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Performance regulation and industrial location: a case study

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Abstract. The impact of performance regulations on industrial location in the USA or elsewhere has been little researched. This case study shows conventional assumptions to be questionable on two counts. First, industry appears not to consider local regulations until after selecting a site on more basic economic reasons. It assumes that regulations are not a significant barrier, owing to local eagerness to attract new growth. Second, the letter of the law is not the effect of the law, given the role of politics. In the case study described, opposition led to strict enforcement and the company's withdrawal, but a business backlash restored a more normal degree of governmental accommodation to industrial growth.

1 Introduction

On January 20, 1977, the Dow Chemical Company announced its decision to abandon plans to develop a $500 million petrochemical facility in Solano County, California, thirty-five miles northeast of San Francisco (see figure 1). Dow's West Coast General Manager publicly decried bureaucratic inefficiency and delay:

> "With no positive results to show after spending two and a half years and 4.5 million dollars just to get four permits out of 65, I've got to cut my losses ... I've built 14 plants in different parts of the world, and I've never spent this much time just getting permission to build." Brubaker (1977)

The company thus placed responsibility for their decision on government regulation. Its claims were readily accepted by business groups, labor unions, local government officials, and the press.

Opponents of the Dow facility, on the other hand, answered that the company had failed to meet the substance of regulations. Indeed, the opposition felt that the regulatory process had not been strong enough, either in the scope of evaluation or in enforcement of the law. State administrators also denied that they had been obstructionist and blamed Dow for failing to cooperate:

> "A careful review of the record shows that the State is not involved in delaying tactics on the Dow project ... Dow has received unparalleled cooperation from state officials in obtaining prompt and fair consideration in its project ... A look at the record shows that in every case where action taken by a state agency has not been taken within the normal span of time, the delay has resulted from action, or lack of it, by Dow." Office of Planning and Research (1976)

Nevertheless, a political backlash following Dow's withdrawal precipitated a revision of state regulation. The rationale was that the state's 'bad business climate' would be improved, thereby inducing corporations to locate in California. The claim that regulation plays a major role in location decisions was never substantiated, however.

In this article, we try to shed light on the part played by performance regulation in industrial location. By 'performance regulation' we mean environmental, land-use, and related controls, in contrast to the sort of rate of return regulation that covers most public utilities. First, did Dow consider such regulation when deciding to locate in Solano County. The answer will be shown to be no: Dow had every

business reason to choose that site, and regulation was an afterthought. Second, was the regulatory process effective, either in applying the letter of the law or in expediting government decisions. On the whole regulation was not very effective; nonetheless, much to everyone's surprise, construction of the Dow plant was blocked. This occurred because air pollution standards could not be met and because these standards were enforced owing to vigorous political opposition. Bureaucratic delay was not a factor. Third, why were the regulations subsequently relaxed. The Dow backlash helped restore a more 'normal' level of government cooperation toward business in a state whose economic conditions were attractive to new investments.

In drawing our conclusions, it is necessary to level criticism at conventional ways of viewing the problem of performance regulation and location. We believe that first, behaviorist approaches underestimate objective economic reasons for location decisions. 'Business climate' is by no means a subjective matter, though it does include noneconomic forces. Second, most writers overestimate the autonomy of the state. One cannot take regulatory laws at face value; the political forces shaping

