The Political Ecology of Automobile Recycling in Europe*

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Abstract

This paper addresses the relationship between organizations and the natural environment from both theoretical and empirical perspectives. In doing so, it contributes in three ways. First, it satisfies the need for more political perspectives in environment-related research. Second, by analyzing the end-of-life vehicle issue that the European automobile industry addressed in the 1990s, the paper satisfies the need of developing research that integrates organizational and field-level analysis. Finally, the use of the political ecology framework for the analysis of the end-of-life vehicle issue contributes to the development of a more politically charged institutional theory in which, as the study shows, both inertia and change in organizational fields depend on circuits of political ecology.

Descriptors: political ecology, end-of-life vehicles, organization and environment, institutional theory

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Introduction

In Western Europe, around 12 million cars become end-of-life vehicles (ELVs) every year, generating approximately 2.2 million tonnes of permanent waste (Wright et al. 1998; Kurylko 1997). Remarkably, in the context of Western European countries, this only became an *issue* in terms of its environmental impact in the last decade of the 20th century. In particular, Germany became known worldwide for its tough approach, requiring the implementation of 'extended producer responsibility' regulation as a solution to post-consumption waste problems. It was in August 1990 that the Federal Ministry of the Environment drafted a proposed regulation suggesting that it was the manufacturer's responsibility to take back end-of-life vehicles, at no cost to the consumer. That was in 1990; by 1999, however, representatives of the German government were lobbying European Union diplomats to delay full producer responsibility regulations. After long negotiations, the Union agreed to push the back date when producer responsibility would apply to car manufacturers from 2003 to 2006.

It was this change in the position of the German government that served as a trigger for us to enquire into an area of both empirical and theoretical importance for the emerging field of *organization and environment*. We

were intrigued by the political contestation surrounding ELV issues. It was this contestation that encouraged us to seek an explanation for both change and inertia within organizational fields. Surprisingly little help could be found in organization studies. Only a small body of knowledge has accumulated on environment-related research, mostly since the 1990s. One of the most important streams deals with the role of regulation in promoting organizational change — a line of inquiry initiated by a short essay written by Michael Porter (Porter 1991) and published in *Scientific American*. The 'hypothesis' developed in this essay initiated intense debate as well as generating studies inquiring into the role of regulation in promoting environmentally sound innovation (Walley and Whitehead 1994; Porter and van der Linde 1995; Palmer et al. 1995; Esty and Porter 1998). While these studies focus either on the societal or organizational level of analysis in questioning the influence of environmental regulation on organizational behaviour, they do not enquire into the political economics of regulatory frameworks. Such lack of consideration is not unusual. In a review of organizational and management articles published in the first half of the 1990s, Kivisaari and Lovio (1996) found that there was a substantial lack of political/power perspectives in environment-related research. They also found that a significant number of studies had a tendency to analyze organizations as singular entities, focusing on internal determinants of environmental strategy. In a more recent (and preliminary) review, Russo (1999) reiterated the view that most studies on organizations and the environment concentrate on the societal or organizational levels of analysis, while research at the industry level is scarce. Indeed, according to Den Hond (2000), when research has been developed at the industry level of analysis, it quite often assumes an 'industrial ecology' perspective, in which the *organization and environment* issue is reduced to the management of material flows by informational, technical, or economic means.

Environment-related research has evolved significantly in the second half of the 1990s. The influence of environmental issues on the definition of corporate strategies has grown as an important area of enquiry that focuses on the potential open to firms to profit from environmental investments (for instance, see Reinhardt 1998, 1999). Overall, a wide range of perspectives has been used to research why organizations pursue ecology-oriented strategies and practices (Starik and Marcus 2000). According to Winn and Angell (2000) such growth did not change the characteristics of the emerging research area: the organization remained the main level of analysis used in the majority of studies. Exceptions can be found in the work of Hoffman (1999), Howard et al. (1999), and King and Lenox (2000). Because the theoretical foundation of their work is mainly based on institutional theory — a traditional area of organization studies — the *organizational field* is the main level of analysis adopted. The significance of their work is that, taken together, it helps one to understand the institutional dynamics (mainly related to the *Responsible Care* programme) that influence behaviour in the organizational field surrounding the American chemical industry. The work of Hoffman (1999), in particular, stresses a view of organizational fields as

'arenas of power relations'. He later emphasized the need for some refinement of neo-institutional theory, calling for research that provides 'balanced attention to both the influence of the institutional environment and the role of organizational self-interest and active agency within that environment' (Hoffman 2001: 134). We take up this challenge in this paper, encompassing three main elements that require further development within a consideration of the *organization and environment*.

First, by applying the *political ecology framework* proposed by Orssatto and Clegg (1999) to the analysis of the ELV issue, we focus chiefly on the political dimensions of environmental issues in organizational studies. The framework addresses issues developed in the *institutional context* of the European automobile industry. It does so by providing an 'anatomy of power' that combines institutional theory with a power perspective. Hence, in this paper, we propose an *institutional-power* analysis. The use of this framework uncovers field-level constituencies engaged in 'institutional wars' (White 1992), enabling us to explain ELV-related organizational practice in the European automobile industry during the 1990s. In doing so, we avoid simplistic answers, such as the proposition that a powerful automotive industry succeeded in imposing its interests on a less powerful government, or that the resolution of the issue is determined by economic and technical constraints that are autonomous determinants.

Second, the use of the framework allows us to establish a link between organizational and field-level factors (here called *environment-contingent factors*) that influence the development of environmental initiatives in a specific organizational field. As we will argue, contingencies do not just have an impact on organizations, but flow through contexts in which power is embedded (Clegg 1989). These dynamics within the terrain of political and strategic ecological practices, located both within and around organizations, consist of what Orssatto and Clegg (1999) call the *political ecology of organizations*.

Third, by using this political ecology framework for the analysis of the ELV issue, the paper develops research that focuses on the context in which organizations are embedded: the industry level, which we prefer to develop in our analysis, as the organizational field.

Empirically, we discuss longitudinal case studies of both the policy processes and industrial activities that formed around the European ELV issue. We collected our information from semi-structured interviews with key players in the various governments and industries, as well as through document analysis (Den Hond 1996; Den Hond 1998a; Den Hond 1998b; Orssatto 2001). The choice of the research population followed Hoffman's (1999: 554) principles, where the 'membership and bounds were not externally imposed by the experimenter, but emerged from the data'. By addressing the problem areas involved in the ELV system, we identified the scope of influences in the European automobile industry. In sum, the population to be researched was defined through the patterns of social interaction identified in the research process, and depicted in the political ecology framework.

We analyzed the organizational field of the automobile industry in Germany, France and Italy. We appreciate that other countries that host manufacturing plants, such as Sweden, England, Belgium, Spain and the Netherlands, also had their share in developing and influencing ELV-related regulations. However, our selection of three cases relates to the home bases of the leading car manufacturers in the European market in terms of volumes sold, numbers of models developed, and exports. Statistically, when European cars end their 'lives', these lives are more likely to have started in Germany, France and Italy, than elsewhere.

