry and business led to the strengthening of the position of national and community actors in the clean air political-administrative arrangements. The centralization was intended to guarantee the harmonization of emissions requirements and hence their competitive neutrality. It is basically impossible for a central administration to implement emissions reductions requirements equally on a country-wide basis. The centralization of the (quantitatively increased) legislation was, therefore, accompanied by a reinforcement of the regional implementation level. The temporary losers in this situation were the local units. The industrial and commercial orientation actually gave rise to the expectation that the position of institutional actors in industry, trade and police authorities would be strengthened. This calculation was, however, thwarted by the increased confidence of the environmental authorities who endeavoured to implement industrial and commercial clean-air policy themselves. Thus, in many cases the corresponding competence shifted from the traditional industry and trade inspection boards to the newly created environmental authorities. The actors responsible for the regulation of industrial and commercial emissions assumed a dominant position in the political-administrative arrangements of these clean air policies which had undergone an institutional “transplant”. These arrangements are often very well integrated in vertical terms (co-operation between national and regional level) with fragmentation along this axis existing only down to the local authorities. Horizontal intra-policy fragmentation is, in contrast, rare.

These transfers of competence created a need for new interpolicy co-operation between environmental and industrial or commercial regulations. This was guaranteed at the level of programme formulation through the widespread inclusion of these administrative instances in the definition of emissions and process standards and at implementation level through the development of more differentiated inter-policy networks in the context of the environmental impact assessment procedure (Kissling-Näf 1997). Finally, it is important to recall that the absolute necessity of the regional implementation of the almost precipitously produced international community law and national emissions reductions legislation in some countries (particularly France and Italy) made a key contribution to the formation of relatively autonomous subnational bodies. The implementation of technology-oriented industrial and commercial clean-air policy can therefore be described as one of the focal points for the assumption of autonomy by regional economic policies in these countries.

3.3. Clean air policies of the 1990s

A number of collective shock experiences in the 1990s led to the emergence of yet another perception of the problem of air pollution which ultimately transformed into an agglomeration-specific mobility and global climate issue (also strongly influenced by traffic). The shock of the discovery that even in countries which had introduced mandatory use of three-way catalytic converters for their vehicle stock during the 1980s, levels of NO_x pollution, the newly discovered health hazard of the PM_{10} particulate matter and ozone levels had hardly been reduced at all in areas near cities because the reductions achieved had, for the most part, been negated by increases in motor traffic. Clean air policy actors were also severely shaken by the debates surrounding greenhouse gases and climatic change which introduced a new global component. Barely had the pollution caused by industry, commerce and households been brought under control and the traffic file, which has been widely considered as more important, reared its head. Two new dimensions were, therefore, added to clean-air policies: air pollution was perceived firstly as a threat to health and ecosystems caused by traffic in and around urban agglomerations (again spatialised perception) and,

secondly, as an initially barely comprehensible global threat mainly arising from increasing fuel-consuming mobility.

This change in perception was accompanied by a recent change in the causal hypothesis. Individual and freight road traffic which was previously for the most part sacrosanct moved to the position of the central target group. Drastic intervention against these two target groups was identified as the price to be paid for "Clean Air in European Cities"[18] and protection against global climatic change. This conviction was articulated in declarations against the increasing collapse of the transport systems of cities and conurbations, the increase in winter and summer smog which is harmful to health and causes material damage in cities and the consistently high ozone levels in valued recreational areas surrounding cities. To this was added the increasing political belief in global temperature increases and variations (El Niño) with their disastrous consequences[19]. With the advent of the greenhouse gas problem, the affected group, which defines itself as a politically legitimated actor, increased significantly. In addition to more active and aggressive pressure groups against commuter and through traffic, non-governmental organisations emerged in Europe and throughout the world as protectors of climatic interests. These NGOs were, in turn, supported by the governments of the potential losers in the game of climatic poker.