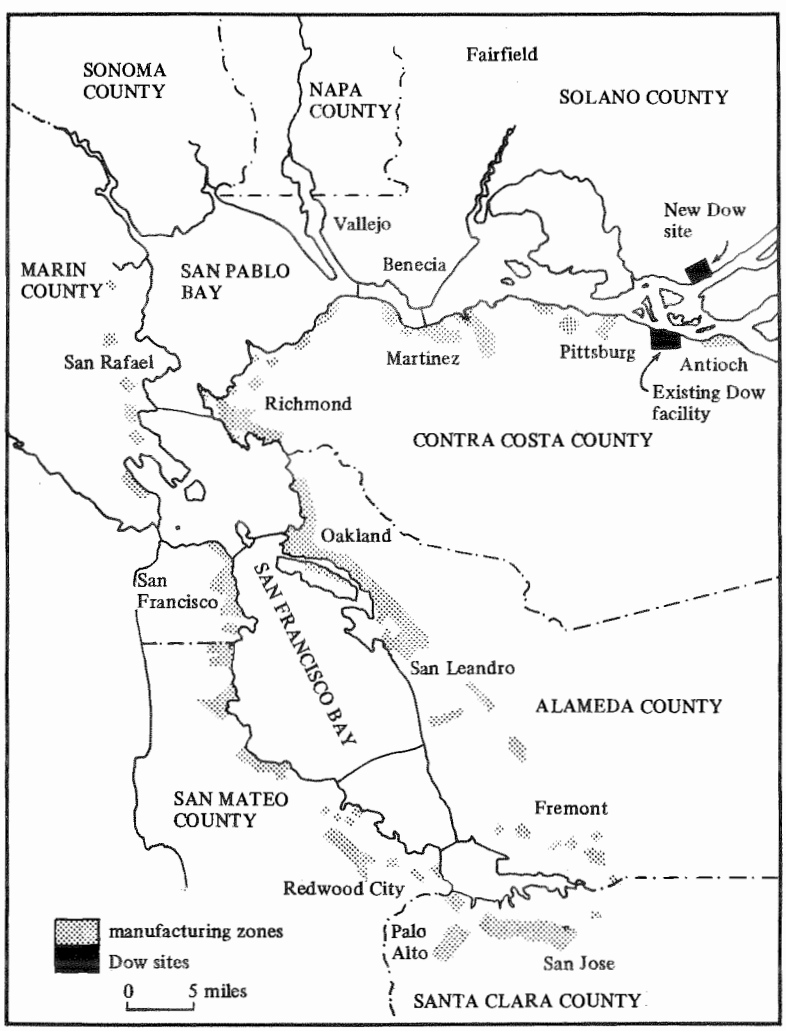

Figure 1. San Francisco Bay Area: manufacturing zones and location of Dow Chemical Company facilities.

regulation—which is an ongoing process—must be considered. Given the balance of class power, that process is not ordinarily conducive to strong enforcement of environmental and planning laws. Hence, the proposition that regional growth depends on given 'factor endowments' is wrong because it ignores the ability of industry to shape the conditions of regions into which it moves. Last, it is not possible to construct a wholly determinate model of industrial location because of the indelible element of human conflict and conscious intervention in economic processes. The problem for industrial location theory, then, is that regulation may or may not affect corporate location decisions depending on political considerations.

We draw evidence for this study and our conclusions from a close monitoring of the Dow case as it unfolded. We attended most government hearings at the local, regional, and state levels; we interviewed members of the opposition and Dow officials up to the regional level; and we reviewed documents prepared by the company, the opposition, and the various government agencies.

2 Location theory and Dow's siting decision

2.1 *The proposal*

Solano is a largely rural county, supporting ranching and dry wheat. Besides agriculture, the economic base consists principally of military employment near Vallejo. The only major industries are a refinery in Benicia and a recently completed brewery near Fairfield (see figure 1). The latter area is also experiencing rapid residential growth as a dormitory suburb of Vallejo, the San Francisco–Oakland metropolitan areas, and Sacramento (Stanford Research Institute, 1975).

Dow operates a caustics plant across the river at Pittsburg, at the eastern end of the Contra Costa County industrial belt between San Francisco Bay and the Sacramento–San Joaquin Delta. In July 1975 Dow announced plans to expand the Pittsburg facility and construct a new petrochemical complex on 834 acres of a 2700 acre property in the Montezuma Hills of Solano County. The two sites were to be connected by four pipelines carrying hydrogen, ethylene, and propylene gases beneath the Sacramento River (Gilbert, 1975).