End-of-life Vehicles

Cars can become end-of-life vehicles for different reasons. The *natural* circumstance occurs when car owners are no longer able to extract additional use value from their vehicles. In such condition, private owners sell their cars to dismantlers. But when the car has a negative value (it would cost the owner money to dispose of it), it is very common that the last owner will (illegally) abandon the vehicle. In this case, local councils normally have to carry the cost of transporting the *abandoned* end-of-life vehicle from the dumpsite to a scrap-yard or a shredder firm (in this case, bypassing dismantling activities). Another situation that is economically significant occurs when cars become *premature* ELVs. Research by Ghering and Teulings (in *CAIR & MVDA* 2000) found that around 22 percent of the cars taken off Dutch roads, for instance, were written off because of accidents. Depending on the degree of vehicle damage, these premature ELVs can be significantly more valuable in terms of their components, than is the case for ELVs that have 'died' of old age. Accidents normally involve compensation by insurance companies, and these firms are normally the ones who deliver premature ELVs to car dismantlers (Orssatto 2001).

Whatever the reason for cars becoming ELVs in the Western European context, they will inevitably need to be processed. The current processing system for *natural* ELVs comprises the disposal of the vehicle by the last owner, its dismantling and the shredding and the recovery of metals (Figure 1). The profit motive driving the system is to find value in parts and components on the second-hand parts market and in scrap metal. Due to rapid and often dramatic fluctuations in scrap metal prices, the system has become very flexible in responding to changing market demands. It is a complex system that comprises several interdependent, but competing, economic agents (Groenewegen and Den Hond 1992; Field and Clark 1994).

Traditionally, ELV *dismantling* has been an area of low technological qualification and little capital investment. Typical operators work from the wastelands of consumer society and live off the waste that this society produces. Driving down costs and increasing turnover is the source of profit. Many disassemblers refrain from investing in equipment and capabilities that might upgrade the business, e.g. for stocking parts and components or for the collection and disposal of hazardous automotive substances, such

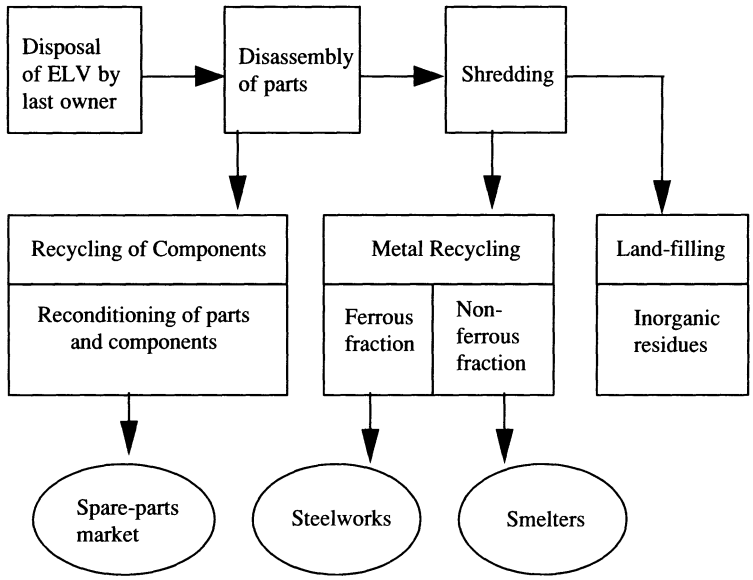

Figure 1.
The ELV Processing System (Den Hond 1996)

as solvents and oils. In order to reduce labour costs, some car dismantlers even ask their customers to disassemble the parts they want to buy. Consequently, many scrap-yards are still repositories of years of abuse, neglect and contamination of the natural environment, as oils have spilled, fuels run, and batteries leached into the topsoil. Thus, in this traditional sector, there was considerable potential for innovation and organizational learning, by increasing the efficiency and scale of operations, as well as in handling hazardous wastes and materials. It is because of the industry's reputation and its traditional lack of organization that the inclusion of car dismantlers into the political ecology of ELV recycling has proven difficult in the Netherlands, Germany, and Italy. Some car dismantlers in these countries have used the ELV issue to leverage their business, by investing in their operations in order to upgrade and upscale their business. Today, such investment increasingly becomes a 'license to operate'.

By contrast, *shredding* exhibits much higher levels of technological innovation. At a shredder plant, the ELV is destroyed into fist-sized pieces. Various separation technologies are used to recover automotive metals. The shredder industry is capital-intensive and there are few opportunities to improve the efficiency of metals recovery. Under profitable conditions in the industry, recovery rates for automotive materials exceed 95 percent for ferrous metals and 90 percent for non-ferrous metals. Since about 75 percent of the vehicle weight is composed of various metals, a considerable amount is being recovered in recycling. The remaining 25 percent comprise shredder residues, and these will need to become landfill; it is estimated that about 3 million tons are dumped annually in Western Europe (Groenewegen and Den Hond 1992).

If vehicles were just made of metal, and if no product innovation had

occurred, there would be little more to add to the sketch provided. However, today's ELVs were designed about 15 years ago, and in recent years various types of plastics and composite materials have been increasingly substituted for metals (cf. Den Hond 1996 for a more detailed technical account). Because the relative share of metals in the cars' material composition has decreased, the amount of shredder residues is expected to increase. This threatens the profitability of metals recycling in two ways. First, decreasing metals contents result in a lower valuable-materials turnover for the shredder and, hence, lower revenues. Second, increasing amounts of shredder residues result in increasing disposal costs. Reduced capacity for landfill and more stringent controls on waste disposal further increase landfill costs.

Governments and industries have explored various solutions, including improving the current system by processing shredder residue further, to produce fuel for energy-intensive industries such as the cement or steel industries. Development work has been done to separate plastic materials from shredder residue. For instance, tyres can be recycled into industrial products for the construction industry. New technological bases for ELV processing have also been sought. The joint project of Mercedes-Benz and Voest-Alpine is an example. They developed a process for 'metallurgical recycling' in which the ELV is fed into a melt-reactor. In this reactor, steel is produced; organic materials are incinerated and added to the carbon contents in the steel product, while inorganic materials are separated into inert slags.

Car manufacturers and their representative organizations, car dismantlers, shredders, national governments, and the European Commission comprise the major players in the ELV arena at the European level. In the 1990s, the European Commission tried to play a central role in drafting various proposals for directives on the treatment of ELVs. However, lobbying by both industry and national governments has resulted in a competition for preferred policy outcomes. As will be shown, national circuits of political ecology, compared with those at the European level, have proved to be stronger than for most of the decade (Den Hond 1998b). Moreover, differences between institutional-power contexts among EU countries resulted in differing patterns of action and reaction in the way the ELV issue was addressed. For this reason, in order to explain what happened in the European auto industry, the next section describes the evolution of the ELV issue in three different institutional contexts: Germany, France and Italy.

The Evolution of the ELV issue in Germany, France and Italy

The automotive industry has been aware of the ELV problem since the late 1970s, but it was only in 1990, with the proposal of a draft regulation from the German Federal Ministry of the Environment, that explicit recycling strategies were initiated by the sector. The initial policy objectives with respect to ELV waste were based on three principles: (i) producer respon-

sibility for handling ELVs – the polluter pays principle; (ii) preference for waste prevention and recycling over incineration and landfill, and, (iii), stimulation of environmentally conscious product development. The 'voluntary agreement' approaches of France and Italy are in contrast to the direct regulation approach in Germany. In these countries, the automotive industry and related businesses (suppliers of materials and parts, car dismantlers, metals recovery and recycling firms) pro-actively anticipated an industry position and reached a formal agreement with their respective national governments.