The intervention hypotheses also had to be adapted to this articulation of the problem into the local and global levels. Control of the structure of emissions by means of regional planning was increasingly applied in the resolution of the local-supralocal air pollution problem (development of residential settlement areas on the outskirts of cities; infrastructure planning - Snickers. 1998). Moreover, a wide range of interventions were introduced in the area of individual and goods motor traffic in the form of bans and regulations (traffic regulations), incentive systems (traffic taxation, road pricing etc.) and direct infrastructure services (development of public transport in view of the modal split). The heterogeneous target group of vehicle users, which it would be impossible to control using individual measures,

18 Cf. concluding reports of CITAIR, Cost Actions nos. 614-618, Zürich (Synergo), 1998.

19 NFP 31; Glogger 1998.

became the object of attempts at collective regulation (car fittings, fuel composition), incentive schemes and campaigns[20].
The intensification of traffic-related clean-air policies led to a downturn in the significance of the resource of the law which was overtaken by the resources of information (campaigns, traffic research, traffic education), personnel (control of road traffic regulation), money (incentive schemes, expensive technical traffic regulation systems), consensus (increasingly controversial road-building projects), time (the problem of peak traffic periods) and space (spatial concentration of traffic movement). This list of required resources is extensive and involves correspondingly high costs for the most part carried by the local and regional administrations which by now were plagued with financial difficulties. Also, in view of the increasingly scarce resource of political support (opposition on the part of the automobile associations), tension was inevitable.

With this reorientation in the direction of traffic, both within clean-air policy as a whole and with regard to their external relations, the political-administrative arrangements underwent considerable reorganisation. Internally, the number of local actors increased and there was a gain in significance at national and international level (climate problem). The horizontal fragmentation to the actors involved in industrial and commercial clean-air policy increased because the latter tend to be more active at regional then local level (concomitant vertical fragmentation). Moreover, co-operation between local, supralocal and national actors (national clean air urban policy) increased. Thus, vertical tensions between the local and regional levels, which can be traced back to defensive urban strategies directed against the outer conurbations (which threaten the town or city with commuter traffic), became more common in the political-administrative arrangement[21].

Such clean-air policies can represent very important triggers for fundamental reorganisation at institutional level, however, as they demonstrate the need for a supra-local regulation unit which would be responsible for the urban centres and

20 Cf. Zimmermann, Wyss and Neuenschwander 1997.

21 Voter potential which is important for the regional governments is recruited in these outer conurbations.

suburban authorities as an agglomeration spatially defined by commuter movements (Klöti et al. 1993; Knoepfel et al. 1995). Such initiatives for the formation of urban agglomerations are also (in part correspondingly) justified by the fiscal impoverishment of the town and city centres and a corresponding increase in the financial resources of peripheral authorities from which the commuter movements to the town and city centres emerge (Frey 1996: 26 ff.). These clean-air polices can, therefore, become the triggers for institutional innovation in the urban agglomerations.

Such traffic-related clean-air policies can only survive if they maintain intensive interpolicy contact with local and regional road construction, traffic regulation, regional planning and public transport policies. In the past, this classical inter-policy quintet (Knoepfel et al. 1995: 356 ff.) was only complemented by further interpolicy co-operation with local or regional energy policy in a few cases. Such interpolicy co-operation was, however, increasingly observed at national level where clean air policies concerning greenhouse gases were being developed.

In rural areas, there was increased co-operation between traffic-related clean air policy and biodiversity-related nature protection policies. This is hardly surprising in view of the fact that the most important cause in the demise of biodiversity is mobility-promoting infrastructure with its extensive requirement of land (Knoepfel et al. 1996: 76 ff., 301 ff.).