Dow intended to use naphtha to produce feedstocks for the plastics industry: vinyl chloride, styrene, phenol, and polyethylene. Naphtha from Alaskan oil would be brought by barge from local refineries or shipped from Alaska, Washington, or Los Angeles. Dow estimated that the new facility would consume 40000 barrels per day of naphtha and produce about one billion pounds weight per year of petrochemical feedstocks and intermediates. Dow asserted that its completed project would provide a total of 1000 permanent jobs, 400 at the new Solano site and 600 at the expanded Pittsburg site, from a capital investment of $500 million. Additional temporary construction jobs—estimated by Dow at 2000—were also anticipated. Dow promised to add 14% to the tax base at Solano County (Gilbert, 1975).

Atlantic Richfield Corporation (ARCO), National Steel Corporation, Southern Pacific Corporation, and Pacific Gas and Electric (PG and E) all have properties adjoining the Dow site. ARCO planned to build a $1 billion combined petrochemical/refining complex. *Chemical Week* predicted that Dow and ARCO's combined ventures could supply over 90% of the West Coast's petrochemicals. PG and E has since received permission from the state to construct two large coal-fired electric generating plants. In other words, the Dow project was to have been the first of several major industrial developments on the periphery of the San Francisco Bay Area.

2.2 *Theoretical structure*

In order to understand the role of regulation in the Dow case, one first needs to analyze Dow's decision on economic grounds. Dow typifies in many respects the

multilocational business organization that is the focus of much contemporary locational research. Furthermore, many of the attributes of modern industrialism, such as technological sophistication and capital-intensive plants, are to be found in the petrochemical industry. Dow is, therefore, in many ways an 'ideal type' for the study of large-scale production located on the metropolitan periphery (and in the rapidly growing Western USA region) (Lever, 1975).

There are, first, factors making it *possible* for productive facilities to be where they are and, second, factors which make a specific site advantageous; the former we call *capability* factors, and the latter *specification* factors. Capability factors are those things which diminish locational restraints and make large-scale, technologically sophisticated plants feasible. Chief among these are the size of the modern multilocational corporation and improvements in transport and communications. Without such developments, industrial decentralization to peripheral areas—in this case a dual movement to the urban fringe and to the West Coast—would not be conceivable. At the same time, plants are not free to move anywhere they like nor are they indifferent to cost differentials. Hence the need to specify local factors such as labor supply, access to transport, and land costs.

In accordance with Massey (1978a; 1978b; Massey and Meegan, 1978), we take the view that the locational requirements of an industrial plant depend on the specific characteristics of its production processes, which structure use of labor, space, and material inputs. Product characteristics and product linkages among industries are also important because of their impact on marketing (Lever, 1974). The combination of production process and product linkages is what system theorists would call the 'product system' characteristics of a plant. As a company with certain factor demands sets out to find an appropriate plant site, they face an uneven distribution of factor supplies, such as differences in skills, in wage levels, and in degree of organization of the workforce (Massey, 1978a). This spatial differentiation offers various combinations of resources among which the firm can choose so as to maximize its profitability.

2.3 *Capability factors: Organizational and other features*

The capability to build a petrochemical plant in a peripheral location has two aspects: (1) a sufficient degree of locational freedom to locate in a relatively nonurbanized area, and (2) the ability to be the leader in a major regional industrialization process. The following is a brief *entré* into the growing investment capabilities and geographic generalization of capital, in order to highlight a few points relevant to the Dow case.

2.3.1 *Concentration of capital.* The concentration of capital in large corporations is a prerequisite for most of the organizational and productive capabilities of modern industry. At its most elemental, organizational size is necessary in order to raise the enormous blocks of capital embodied in large industrial plants, such as the $500 million investment foreseen by Dow. Most large industrial firms finance expansion through internally-generated surpluses (Schmenner, 1978). The ambitious investment program undertaken by Dow in recent times—fourteen plants in ten years—was financed without help from the banks and without any need to meet bankers' guidelines as to pace and scale of expansion. Size is also necessary for carrying financing over the long interval between initiation of large-scale investments and their fruition, as well as for the market power and stability to justify such projects, the capacity to plan large, technically sophisticated undertakings, and the research and development capability to stay in the forefront technologically. We will only pursue two aspects of corporate development that are relevant to locational capability: internalization of the product cycle and spatial separation of operating units.