Germany: The Role of Environmental Policies and Programmes

The origins of the German debate about the environmental impact of changing material choice in vehicle design date back to the early 1970s. In that period, some individuals within FAT (*Forschungsvereinigung Automobiltechnik*) — the long-term research institute of the German automotive industry — became concerned about the increasing use of plastics in vehicle design. At the same time, they were becoming aware of the limits to landfill capacity as well as the limits to growth and the increasing scarcity of natural resources. These topics were considered important enough to justify a dedicated working group on automobile recycling. During the 1970s and 1980s, this working group published a number of studies on related topics, including the use of ferrous and non-ferrous metals, and plastics in vehicle design and design for recycling and disassembly, among others. The German Federal Ministry of the Environment (BMU — *Bundesminister für Umwelt, Naturschütz und Reactorsicherkeit*) was represented in several of the working groups, indicating that the work done under FAT supervision set the agenda, providing arguments for the policy debate around the recycling of end-of-life vehicles in the late 1980s.

A second antecedent of ELV developments in Germany related to the legal foundation of the intended take-back and recycling policies in the Waste Avoidance and Waste Management Act (WMA) promulgated in November 1986. The WMA stipulated that the generation of waste should be avoided, and that, in waste-treatment, re-utilization was to be preferred, rather than incineration and disposal. It also introduced producer responsibility for the treatment of post-consumer waste by mandating product take-back and recycling schemes. Specific measures with respect to ELVs were announced. In August 1990, BMU drafted a regulation stating that car manufacturers were responsible for recycling the vehicles that hey had manufactured, at the end of their life cycle.

German draft regulation induced other European auto-makers to take action. They feared that the cost associated with this new 'extended producer responsibility' legislation would result in a loss of competitiveness (Lindqvist 2000). Not only the regulation itself, but also the possibility that other countries would adopt similar policies was a cause of action. Indeed, in the Netherlands, a voluntary approach to ELV recycling was started in the late 1980s, which resulted in a 'Scrap Vehicle Implementation Plan'

presented to the Minister of the Environment in January 1992. In the early 1990s, the European Commission also adopted plans to develop a directive on the ELV waste issue.

Attempting to cope with the new constraint, auto-makers took action in two complementary directions (Den Hond 1998a). First, they tried to convince legislators that the ELV responsibility should be shared with related businesses (suppliers of materials, parts and components, car dismantling and shredding companies) and that the cost of recycling should be borne in the market. Based on previous discussion among auto-makers and these related businesses, VDA (*Verein der Automobilindustrie*) — the German automobile industry association — was able to respond to the BMU, in October 1990, with a 'concept for the future processing of end-of-life vehicles'. Second, automobile manufacturers started on a more intensive learning process concerning the ELV problem by installing pilot plants for dismantling. Even though political lobbying could delay the implementation of 'take-back' regulation, auto-makers did not want to risk 'being caught' by new cost elements, without any alternative practical responses.

At the firm level, auto-makers worked in these pilot plants in order to learn about dismantling times and to identify economic limits to the recovery of car parts. The pilot plants were either established by single manufacturers, or in cooperation with dismantlers and shredding companies. One result of the research conducted at these 'dismantling laboratories' was to identify the limits to increasing current practices of recyclability of non-metallic car parts. In most cases, the current design and assembling techniques of automobiles made disassembling and recovery extremely difficult. For instance, many different types of plastics are widely used in the industry. Moreover, plastics are difficult to detach from a car body and their identification demands costly time. To defeat these costs and difficulties, it became evident that it was necessary to involve suppliers in the design phase, working closely with them in order to overcome the main hurdles.

Externally, auto-makers developed closer relationships with dismantling, shredding and recycling companies. It was necessary to have a better understanding of the problems associated with the recyclability of materials currently used by car manufacturers. A number of pro-active, forward-looking dismantling companies gained status to become a new *agency* in the auto industry. Dismantling techniques were now to be considered integral activities in the life cycle of cars. Manufacturers needed to identify the problems associated with, not just the production and consumption of cars, but also their disposal. Shredding processes received particular attention, since the increase in the number of plastic parts that were not disassembled meant that they were ending up in landfills — thus increasing costs for business.

In February 1991, VDA established a dedicated working group on end-of-life vehicle recycling called PRAVDA (*Projekt Altfahrzeugverwertung der deutschen Automobilindustrie*) in which all German car manufacturers were represented. PRAVDA aimed at political and technical co-operation among its participants in order to advance industry-wide recycling activities. Under the PRAVDA umbrella, the car manufacturers elaborated further on the

'VDA concept', communicated it to the BMU and the general public, and engaged in technical and market research to prepare for its implementation. Thus, dismantling pilot studies were coordinated and results discussed among the members of PRAVDA; material recyclability was studied in close co-operation with the plastics, rubber and glass industries, and new dismantling tools, information systems, and advanced material-sorting techniques were developed. PRAVDA-VDA elaborated a 'common concept for the recycling of end-of-life vehicles'. The common concept should be seen more as a political stake than a technical document, since all auto-makers endorsed the proposal, despite their preferences for different solutions at the technical level. The industry position was reinforced after the French *Accord cadre* was agreed, since German auto-makers wanted BMU to accept a similar procedure.

Questions about the recyclability of most plastic parts remained, but auto-makers started directing attention towards those components that were easiest to disassemble and most cost-effective to recycle. In the period 1991-95, the next measure taken by auto-makers was to create recycling networks via bi-lateral agreements with car dismantlers and shredding companies. Although these networks represented a step forward to reducing ELV waste, they were restricted to a few car parts. As parts and components become smaller, and require more tooling, their disassembling becomes increasingly time demanding, and thus costly. Consequently, car manufacturers have limited their recycling efforts to a few big plastic pieces. In February 1996, BMU finally accepted an industry proposal very similar to that of the French *Accord cadre*, which we explore in the next section. Some recycling targets were established, but they were much less demanding than the very first draft regulation proposed by BMU in 1990.

France: The Role of Related Businesses

As opposed to the unilateral approach chosen by the German government to regulate end-of-life vehicle processing, issues around ELVs developed differently in France. The French had less historical and legal background in environmental policy and no strong internal dynamics in waste management policy. The policy arena was characterized by greater cooperation amongst all the actors involved in the process, which resulted in the *Accord cadre*, a voluntary agreement signed in March 1993.

The actor that proved to be the prime mover in developing a solution to the problem of ELV waste was in a *related business* to the car industry: a shredder company. During the 1980s, CFF (*Compagnie française des ferrailles*) — the leading French shredder company — became concerned about the escalating costs of landfill, due to the expanding amount of shredder residues. CFF discussed the ELV problem at various times with both the French government and specific organizations in the national automotive industry. After having dismissed material recycling as a viable solution, the company proposed a potential solution that used the calorific value of shredder residue to fuel cement ovens. Together with Peugeot, CFF

started research in September 1990 to prepare a pilot project to develop and test the technology further. The pilot project was launched in June 1991 for a period of two years, with financial support from the Ministry of Industry. Also in 1991, the Ministry sponsored a comparable project with a consortium based on Renault that tested a slightly different incineration technology for shredder residue.

Meanwhile, the European Commission proposed a 'community strategy for waste management' based upon the principles of waste prevention, source reduction, and the 'polluter pays principle', adopted by the European Council in 1990. The strategy applied to both products and production processes and aimed to create loops of material flows in which outputs of specific processes could best be valorized as inputs to other cycles in a continuous process. The strategy explicitly called for the marketing of products developed in such a way as to minimize waste during all stages of the product's life cycle. These principles, it was thought, could be used by the Commission and by member states as a means to restrict the use of certain materials and to develop specific waste policies for products. A number of waste streams were declared 'priority' and member states were invited by the Commission to prepare an EU approach for selected waste streams. France accepted the responsibility for co-ordinating the ELV waste stream in June 1991. In December of that same year, ADEME (*Agence de l'Environnement et de la Maîtrise de l'Energie*) — the French State Agency for Environment and Energy Conservation — presided over the first meeting of the European ELV Project Group.