3.4. The clean-air policies of the turn of the century[22]

There is much to indicate that the above-described concentration of air pollution problems on the ever-expanding road transport systems in agglomerations (individual and goods traffic) and on the accumulation of greenhouse gases will continue well into the next century. With the support of the general change in the environmental policy paradigm, manifest in the sustainable management of resources[23], the problem addressed by clean-air policy has been transformed into a distribution question. There is increasing recognition of the fact that the authorisation of each motor vehicle and the licensing of industrial and commercial operations which emit air pollutants translates into the distribution of rights for the use of clean air or for the repletion of the atmosphere with greenhouse gases. Despite the compliance of emissions of these gases with the individual restrictions defined in the 1990s, their accumulation in the air in urban agglomerations leads to the massive over-use of the existing absorption capacity of the resource of clean air (sink) with little remaining for competing third-party users. The regime of clean-air use (already excessively burdened by motor vehicle use) sees itself subject to increasingly superseded legitimate claims for third-party use which must be considered for reasons of social peace. Thus, the problem to be addressed by turn-of-the-century clean air policy consists in the definition of globally available contingents of clean air on the level of expanding urban agglomerations and on the planetary level of the atmosphere and in the allocation of these contingents to competing user groups. Clean-air policy becomes (re)distribution policy.

The central target group of these redistributing and still primarily traffic-oriented clean air policies are the motor vehicle operators and manufacturers. The situation now differs from that in the early 1990s, however, in that it is no longer individual drivers of motor vehicles and their emissions behaviour but the entire fleets of vehicles with their different subgroups that are being held responsible for

22 The "vision" presented here initially developed in Knoepfel, Grant, Perl 1999 on the basis of contributions in Grant, Knoepfel, Perl 1999; Murswiek 1985 (approaches from a legal perspective) and Knoepfel, Kissling-Näf, Varone 1999.

23 Both natural resources which act as pollutant sinks and productive resources.

the over-use of clean air, for the threat to climate (together with industrial firing installations) and for the insufficient use of these resources by competing user groups. Air pollution is seen as (too high) a price to pay for the increasing domination of the use of clean air by motor vehicles. Thus, the affected group, which already underwent extensive expansion during the 1990s, is now becoming the group which claims the clean-air use rights for itself (and at the direct cost of the target groups). It is demanding not only (socially) justifiable reductions in emissions in the area of motor vehicles but the imposition of vehicle mobility restrictions, irrespective of the will of individual drivers. These can take the form, for example of restricted access to motor vehicle ownership, roads and mobility areas in urban centres. Industrial and commercial operations feature as competing consumers and hence parties affected by the pollution in both agglomerative-urban policy (NO_x orientation) and in the planetary clean-air policy (CO_2 orientation). They see their claim to clean air as threatened by the excessive consumption of clean air by traffic. This enables the formation of powerful coalitions which unite productive and reproductive sectors against motor vehicle mobility.

Such clean air policies will have to develop new intervention hypotheses, the starting point for which is the total fleet of motor vehicles authorised for use in the agglomerative air sheds and not the individual owners of motor vehicles. The same applies for the CO_2 question where, in addition to the national motor vehicle stock, all industrial plants etc. that produce greenhouse gases will be subject to control. What was in part practised under the opposite circumstances in the clean air policies of the 1960s - at least at local level - will henceforth become the general intervention philosophy, i.e. the planned management of the resource of clean air in space and time. This should enable the co-ordination of claims for use by motor-vehicle stocks with other claims for the use of non-reproducible clean air. At international level, the planning should define national CO_2 quotas in the context of the global CO_2 absorption capacity in terms of space and time. Such plans can be achieved through regulation (bans and prohibitions), incentives (national incentives) and through the creation of new clean-air markets. In view of the potentially explosive nature of pure market solutions, which can result in the monopolization of current use rights instead of the desired redistribution, a mixed intervention mode consisting of regulative

(contingent or quotas: implicit right with limits in the form of bans) and incentive (example: economic incentives for avoiding use of motor vehicles) elements will probably be selected.