2.3.2 *Internalization of the product cycle.* Large corporations can reduce the time needed to initiate a new production or market strategy. Dow could not be a leader in the planned industrialization of the Sacramento River's northern shoreline without this capacity. Krumme and Hayter (1975) specifically cite advantages accruing from internalization of research, finance, and initial fabrication, along with mass production, for increasing the rate at which new product systems can be cycled through the corporations to provide a competitive edge.

In the case at hand we cannot be sure whether the plant represented a major breakthrough in product or processing, since the plans were not fully revealed. Nonetheless, Dow has consistently been a leader in one of the most innovative fields of industry. It is estimated, for example, that plastics have had a 15·9% annual rate of increase in output over a recent twenty-three year period, or an overall rise of more than 2800% (Commoner, 1976). Dow's extraordinary capacity expansion in the last few years cannot be separated from its leadership in innovation.

The new marketing strategy Dow wanted to pursue was also important in this instance. The company intended to use naphtha from newly-available Alaskan North Slope crude oil to produce petrochemical feedstocks previously made at one of its Louisiana facilities. Dow's goal was to produce plastics for the Western region *in* the West, thus reducing costs of transport to West Coast markets. Only a large company would have been able to implement rapidly such a new marketing strategy in response to changing raw material supply conditions. For example, smaller firms seeking new markets must plan far ahead for personnel resources. Dow, on the other hand, planned to transfer technical, managerial, and production workers almost immediately to their new site, partly from the existing Pittsburg facility and partly from elsewhere (Joint Hearings, 1976). Personnel flexibility is an important factor for many firms embarking on rapid expansion programs (Parsons, 1972).

2.3.3 *Division of labor in space.* Because of their size and internal specialization, large corporations are able to split off relatively self-contained functional units into separate buildings, linked together by corporate ties rather than spatial proximity. As a result, the special situational requirements of each unit can be met. One phase of a production process, requiring low-cost unskilled labor, for example, can be located in a different place than another one that demands highly paid skilled labor. Thus, top-level management clusters in the centers of large cities, routine administration and R and D diffuse into the commuting fields of national metropolises or regional cities, and mass production decentralizes farther (Massey, 1978a; 1978b; Pred, 1977; Tornqvist, 1977). Furthermore, units of a single corporation are typically scattered throughout the country, as well as overseas. Independent production operations may still be joined by shipping products for sequential processing or final assembly. For example, Dow's chemical plant in Pittsburg, which is centered around inexpensive chlorine gas produced at the site from Bay water, ships intermediate products to other Dow plants for final processing.

2.3.4 *Background factors.* Corporations do not have only themselves to thank for their increasing capacity to build large sophisticated plants with greater locational freedom than ever before: behind them stand the collective accomplishments of capitalist development that contribute to the increased forces of production at capital's command and the geographic range and mobility of capital investment. The most obvious of such contributions is the advanced transportation and communication network linking the country, helping to overcome time and distance. But other factors, such as a widely available wage-labor force, a capacity to build housing and other supportive infrastructure quickly, the credit system, and expanding markets, also play basic roles. The particular background to the Dow

proposal is, of course, the antecedent growth of the Western Region (particularly California) and of the San Francisco metropolitan area. The former provides the large market which drew Dow west, and the latter the necessary infrastructure, labor pool, and so forth not internalized by the corporation itself.

2.4 *Specification factors: Product system and situational characteristics*
Why did Dow choose the Solano County site in particular? This depends on a specific mesh of situational 'demands' created by the product system (nature of the products and their production) and the characteristics of the site and its region. The Montezuma hills property lay at the metropolitan fringe, near an existing center of similar industries and beside a deep water ship channel.