ADEME, as represented in the person of the first director of the European ELV Project Group, considered it fundamental to start a parallel French group on ELV recycling, 'because something had to be organized in France', if only 'to anticipate emerging European politics'.[1] Very quickly, the French Ministry of Industry took over the direction of the French working group from ADEME. The automotive industry and related businesses, as well as the Ministries of the Environment and Industry and ADEME, were all represented in the French group. The first meeting occurred at about the same time as the European working group started. When the French working group assembled in 1991, there was neither a specific waste policy on end-of-life vehicles nor recycling targets (as was the case in Germany). Moreover, no preparatory policy studies had occurred. In the words of a representative of the Ministry of Industry, there was at that time 'no systematic reflection on the issue'.

Significant industry groups, such as Renault, the PSA Group and CFF, agreed to participate in the working group in order to try and prevent direct regulation. These industry groups rejected the German draft regulation as a model. Instead, they thought that industry-wide cooperation, collective liability, and commercial relations between the various parties involved, were better principles from which to solve the waste problem of shredder residues. The working group's objective was to reach a voluntary agreement on the reduction of waste from ELVs along these principles. In March 1993, the group agreed upon a number of targets in their *Accord cadre*.

These comprised the following: (a) a maximum 15 percent waste disposal per car, with a maximum of 200 kg per vehicle, by 2002; (b) from 2002 onwards, for new models marketed, a maximum waste disposal of 10 percent, and (c), in the long term, a maximum waste disposal of 5 percent. The *Accord cadre* specifies that 'the operators [car dismantlers, shredder companies, metal recovery firms, etc.] may freely choose [...] among the different technologies and the various modes of valorization possible'. The co-ordination of the different activities to be undertaken by each of the parties was supposed to occur through a free market. Thus, market arrangements were to govern the prices paid for the various transactions in vehicle collection, pre-treatment, disassembly, recovery and recycling, as well as fixing the conditions under which the operators would accept an end-of-use vehicle. The agreement stated that such a mode of coordination was a prerequisite for the economic and environmentally friendly processing of ELVs. Moreover, it was positioned as constituting an important incentive for car manufacturers to market cars that are easily recycleable. Some of the technical and organizational issues relating to ELV recycling were solved by a process of collective learning, which was, in turn, facilitated by the recognition of principles of shared liability and shared uncertainty (Aggeri 1999).

Italy: The Role of Organizational Commitments, Competences and Constraints

The Italian case follows a different trajectory from the German and French experiences. The dominance of Fiat Auto — the leading Italian and the second largest European car manufacturer — confers a particular national characteristic on the Italian context.[2] Organizational commitments towards better environmental performance and the threat of an emergent new regulatory imperative were the main reasons for Fiat to establish the *Fiat Auto Recycling* (FARE) scheme. Similar to the majority of European automobile manufacturers, the scheme was part of the overall environmental efforts of the company. Nonetheless, Fiat's role in the definition of the problem and the proposal of solutions for the ELV issue in its home country went far beyond any other car-maker in the European context.

After having developed some expertise in dismantling techniques and (the limits of) recyclability of materials, Fiat officially inaugurated the FARE system in September 1992. Economically, the main guideline of the system was its self-sufficiency. According to Fiat:

> 'To be desirable from an industrial point of view, the recycling process developed by Fiat Auto must fully satisfy the criterion of economic self-sufficiency. This means, as far as Fiat is concerned, that the cost of a part made of virgin material must be substantially equal to the same part made of recycled material. For example, the total cost of an air duct made of recycled material from a bumper must be equal to the cost of the same part in virgin material plus the cost of disposing of the bumper.' (Fiat Auto 1995)

As a first step, Fiat established a pilot dismantling plant at Mirafiori, Italy, in 1992, in order to learn about the economics of recycling. Research at the pilot plant resulted in the identification of those non-metallic car components — including bumpers, windshields and windows, and seat foams — that would be economically viable to recover, recycle and 're-market'. To collect materials, Fiat established 'Green Centres' throughout its sales network, and the consumer received economic and technical incentives to dump his/her car at one of these centres. In practice, this activity also worked as an incentive for consumers to change their old vehicles for new ones — a double dividend for Fiat. Once the car was dropped in to the centre, personnel prepared the vehicle for disposal by recovering fluids and removing the battery. These were then sent to a waste disposal centre (Fiat Auto 1995).

Fiat was aware that not all cars would be collected by the 'Green Centres', and so they also joined ADA (*Associazione Nazionale Demolitori Autoveicoli*) — the Italian Association of Car Dismantlers. Membership of ADA was used to select dismantling companies to which the cars would be sent throughout Italy. ADA elaborated the pre-requisites that demolition companies needed to reach in order to become members of the system. By May 1997, the FARE system had 251 affiliated car dismantlers (Wright et al. 1998). Although, initially, Fiat and ADA intended to expand this network to 200 centres, it would still only be big enough for the collection of approximately 15 percent of the 1.5 million vehicles that reach their end-of-life every year in Italy. Fiat argued that the project was not part of the core competency of the company and that other organizations should take over the business in the future. They proposed that the FARE system should be seen as a demonstration project in which other businesses and government should be more directly involved in the near future.[3]

A central principle of the FARE system was its 'learning by doing' approach. Fiat representatives claimed that, even if the system was not the most sophisticated technically, it was a practical project through the recovery of actual materials, rather than being merely a theoretical solution. Fiat identified the main problems of dismantling, collecting, recycling and re-using materials in a real situation. Not only did they identify technical problems that emerged as outcomes of this practical approach, but also issues associated with the expansion of legally approved centres for the collection of cars and the creation of markets for re-cyclates.

With the centres for collection and dismantling being gradually expanded, Fiat identified companies that could potentially recycle the materials from car parts. Montell Group — one of the largest suppliers of plastics for the automobile industry in Europe — re-processes bumper material for re-use in less demanding applications, such as air filter housings and dashboard cables. This example also emphasizes the cascade principle of the FARE system: because of deteriorating technical properties, materials are re-used in less demanding applications, until they are no longer suitable for use (normally after three generations). It is at this point that they become 'fluff', to be used by foundries as a substitute for carbon coke. Based on the same

principle, glass from windows will not be re-used for new windows, but becomes raw material for bottles. Seat foam is transformed by a north Italian manufacturer into the backing base for carpet pads.

In the first two years of operation, the system recycled more than 100,000 ELVs (Fiat Auto 1995). According to Fiat representatives, this figure means that FARE recycled approximately 82 percent by weight of the cars that have been collected. In 1995, the French group Rhône Poulenc became another FARE member, assuming the responsibility for recycling the chemical elements present in catalytic converters. By the end of May 1997, the FARE framework had processed 275,000 ELVs. From these vehicles, the (precious) metal content of 2,000 catalytic converters was recycled. The system also transformed (down-cycled) 4,670 tonnes of glass into 7.8 million bottles, 132 tonnes of polypropylene from bumpers into 530,000 air ducts, and 1.59 tonnes of foams into 1.8 million m^2 of underlay for carpets (Wright et al. 1998). Overall, the FARE scheme demonstrated that involving businesses operating beyond the frontier of the auto industry, such as makers of carpets and glass bottles, was fundamental to the economic viability of the system.