In any case, the above-described effect mechanism necessitates the definition of the consumable clean air on offer in an air shed for distribution on the basis of quotas (or clean-air rights formulated in other terms) and of the acceptable level of CO_2 accumulation in the atmosphere of our planet. This definition can be applied on agglomeration level on the basis of existing immission limits; however, more detailed information is required about the current status of immissions, the necessary reduction in immissions (or, in exceptional cases, possible additional immissions) and reliable models for the conversion of immissions to emissions. This could be far more difficult to achieve at global level, given the difficulties with respect to data[24].

Of the resources used by the authorities, access to space based on consensus between the most important target and affected groups in an agglomeration (resource: space) and the resource of organisation (establishment of collective organisations for target and affected groups, establishment of super-local institutions) will gain in significance. The described quota regulations could be extremely radical and thus require a clear legal basis. Even if there is no distribution or redistribution of purely subjective legal claims in the technical sense, the resource of law will become increasingly important in the above-described global control as, in addition to the allocation of individual quotas, determination of group quotas will require legal standardization. Given that what is involved here are redistribution policies, the authorities and social actors will find themselves in highly conflictive zones. There will, therefore, be a scarcity of the resource of consensus at times.

The administrative-political arrangements for such clean-air policies will, no doubt, experience considerable change. The position of institutional actors who, as part of the clean-air agencies, are responsible for the inventory of resources

[24] To illustrate: the disputes about CO_2 quotas at the international climate conference in Kyoto (1997).

and planning of consumption will gain in significance. This new function would have to be established within the administrative-political arrangement at the level of an air-shed institution (above local-authority level) (Perl 1999). This kind of supra-local institution is highly dependent on independent democratic legitimization because it is here that the decisive redistribution processes for local clean air policy are implemented (against the will of individual target groups). It will also be necessary to fight tendencies for vertical fragmentation within the political-administrative arrangement. These tendencies will probably arise the attempt of national authorities to enforce CO_2 reduction quotas imposed on them in international agreements on the regions and urban agglomerations. The latter will react to this by refusing to co-operate (ultimately referring to their own distribution struggles in the area of traffic). Similar fragmentation tendencies may appear at horizontal level reflecting the preservation of the vested rights of the traffic-related clean-air policies and "their" quotas. The introduction of redistributive shifts in these quotas in favour of other users such as pedestrians, urban residents, street residents, industry and commerce is, of course, the aim of these new policies. Fragmentation between administrative actors can only be counteracted by a "strong" and hence direct-democratic legitimised "agglomeration state".

As I have shown in another study (Knoepfel, Grant, Perl 1999), such clean-air policies at agglomeration level can only be successful as a component of integrated sustainable mobility policies. Other mobility-relevant policies such as road construction, regional planning, traffic regulation and public transport and both national and regional energy policy are also involved here. With the help of an intelligent interpolicy strategy, clean air policy can become the focal point of this kind of mobility policy despite the fact that it is responsible for the administration of one of the two increasingly scarce natural resources in this area (clean air)[25]. At institutional level, such clean air policy should become an important impetus for institutional reorganisation at both local and international level. The above-described distribution problem can only be solved if new "air-

[25] The other scarce resource is road surface used by the public, under state or private ownership. The increased use of this resource is now reaching its limits for a wide range of reasons.

shed institutions" with independent democratic primary legitimization which include urban centres and suburban authorities are established in the agglomerations. At international level, regimes are required which have sufficient legitimization (for example within the framework of UNEP) to enforce the agreed CO_2 reduction quotas on the nations.