2.4.1 *Capital intensity*. Firms locating at metropolitan peripheries tend disproportionately to have high capital-to-labor ratios (Erickson, 1977; DoE, 1975; Struyk and James, 1975), in contrast to contemporary rural industrialization, which is predominantly in low-wage, labor-intensive activities (Spooner, 1972). Dow's plant was typical in this regard. The petrochemical industry is extremely capital-intensive. There are approximately sixty petrochemical facilities in the United States, with capacities ranging from 35 to 1000 million pounds annually, employing only 7000 workers directly, and an additional 170000 in secondary fabrication (Commoner, 1976). For its proposed investment of $560 million in Solano and Contra Costa Counties, Dow planned to create 1000 permanent positions, or in other words an investment of $560000 per job (Gilbert, 1975). Construction of the facilities would have provided 2000 temporary jobs. This ratio is far higher than for any other three-digit industry (SIC).

Capital intensity is a descriptive category that means very little of itself, however. Increased capital-to-labor ratios have come about through standardization, mechanization, and automation. Petrochemical production has achieved an extreme degree of automation and continuous flow processing. This affects, in turn, the demand for labor, land, and transportation.

2.4.2 *Labor force*. Four labor-supply conditions may be significant in industrial decentralization and submetropolitan clustering: availability, wages, skills, and worker control.

First, sufficient labor must be available to meet demands not met by transferred company personnel. Solano County meets this criterion, as it is plagued by high unemployment, is capable of absorbing considerable growth, and is within commuting range for many Bay Area workers (EDD, 1976).

Concerning the second factor, wage rates, one would expect lower housing and commuting costs in a semirural county, and hence cheaper labor; and, indeed, significant wage-differentials have been observed between urban centers and peripheries (Sternlieb and Hughes, 1975). Nonetheless, it would be an oversimplification to say that industry locates at the periphery for cheap labor, without regard for the appropriateness of skills and other factors. Furthermore, peripheral labor forces are not homogeneous. As a result, although many industries move outward for cheap, low-skilled labor, others move for expensive, highly-skilled labor (Vaughan, 1977; Struyk and James, 1975). Given that petrochemical companies pay relatively high wages because labor is so small a part of total costs (Stanford Research Institute, 1975) and that wage-rates are not clearly lower in Solano County than elsewhere in the urban area (Stanford Research Institute, 1975), the wage factor appears to be unimportant in Dow's decision. This conclusion would be modified if Dow were thinking ahead to the future development of more labor-intensive, unskilled, low-wage work in secondary fabrication.

The third factor, skill, is determined primarily by the technology of production. Dow would have produced petrochemical feedstocks through a highly automated process. With progress in mechanization, work tends to become routinized, in contrast to the more varied and individually skilled labor required for specialized products (Marx, 1967; Braverman, 1974). Historically, the skilled labor force has been concentrated in metropolitan cores along with specialized manufacturing; over time, more standardized mass production has tended to decentralize in search of lower-skilled and hence cheaper, workers (Feller, 1975; Massey, 1978a; 1978b; Massey and Meegan, 1978).

Nonetheless, the strict 'deskilling' model of location must be modified in order to explain why capital-intensive industry in general, and Dow in particular, does not abandon metropolitan areas completely. First, in most capital-intensive industrial plants, some traditional skilled jobs remain—or are even created for the first time—in plant maintenance, construction, and repair. For maintenance jobs requiring polytechnical skills, Dow could import some workers from its other facilities, but some gaps would remain. Solano County was probably a reasonable compromise location. Supplementary workers could be induced to move or commute from the Bay Area, particularly out of the northern Contra Costa industrial belt, which is already specialized in refining. Dow also intended to draw on the metropolitan area for construction and repair workers. For example, Dow's Pittsburg chemical work does all its major new installation and servicing by subcontracting; it thus has a greater demand for skilled labor than would appear from figures on permanent employees. A second reason, frequently overlooked, is that plant control jobs in automated factories require workers who can be trusted to monitor and insure the smooth operation of a complex production process involving enormous capital investment. Control workers must have a general level of comprehension and analytical ability that, although not the same as traditional craft skill, is nonetheless a new type of skill. A workforce with these attributes is available in metropolitan areas.