The relative success of the FARE scheme in Italy predisposed Fiat to seal bilateral agreements with auto-makers in Germany (BMW), France (Renault) and England (Rover), in which each company would handle the ELVs of the partners, throughout their respective recycling schemes. These agreements discouraged industrial competition on ELV-related activities. In Germany and France, collaboration among car manufacturers transformed ELVs into a non-competitive issue in both the national and European contexts.

The pro-active role that Fiat played in the ELV issue in Italy — with the installation of the FARE system and its success — provided a compelling argument for the company to argue against the implementation of a national ELV legislation. The real intention of the company in finding a solution to the waste generated by ELVs in Italy could be measured by the pragmatic results of the FARE system. Such results provided the company with the grounds to convince Italian legislators to wait until a standard regulation emerged from the European Union. Nonetheless, in April 1997, Fiat signed an 'agreement of intent' with the Italian Environment Ministry, formalizing the intention of the company to increase the recycling rates of automobiles to 85 percent (by weight) by 2002, and 95 percent by 2010. Thus, Fiat could oppose national legislation and try to influence EU regulation in order to legitimize its own approach.

Circuits of Political Ecology

Local institutional-power frameworks and cultural specificities resulted in distinct dynamics in the evolution of ELV issues in Germany, France and Italy. Yet, most European car manufacturers market their products in several European countries, thus politics that are 'foreign' to their national

origin can influence their market performance. Strategically, auto-makers and their representative organizations at the EU level also proposed solutions for ELV issues. Car manufacturers not only used their permanent Brussels' lobby to have their voice heard within the Commission, but also enrolled their representative organizations at the EU level. For instance, ACEA (*Association des Constructeurs Européens d'Automobiles*), presented 'concept solutions' in response to Commission proposals at various instances that were highly similar to the French *Accord cadre* and the VDA proposals. The emerging pattern was that, first solutions were negotiated (and consequently implemented) between car manufacturers (and related industries) and their national governments, and later the national consensus was defended during negotiations at the EU level. Interestingly, the very same principles behind the industry proposals also underlaid discussions within the OECD (Organization for Economic Cooperation and Development) and the USEPA (United States Environmental Protection Agency). Moreover, it is likely that the national debates influenced each other in subtle ways, as alluded to in the case of France.

Were the results achieved in the different countries the result of patterns of technological, economic or political determination? Similar, and in some cases even common technologies are used to dismantle and recycle ELVs. When we consider the dynamics at work in the complex narratives scripted in the previous section, it is evident that there are a number of common actors, such as industry groups and state regulators. One must nevertheless allow for considerable initiative, ingenuity and indetermination in analyzing the settlement of the issues in each country. While different strategies of control were attempted — from regulation through to market arrangements — the settlement was essentially political. The technologies do not provide an explanation of the outcomes: material flows, such as ELVs can be managed in various ways, and how they are, in fact, managed is not technologically determined. Economic rationality did not determine the outcomes. The cost-effectiveness of different ELV solutions is contingent on local situations. These include questions such as whether or not, and if so, how, actors such as car dismantlers can be included in the political ecology. Recourse to models of political determination proves no easier. Three European states produced different outcomes. While we do not doubt that a model of politics best describes these variable outcomes, we would maintain that it has to be a contingent model, such as the one that Orssatto and Clegg (1999) have provided in their 'political ecology' framework, adapted from Clegg's (1989) 'circuits of power' model.

Figure 2 applies this framework to the analysis of the ELV issue. The presentation aims to represent the dynamics related to each element in the circuits of political ecology. The main players tried to act in each element of the circuit: auto-makers basically tried to maintain the current circuits unaltered, while legislators forced changes in the rules and consequent social integration of the industry, with related businesses assuming a 'mediator' position. Although we present each of the elements separately, the circuit should not to be seen as a linear series of events. Rather, it should be imag-

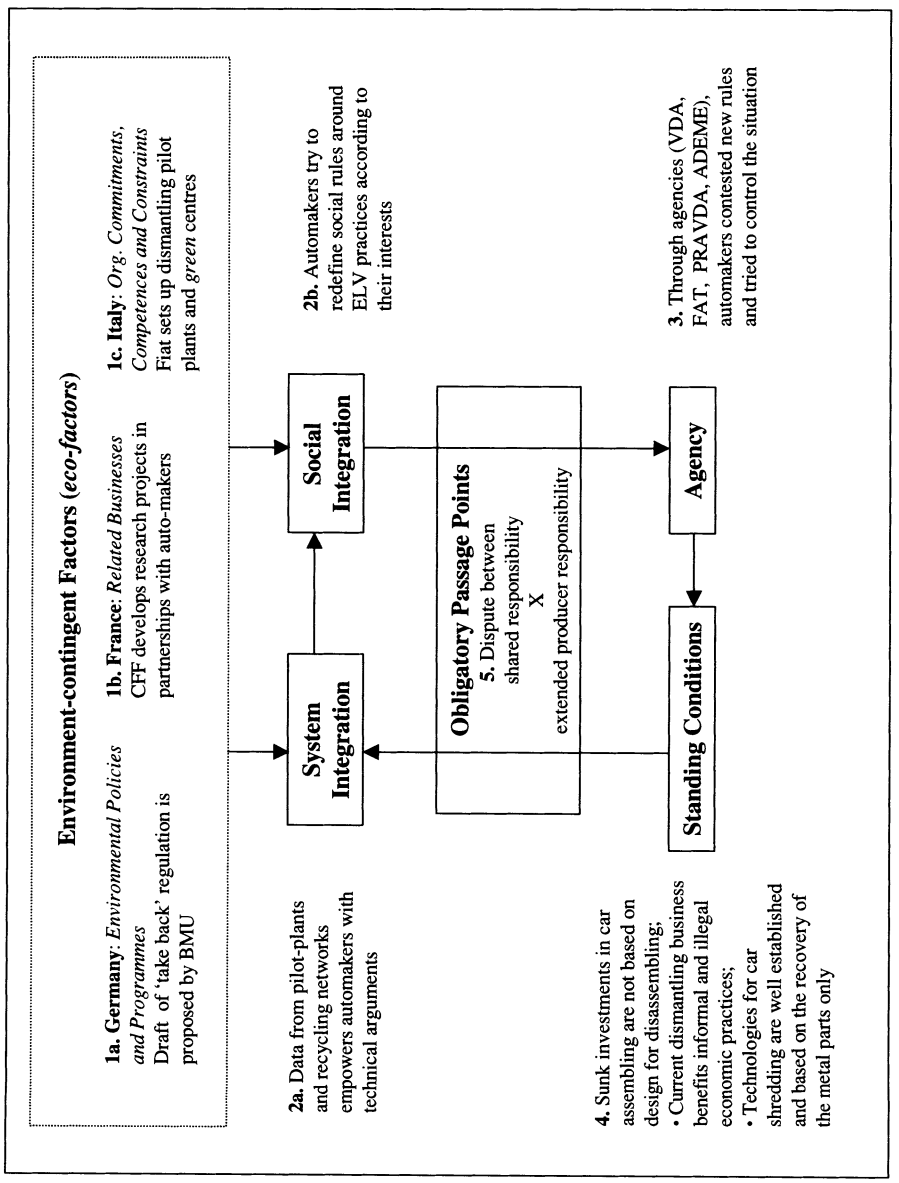

Figure 2. Circuits of Political Ecology of the European ELV issue

ined as an arena in which an indeterminate struggle unfolds as an increasingly scripted scene constrained by those scenes that have already elapsed, thus creating path dependencies. At the outset, the script, direction and outcome are indeterminate. Only as the process unfolds are we able to translate the sense that is being made.