4. Summary and conclusions

The chemical composition of air pollution has changed in the course of the past fifty years. Nonetheless, throughout this period it has mainly originated from combustion processes which have only been subject to insignificant change with respect to their main polluter groups. Thus, during this period since the 1950s, CO_2 (non-toxic) and nitrogen oxides, sulphur dioxides and dust particles have been emitted into the clean air as a result of combustion processes. Despite this, the problem perception and formulation of clean air policies in West European countries have undergone fundamental change on at least three occasions in this relatively short time. They changed from a focus on the local health hazard caused by house fires, industry and commerce to the potentially ubiquitous threat to ecosystems arising from industrial and commercial emissions, local and global health and climate hazards and finally on the issue of (re)distribution which is concerned with the allocation of competing rights to the local resource of clean air, rights for the use of the CO_2 sinks or for the repletion of the atmosphere with greenhouse gases at global level. This history has taken the clean-air policies of West European countries through a series of rapid and unpredictable changes involving the exchange of both the causal and intervention hypotheses which deploy the necessary public resources for its management and the reorganisation of their political-administrative arrangement, including their institutional framework, on several occasions. The course taken by external relations with other public policies was equally turbulent.

In reality, therefore, we are dealing with four very different policy generations whose only common factor is that their core concern was the fight against the health hazard of air pollution. The interactive arrangement of the five basic elements which react to different problem and target definitions shows a high degree of internal coherence in all cases. These rationalities are updated on a varying but coherent basis through state action in the context of action guiding reference systems for the linking of acting subjects (target groups), objects (affected groups) and a varying spatial and temporal perimeter (local, national,

global). It should be noted that the fourth development phase (turn-of-the-century clean air policy) primarily involves prospective speculation[26].

Thus, I believe that I have provided sufficient substantiation for hypotheses one and two formulated at the outset of this essay. There is actually no single "rationality" of clean air policy. On the basis of the six basic elements described, however, it is possible to distinguish four different rationalities, whose changes at the level of these basic elements conform to a specific regularity. This is not only due to the fact that it is a highly technical policy. It is true that the actors' discourse, particularly in an international comparison, is primarily highly technical in nature and thanks to a language capable of generalisation (often English) transfers have taken place between different countries. This is not sufficient, however, to explain the similarities of the rationality structure. Equally significant is the fact that the described policies display a very similar setting of institutional and social actors for each phase. The composition of these "policy operators" changes from one phase to the next depending on the varying target and affected groups and the institutional positioning of the policies with respect to other major policy areas (health, industry etc.). Newly established policy areas produce different substantial policies. The nature of the actor population is decisively influenced by the changing perception of the problem. The latter is clearly less contingent in similarly objective air pollution conditions than in other public policies which often perceive similar problems in very different ways and produce very different actor constellations.

Thus, the change which can be observed in rationality over the past fifty years, at least in West European countries, displays a surprisingly reasonable line of development. This must be mainly explained by the common course taken by the objective problems in these countries, the social and institutional actors involved who populate the policy areas in similar constellations and the gradual learning processes resulting from internationally available information.
Because this statement is restricted to West European countries, it is not possible to identify, for example, the extent to which East European or even Latin

[26] Speculation: integration of the economic principle in the management of the resource of clean air with corresponding change of regime. Cf. Knoepfel, Kissling-Näf, Varone 1999.

American or South-East Asian clean air policies will necessarily display similar patterns in the future. Impressions from Eastern European countries would lead to the assumption that clean-air policies are primarily tackling house-fires, trade and industry and as part of a second phase the traffic sector. Due to the mass resistance of the owners of the very potent symbol of newly-acquired affluence, the motor car, an attack on traffic without previous or at least parallel intervention for trade and industry would face inevitable political failure. This is supported by the increased availability of new industrial clean-air equipment thanks to technology transfer. However, the effect of international transfers in the area of motor vehicles are negative rather than positive in their effect on the environment[27].

It is left to the reader to complete the sketch presented to give a full-scale and detailed portrait. Please forgive me if the heavy pencil lines of the sketch are revealed as inaccurate in places in the course of this detailed work. Whether ultimately the turn-of-the-century clean air policies, whose sketch presented here, seem irrational to some, will actually become a rational reference system in the year 2010, is something I will not be able to judge until I am in my retirement. By then this in turn will be identifiable as a temporary phase and a new (fifth) phase will be under way.

[27] Transfer of used vehicles to East Europe with inferior environmental fittings.

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