Finally, worker control may be the most important labor factor at the urban fringe. Dow is a nonunionized company and the San Francisco–Oakland area has a relatively strong union tradition. It would have been politically more difficult for Dow to locate a major nonunion facility nearer the urban core. Alameda (Oakland) and San Francisco Counties are more organized than Contra Costa County, which in turn is more organized than Solano County. Santa Clara County, at the opposite end of the Bay, offers a good example of rapid growth based on nonunion labor in the electronics industry (Bernstein et al, 1977). Also, from the standpoint of maintaining a stable labor force, it makes sense to locate routinized work away from communities with more diverse and interesting employment opportunities (Greer, 1976–77; Gordon, 1977).

2.4.3 *Land*. In general, plants established on the metropolitan periphery require more land than those in core areas. For example, in a study of New York, Beckman (1974) found that outmigration was accompanied by massive increases in floor area (and little or no increases in employment). The new Dow facility would have been extremely large, initially occupying about one-third of the 2700 acre site. This sort of space is costly and hard to come by in built-up areas.

Just as important is the availability of space for future expansion. Because petrochemical production is based on flows of materials by pipe, it demands contiguity. Moreover, no by-product is ignored, since it can form the feedstock for another product. Because more products mean lower average unit costs and because any revenue from a new product is better than none, new synthetic materials enter the market at prices low enough to drive out older products (Commoner, 1976). As a result, expansion of output is rapid and plants proliferate like beads along a string.

The industry is thus characterized by clusters, such as those found on the Houston Ship Channel, northern New Jersey, along the lower Mississippi River, and in Europe at Dunkirk and Rotterdam. Therefore, the real scope of a petrochemical project is inevitably a chain of developments rather than a single plant. In fact, the Solano County site was near enough to Dow's existing Pittsburg property to link the facilities by pipelines under the Sacramento River. (One beauty of the site was that the barrier of the river is significant in social terms--cheaper land, lower rate of unionization, better political climate—but could be easily overcome physically.) Although Dow could have obtained a site on the Pittsburg side of the Sacramento River (a US Steel Corporation property), the Company denied that the site was available because it would not have accommodated suitable plant expansion and "downstream" industry.

A large rural site was also important because petrochemicals are a 'nuisance' industry (Struyk and James, 1975). Another consideration was that with the lower purchase cost of the site, extra profit could be realized on sale or lease of portions of the property to subsequent processing companies. This is an attraction of cheap land at the periphery frequently overlooked in industrial location theory (Greer, 1976–77; Buder, 1967).

2.4.4 *Transport: Raw materials and markets.* Transport costs are the key element in conventional location theory. In accordance with conventional principles, Dow needed a deep-water port to receive raw material shipments. Given the bulk of liquid naphtha and the mass rate of processing--approximately 40000 barrels per day to generate 1 billion pounds of feedstocks--material transport had to be a crucial consideration. The Southern Pacific mainline and Interstate 80 also lie nearby.

The decision to establish a facility in the Western region was based primarily on marketing considerations. Dow currently produces petrochemical feedstocks in Louisiana and markets them on the West Coast. At the hearings, first Dow asserted the Solano facility would reduce consumer prices and save energy, because materials would not be shipped from Alaska to Louisiana then back to the West Coast. On further questioning, Dow admitted that no cutback in Louisiana production was planned; rather, the Solano facility was to expand the overall capacity (Joint Hearings, 1976). Dow would have thus lowered its transport costs both on inputs and on outputs, as well as expanding its share of western markets. Dow was evidently one of the 51% of all industries sensitive to changes in transportation costs (of these, 84% are sensitive to the cost of transporting inputs) (Lichtenberg, 1960; Harris and Hopkins, 1972) and one of the 25% of manufacturing corporations following a market area plant strategy, in which plants are designed to serve particular subnational market areas (Schmenner, 1978).