Environment-contingent Factors (Eco-Factors)

The proposal to introduce take-back regulations in Germany, the initiative taken by related businesses in France, and Fiat's project in Italy, are all different starting points for addressing the same issue: What should be done with vehicles at the end of their lives in order to minimize hazardous waste and landfill? Different national solutions have been pioneered in each case, and there is some evident degree of imperfect isomorphism between them. However, more important are those factors within the organizational field of the European automobile industry that have induced manufacturers to adopt different environmental strategies. We regard these as constituting the *environment-contingent factors*, or, in shorthand, *eco-factors* (cf. Orssatto 2001). Eco-factors have the potential to transform subtly what people do in and between organizations — the contexts within which power is embedded.

In the case under consideration, Event 1a in Figure 2 identifies the draft regulation issued by the German Ministry of the Environment (BMU) as the first explicit eco-factor to trigger actions regarding the ELV problem in the German automobile industry. Auto-makers responded to the threat of the new regulation by carrying out technical research at pilot plants and through political lobbying. The implementation of pilot plants in several European countries served the objective of improving manufacturers' knowledge about dismantling problems. At that stage, ELV research was crucial for auto-makers and related businesses. Event 1b shows CFF in France taking the initiative in research and in presenting suggestions about how to solve the problems created by the material contents of ELVs. Finally, such a learning process was also one of the main central motives for Fiat to install its pilot plant in North Italy (Event 1c in Figure 2).

Political action always occurs in a social and systemic context, in which each action has the potential to redefine the meaning of the whole. It may be thought of as flowing through pre-existing circuits of social and system integration — representing previous strategic consolidations of power in what seems to be the naturally occurring order. Politically engaged actors seek to stabilize a set of relations that will mean one of two things: either that they rarely need to exercise causal power in order to maintain the *status quo*, or that, if they do, they are likely to be successful in doing so. Just as scientists seek to configure artful experiments, in which their intervention arranges the standing conditions through which natural causality can be observed, politically engaged actors seek to enrol, translate, or persuade others into their projects. We shall explore the circuitry of this model, beginning with system and social integration.

System Integration and Social Integration

Lockwood (1964: 251) associates the 'materiality' in any society with the social reality surrounding it. In such perspective, system integration relates to 'the material conditions that include the technological means of control over the physical and social environment and the skills associated with them'. Social integration, on the other hand, deals with the symbolic sphere, with relations of meaning and the ways in which these define certain types of membership categories in relation to other categories within organizational fields. Hence, social and system integration present distinct facets of the same 'reality'. Struggles over relations of meaning and membership create social change through changes in social integration. They redefine what it means to be a member of an organizational field as well as what are normal practices within the contexts in which organizations are embedded.

At the time that BMU proposed take-back regulation in Germany, strategic actors in the organizational field did not comprehend the potential of fully recycling ELV components. *System integration* had not occurred around this arena of practice (cf. Groenewegen and Den Hond 1993, who argued that the 'design context' of cars was not matched by their 'disposal context'). As a result of research concerning the technical potential and economics of car recycling from the early 1990s onwards, auto-makers realized that the real costs of disassembling ELVs and re-using or recycling car parts, significantly outweighed potential earnings.

Auto-makers also learnt whether consumers would be sensitive to marketing information about the recycling rates of their vehicles. Uncertainty in this area was reduced by a significantly low consumer response to advertising campaigns that addressed the ELV efforts of car manufacturers. Apparently, the recycling rates of cars are not variables that determine many purchasing decisions. It also became clear to car manufacturers that when the German take-back regulation was eventually approved, it would represent higher costs than consumers would seem willing to pay. Auto-makers concluded that taking responsibility for recycling did not have market appeal, hence presenting little competitive advantage. On the other hand, a positive aspect from the auto-makers' perspectives was that this also meant that consumer pressure was not a central variable in framing ELV strategies, which confirmed auto-makers in the prudence of their response.

Additional to the information about consumer behaviour, data collected in disassembling pilot plants also influenced auto-makers to work towards the stabilization of current social and system integration. In the early 1990s, research about disassembly times and the cost/benefit ratio of materials recovery produced important know-how about ELV processing, for both auto-makers and legislators. Technical information was scarce and data originating from pilot projects enabled auto-makers to argue against legislative action. The data collected at dismantling pilots was used to demonstrate that it was not feasible, instead of being used by auto-makers to promote ELV recycling. In terms of the political ecology framework, the pre-existing system integration of ELV practices were preserved by an

innovative argument waged with hard data collected at the pilot plants (see Event 2a in Figure 2).

Originally, the German draft regulation was intended to force changes in the rules driving the industry: thus, it would have forced a redefinition of *social integration*. A new set of responsibilities would have been imposed on automobile manufacturers, making them accountable for the cars they put into the market, up to and including their end-of-life. Maintaining unaltered the integration of the previous systems thus became a strategic priority for the car industry (see Event 2b in Figure 2). As a whole, at the European level, this was avoided by the industry. However, the Italian experience demonstrates how re-fixing rules for related businesses can influence the social integration of the industry. ADA re-fixed the rules of the car dismantling business by organizing a network of dismantling, shredding, and recycling companies. Becoming a member of the network represented a new status for the dismantlers. These newly legitimated and empowered members gained a new social capital with which they struggled to change the image of the sector from one normally associated with illegal operations.

Agency

When people get others to do things that they would not otherwise have done, we call this an exercise of 'agency' to achieve power: the ability to make a difference (see Clegg 1989: Chapt. 9). In the specific case of automobile recycling schemes in Europe, we concentrate our attention on the formation of specialized organizations to represent the interests of car-makers. For instance, the new set of social relations between auto-makers and dismantling and shredding companies constituted an innovative key agency that could help to preserve industry interests. Through this and other agencies, auto-makers contested the proposed legislation and tried to control the situation, keeping the obligatory passage points unchanged. In other words, the central arena related to who would be able to define what should be done in relation to the cars at the end of their lives. Auto-makers sought to gain acceptance for notions of shared responsibility, while some legislators worked to extend an approach stressing producer responsibility.

In resisting the new rules that government sought to frame for the field, it should be noted that, initially, the auto-industry did not operate competitively, but collaboratively. First, positions were defined and represented in concert, at national and international levels, e.g. through PRAVDA and ACEA. Thus, whatever emergent policies developed, they stood a fair chance of representing an agreed position from the industry: in this way, one might suggest, they sought to structure an emergent circuitry of power, in order to maintain their existing interests (see Event 3, in Figure 2). In France, collaboration between industry and government in solving the ELV issue was seen as important, in order not to compromise French national interests. These seem to have been defined in terms of the competitive position of French car manufacturers *vis-à-vis* their German counterparts; a complementary explanation

to Aggeri's (1999) suggestion that, in France, the voluntary agreement approach had been chosen deliberately, because it allowed for the collaborative learning and sharing of responsibility in regulatory cases of high uncertainty and complexity, such as the ELV issue.

Standing Conditions

Agency cannot be exercised independently of the context that maintains and stabilizes the access of agents to resources. We can refer to this context as the set of standing conditions that sustain the stable context within which resource dependence routinely functions as a means for producing particular outcomes. Whether any particular episode in which power is exercised makes a difference, depends on the 'systematicity' of the organization field, captured in the framework by the notion of 'standing conditions'. Where standing conditions are highly systematized, it is difficult to innovate, but it is equally difficult when they are too loose, too chaotic, or too uncertain.