2.4.5 *Regulation.* Conventional industrial location theory focuses on 'factor' analysis (Walker and Storper, 1981). 'Factors of production' are taken as given conditions, static and self-evident, to which industry adapts. Approaches to the 'public policy' factor have ranged from highly quantitative treatments of the cost of actions demanded by regulators to general evaluations of the presumed effect regulatory restrictions will have on regional economic growth (EPA, 1979; Bosworth, 1976). Nonetheless, conventional thinking on the matter is beset by a basic contradiction. Although the literature frequently presumes that regulation plays a role in location, very little concrete evidence to this effect has been produced (Schmenner, 1978; Healy, 1979; Duerksen, 1979). Similarly, in public debate one hears frequent complaints that regulation has industrial development hamstrung (Brubaker, 1978; Quarles, 1979; Frieden, 1979), yet regulation is rarely cited as a significant factor by those who make corporate location decisions.

In the case before us, there is a related discrepancy between logical choice of site on economic grounds and the company's apparent failure to consider regulatory barriers to its plans. Dow had several excellent reasons for selecting the Solano County site: access to western markets, the deep-water port to receive Alaskan crude oil, propinquity to an existing plant, room to expand, cheap land, labor control, access to a major metropolitan area, and so forth. On the other hand, a number of significant restrictions on building a petrochemical plant existed, such as agricultural zoning designation, air and water pollution laws, and agricultural land preservation contracts. Rarely do industrial siting decisions require as many regulatory approvals as Dow sought. For example, a mere 4·3% of proposed industrial plants employing more than 100 workers demand zoning changes (Schmenner, 1978).

How are we to explain this contradiction? The authors have been forced to the conclusion that Dow made its siting decision on economic grounds alone, and that regulation was regarded as an obstacle to be overcome *after* the decision had been made. The Dow managers appeared not to have prepared their case adequately. This was not the product of poor foresight, however, because they were apparently acting on the assumption that performance regulations would not be an insurmountable barrier as long as government officials had a favorable attitude towards the planned development. This assumption proved to be well-founded with respect to the Solano County Board of Supervisors, who were to play a central role in the regulatory effect. The absence of thorough preparation of their case also suggests that Dow were not expecting the emergence of an organized political opposition that could pressure the state government to enforce its regulatory laws. Again this must be considered a reasonable expectation on their part, because such opposition is relatively infrequent. This strongly suggests that a 'good regulatory climate' does not mean merely a willingness to facilitate decisions (Industrial Development, 1978; Rahe, 1973) but a willingness to bend the substance of regulations where necessary to attract investment.

3 The regulatory process

Industrial location is not regulated systematically in the United States. A few states have enacted major facilities and power plant siting laws, but these are commonly meant to *aid* industry as much as to restrict it (Heiman and Walker, 1981). Nonetheless, there is nowhere a system comparable to British IDC controls (Healy, 1976). Dow faced a combination of state land-use planning requirements and federal environmental statutes, in which local government played the leading role:

1. *County zoning and planning*. The principal form of land-use controls in the USA is local zoning. Under its Planning and Zoning Law (1937 amendment), California also requires cities and counties to prepare general plans for the orderly physical growth and development of land. The Dow site lay within an area zoned agricultural, and not designated for industrial development in the Solano General Plan.
2. *Agricultural land conservation*. Under the California Land Conservation Act of 1965, known as the Williamson Act, owners of rural land in participating counties can lower their tax assessment by contracting with the local government to keep their land in agricultural use. The Dow property was under such a contract, which is binding for ten years after notice to cancel has been given.
3. *Environmental impact assessment*. On projects the size of the Dow proposal, designated 'lead agencies' are entrusted with writing, or having prepared by contract, an appropriate Environmental Impact Statement (EIS) and an Environmental Impact Report (EIR) in keeping with, respectively, the National Environmental Policy Act of 1969 (NEPA) and the California Environmental Quality Act of 1970 (CEQA). The two lead agencies were the Solano County Board of Supervisors and the US Army Corps of Engineers.