In the case of the ELV issue, Event 4 in Figure 2 shows that the systematicity of the organizational field occurred at various levels. First, consider the investment on the part of suppliers in order to develop composites that could easily be separated. Most advances in the quality of car interiors, such as dashboards, are actually a result of the combination of different materials. Re-transforming these composites into their original material (normally petrochemicals), if technologically feasible at all, requires significant investment in research. Second, auto-makers' investments in car assemblage also have to be readapted to the concept of 'designing for the environment' or, more specifically, 'designing for disassembling'. Although technologically feasible, redesigning assembly plants, based on new principles, will hardly be free of costs and usually can only be implemented by introducing new models. The standing conditions of the shop floor benefit the current paradigm of production (Nieuwenhuis and Wells 1997).

Third, car dismantlers gain marginal benefit and profit from the existing end-of-life arrangements in the auto business. In many cases, scrap yards involve economic activities and transactions that do not always require invoices or receipts. Additionally, scrap yards are well known for their reluctance to comply with regulatory requirements — an increasingly necessary requirement, as soon as more demanding regulations for recycling are in place. Apart from more professional companies, such as the partners of ADA-Fiat, there are many reasons for believing that the standing conditions surrounding car dismantling maintain a highly organized, networked and informal, not to say illegal, economy. Moreover, it is an economy whose standing conditions are such that there are few technological barriers to entry. Rather, entry barriers are those of illegitimacy on the one hand and, on the other hand, the substantial investments that are entailed in a serious and legitimate approach — one that seeks to recover plastics and enter in the shredding business. Thus, there are many good reasons for maintaining the existing obligatory passage points, both formally and informally.

Obligatory Passage Points

Political actors will try to secure their interest in a specific organizational field, through the designation of what is obligatory and what is not. Only if it becomes imperative to the majority of the firms in the industry, will innovation in the activities of recycling automobiles transform the circuitry of power. Obligatory passage points are most easily identified, if there is no shared understanding of how to deal with them. This was most evident in the German case. Two views were opposed: the industry view of 'shared responsibility' and BMU's view of 'producer responsibility' (see Event 5, in Figure 2). Although the positions of both parties converged to some extent during the process, no agreement was reached over the type of regulation that should be enacted. VDA kept to its self-regulatory scheme and followed a regime of accomplished facts. BMU wanted to regulate directly all end-of-life vehicle recycling. Finally, by February 1996, BMU accepted the industry proposal for a voluntary agreement, similar to the French *Accord cadre*. Indeed, German auto-makers may well have gained more power to fight against the imposition of direct regulation, after the French group had reached their voluntary agreement in March 1993. BMU lost the regulatory battle that raged around end-of-life vehicle recycling. The automotive industry was able to form a sufficiently strong lobby to counteract regulatory pressure from the Ministry. This allowed the industry to reproduce their own rules and, with minimal concessions, to approve their own targets for ELVs. We wish to highlight three disputes (out of a longer list dealing with the technical, organizational, economic and legal aspects of ELV processing) to illustrate how VDA and BMU battled about the details, in order to materialize their respective abstract views. They were also being debated in the French case, but there the level of controversy between the various parties remained largely hidden behind the collaborative effort to develop the *Accord cadre*.

The first dispute concerns the question as to whether the infrastructure to be established for ELV recycling should be manufacturer specific. BMU opposed the idea of manufacturer-specific vehicle collection and dismantling networks for fear of trade barriers (low-volume importers would have difficulties in setting up their own recycling facilities, and manufacturer-specific networks allow the manufacturer to increase brand loyalty, cf. the Fiat case, as well as the arrangements made in France). Rather, the Ministry favoured pooled arrangements with specialist third parties. The automotive industry implicitly gave in on this point. In its 'Common Concept' of March 1995, VDA/PRAVDA wrote that car manufacturers would concentrate on the development and marketing of recyclable vehicles and that any car dismantler would have free access to the market of vehicle recycling. The result was that German auto-makers lost a significant part of the control they wished to have over ELV collection. Through their scrap-metal subsidiaries, steel manufacturers stepped into this void, and gained control over a substantial part of the ELV scrap metal flows by engaging in long-term collaborative arrangements with selected car dismantlers.

The second dispute relates to the projected level of ELV recycling, in both

quantitative and qualitative terms. Whereas VDA initially opposed any specific recycling targets, such as those formulated in BMU's draft policy papers of 1990 and 1992, in 1994, it adopted the recycling targets that were proposed in the French *Accord cadre*. These targets are close to those set by BMU, in 1992. In its second draft regulation of 1994, BMU accepted incineration allied with energy recovery as contributing to a solution for the waste problem of shredder residue, as demanded by VDA. One of the reasons for this shift seems to have been the disclosure that there had been illegal transport of shredder waste from Germany to France during June 1993.

Finally, there was the dispute about who should pay for the extra cost of collecting, dismantling and recycling ELVs. VDA continued to oppose the principle of cost-free disposal by the last owner, although BMU left open the possibility of increasing the price of new vehicles to cover additional expenses in end-of-life vehicle processing. Nevertheless, several individual car manufacturers announced cost-free take-back of several of their models (under certain conditions) at the 1991 Frankfurt Auto Show. Mercedes and BMW suggested paying the last owner for the residual value of their end-of-life vehicle.

From National Voluntary Agreements to the EU Directive on ELVs

As the previous sections have demonstrated, from 1990 to 1996, a series of disputes occurred around the two potential solutions (direct regulation and voluntary agreements) for the problems generated by ELVs in the European context. The automotive industry, with the collaboration of materials- and parts suppliers, car dismantlers, and metals recovery and recycling firms successfully influenced national governments to accept voluntary agreements as an appropriate strategy for dealing with ELVs. Given industry commitment, government promised to refrain from direct regulation. Overall, by signing voluntary agreements, industry and national governments accepted the resolution that the automotive waste problem should be based on a 'shared responsibility' of firms in industries involved in the 'total value-chain' of automobiles. By the end of 1996, the German, French, and Italian governments — the three major car manufacturers in Europe — supported the position of their respective national auto industries.

The relatively comfortable situation enjoyed by car-makers 'at home' was, in turn, counterbalanced by the plans of the European Commission (EC) for regulating car recycling. Indeed, in July 1997 — shortly after the German agreement was reached — the Commission presented a 'Proposal for a Council Directive on End-of-life Vehicles' (COM 97-358). According to representatives of the European Parliament, in the context of the European Union, the voluntary national agreements not only differed from each other, but were also based on conditions that potentially weakened the measurement of their performance (Kurylko 1997). After intense negotia-

tions, the legislation was officially adopted by the European Parliament three years later, in September 2000.[4] Among other requirements, the directive requires that: (i) 85 percent of materials have to be recovered by 2006, of which 80 percent will be recycled, and; (ii) 95 percent of materials have to be recovered by 2015, of which 85 percent will be recycled. Member states were required to bring into force the laws, regulations and administrative provisions necessary to comply with the Directive, by 21 April 2002.

Although the ultimate implications for car manufacturers depends on how each member state 'translates' the Directive into national laws and regulations, it does not explicitly impose the responsibility on them to do so. Article 5, for instance, asks member states to assign the responsibility for the collection of ELVs to 'economic operators'. Hence, the responsibility will not necessarily be imposed exclusively on car manufacturers. Moreover, the targets established in the directive do not differ significantly from those considered feasible by some individual auto-makers, such as Fiat, PSA, and BMW (Wright et al. 1998).

The evolution of the ELV issue in Western Europe during the period 1997-2000 has not been presented in this article. Such a task would require additional research on the process that occurred in the context of the various institutions of the European Union, in a similar fashion to the way the previous section charted affairs in the automobile industry of Germany, France and Italy. The rationale is clear — at this early stage, the determinants were principally national rather than federally European in their origin, although they had implications at Community level. The evolution of the ELV issue in Europe demonstrates that these pragmatic measures required several years of negotiation between diverse members of the automobile industry and legislators, and this had a considerable impact on the recyclability of 9 million ELVs per year in the EU. Starting from the initial intention of the German Minister for the Environment to regulate car recycling in 1990, the implementation of a specific ELV law was delayed by more than a decade. That decade gave the industry a relatively long period in which to increase their rates of materials recovery and recycling. The length of the process, and the breadth of the auto field involved, demonstrates the usefulness of analyzing the ELV issue from a perspective not solely limited to the technical or economic aspects of the problem.

Conclusions and Implications for Future Research

In this paper, we used the framework proposed by Orssatto and Clegg (1999) for analyzing a specific business-environment relationship issue. Although the voluntary actions of corporate environmental management can partially explain the evolution processes of greening in industries, it seems imperative to look at business-environment relationships from perspectives that consider the ways in which episodic power relations are stabilized by players within an organizational field. We believe that this is

exactly where the usefulness of this framework resides. As a practical response to theorizing about ecological issues in management, it can help us to gain an understanding of the (industrial) contexts in which environmental disputes occur.

Although technical and economic expertise is vital for the study of business-environment relationships — and we have drawn on it here — we propose that the use of a political ecology perspective can significantly improve analysis. In doing so, we address one of the main criticisms of approaches to environmental issues in organization studies: that more political perspectives are necessary.

We used the organizational field as the basic level of analysis in our study, which encompasses relations that are usually conceptualized as occurring within the traditional notion of an industrial sector. In doing so, we satisfy the need for more studies developed at this level of analysis. The choice of the level of analysis substantiates Hoffman's (1999) proposal to define the 'field' as based on the development of 'an issue'. In this respect, our study of the 'ELV issue' has implications for the development of an important theoretical tradition — institutionalism in sociological and organizational theory (DiMaggio and Powell 1983; Scott and Mayer 1994).

As we suggested in the previous sections, in this case, the mechanisms towards isomorphism stressed by institutional theory, seemed weak. Rather, according to our study, isomorphism only emerges from negotiation over meaning and membership occurring in the organizational field. In this respect, our research corroborates the findings of King and Lenox (2000: 698), which stress 'the potential for opportunism to overcome the isomorphic pressures of even self-regulatory institutions and suggest that industry self-regulation is difficult to maintain without explicit sanctions'. State regulation, or coercive isomorphism, influenced the outcomes of the ELV issue only after the automotive industry was able to define the scope of isomorphic pressures. Hence, according to our study, isomorphic pressures are political, in ways that institutional theory has not yet envisaged.

Our findings also suggest that any conclusion that the voluntaristic actions of auto-makers 'cause' outcomes, such as postponing proposed regulations, should be balanced by the overall dynamics of the political ecology. Although auto-makers indeed worked to secure their interests (den Hond 1998b), they only succeeded in maintaining, unaltered, the elements of political ecology, because other players within the circuitry of power — e.g. consumers trying to provoke changes in social integration — were not forcing its transformation. In this regard, we tried to demonstrate that power did not reside in the auto-makers' hands. Instead, rather than some 'reproductionist' logic of action, by which power is always recreated, it was the flow of power relations that defined the elements of the circuit and that eventually favoured the interests of the auto-makers. In a similar fashion, the aim of governments to instil positive power by regulating ELVs did not succeed, mainly because there were no objective beneficiaries of such a strategy within that organizational field. Environmentally committed consumers, who might have voiced ecological prerogatives as stakeholders representing nature, were more

or less absent in the whole process. By looking at the developments occurring in the organizational field, instead of focusing on the recycling strategies of single companies, or on the regulatory process *per se*, the paper shows how both organizational interests and field-level constituencies significantly influenced the evolution of the ELV issue.

The analysis emphasizes that relationships between auto-makers and regulators, as well as between the various industrial parties, are deeply embedded in the circuitry of power in an organizational field. Technical information — normally used with claims of neutrality — assumes non-technical dimensions and is used as a political stake. The identification of the disputes around what were to be obligatory passage points is crucial in gaining an understanding of why social and system integration remained practically unchanged in the European auto industry. Episodic power gaines, such as the initial imposition of a direct regulation by the German government, were insufficient to cause changes in the social and system integration of the industry. The continuous and collaborative work of industry organizations was more consistent in preserving their resources and reproducing the social rules. The pace of innovation was finally defined by the industries'own self interests and schedules.

The use of the framework has generated many other specific conclusions related to the content of the case. The end-of-life vehicle problem constitutes a crucial challenge to the European automobile industry, and decision-making about ELVs will have enormous repercussions for other industries. Many other industrial systems will suffer consequential environmental changes as a result of struggles waged here. The ELV issue is very complex and much more could be said about its political ecology dynamics. However, our main intention here relates less directly to this specific case and more to the use of the framework. Our aim is to demonstrate that the transformation of environmental practices in organizations requires the stabilization of changes in the circuits of political ecology at the organizational field level. This is why we refer to an institutional-power framework: the circuitry of power relations needs to be institutionalized in the context of the organizational field.

The political ecology framework can potentially be applied to another industry, or to a different context in the same industry. We would then expect different narratives to unfold. Environment-contingent factors, social and system integration, obligatory passage points, agencies and standing conditions will be specific to contexts. Nonetheless, in the process of identifying these elements, the researcher will be indirectly using classical concepts from power perspectives, such as those elaborated by Clegg (1989), Haugaard (1998) and Flyvbjerg (1998). In this regard, the concepts presented here are not tentative elaborations dissociated from more substantive works on power. Rather, they represent a long trajectory initiated in the studies of Clegg (1975) that, more recently, have been developed as a specific application of a power perspective to the analysis of business-environment relationships (Orssatto and Clegg 1999).

Using the political ecology perspective to analyze the unfolding of the ELV

issue in an American or Asian context, for instance, could generate useful information about the main obligatory passage points within these contexts, as well as the main actors influencing social and systems integration. Similarly, the political ecology perspective could also be productive in analyzing end-of-life issues in other industrial contexts, such as the consumer electronics, computer hardware, and 'white goods' industries. The information could substantially help to improve knowledge about the political elements involved in fostering or limiting industries in adopting environmentally friendly technologies and products. This understanding can serve both analytical and prescriptive purposes, since forcing better environmental practices requires grasping the complex world of competition and power, the world of organizations, and their political environments.

Notes

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1. Telephone interview with the first Director of the European ELV Project Group, in March 1995, Angers, France.
2. The information presented here was obtained by conducting interviews with personnel of the Project Management and Industrial Development, Central Laboratory of Fiat Auto, and the Direction of Environmental Affairs of Fiat, Torino, Italy.
3. Interview with the Vice-President of the Italian Association of Auto Demolition Companies (ADA), in November 1996, Milan, Italy.
4. Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of-life vehicles — *Official Journal of the European Communities* (L269/34).

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