4. *Permits for resource use and pollution discharge.* Permits were required from a number of state agencies. Most important were the discharge permits sought from the Bay Area Air Pollution Control District, pursuant to the federal Clean Air Act of 1970.

Yet how seriously would Dow have needed to take this panoply of regulations? They were likely aware of the record of such strictures in practice: local zoning and planning are notoriously compliant to developers (Downie, 1974; Clawson, 1971); Williamson Act Contracts have not withstood the temptations of ripening land values (Mariolle, 1978); environmental impact reports are not binding on state and local officials; and the Clean Air Act has been subject to considerable legal erosion (Walker and Storper, 1978). Expectations of regulatory weakness and flexibility were, as it turned out, quite justified in the case at hand—up to a point.

3.1 *Local government responsibilities*

The Board of Supervisors and County agencies had three powers relevant to Dow's plans: to draw up a General Plan and zone land in accordance with it; to enforce the Williamson Act; and to prepare and certify an EIR. The County took action in all three areas in November 1975. In December, opponents of the project brought a class action lawsuit against the Board challenging their actions.

3.1.1 *General Plan and zoning.* The General Plan must contain a statement of development policies, maps of designated land uses, explicit objectives, principles, standards, and plan proposals. Nine "elements" are mandatory, including a land-use element describing permitted kinds and intensities of proposed land use and an open space element setting forth long-range plans for conservation of open space land, including agricultural areas. Because of widespread noncompliance by local governments, the state legislature amended the law in 1971 to require that all zoning ordinances be consistent with the objectives, policies, general land uses and programs specified in General Plans. Solano County's planning office prepared a *General Plan-1990* including a segment on the southeastern portion of the county where Dow hoped to build (Solano County, 1973). The plan did not envision industrial development in the latter area until well after 1990, nor were all the relevant elements of the plan complete and officially adopted. Although the county planning director publicly claimed that plans were adequate to deal with the problems created by industrialization, he was not even sure which elements had been approved (Joint Hearings, 1976). Nevertheless, the Montezuma Hills area was rezoned for industrial use.

In response to opposition criticism, but *after* changing the zoning and certifying the EIR, the county government did two things. The planning director asked his staff to begin work revising and completing the General Plan for the southeastern section, and a special study was prepared regarding industrial development in the Montezuma Hills shoreline corridor. The latter study was quite controversial. First, the county accepted contributions from major corporations including Dow and ARCO to fund the study. Second, the plan posed only three major alternatives for growth in the corridor: Dow alone, Dow and several related industries, and full-scale development by the various landowners in the area. These scenarios must be considered an uncritical acceptance of heavy industry as the most beneficial use of the area. Third, the geographic scope of the study, which covered only the corridor on the river targeted by industry for development, was very restricted. It could not therefore assess the land-use impacts of industrial development on the whole county or the region.

3.1.2 *Williamson Act cancellation.* In order that the Williamson Act should not merely serve as a tax dodge for 'ripening' development land, counties must make three determinations in order to cancel contracts and allow agricultural lands to

revert to development status:
(1) cancellation must be "in the public interest";
(2) the land may not be put into a more profitable use; and
(3) there must be no available alternative site for the proposed use.
Despite these limitations, the Solano County Board of Supervisors cancelled the contract on the Dow site in a perfunctory manner (Solano County Superior Court, 1975). Opponents objected to cancellation, arguing that the intent of the act was to halt conversion of prime agricultural land at the metropolitan periphery and that an alternative site across the river owned by US Steel Corporation was available (see section 2.4.3 above).

3.1.3 *Environmental Impact Report.* The Environmental Impact Report is the principal means of evaluating the effects of major development projects. Under state law (CEQA) an EIR must also evaluate alternatives to the proposed project to determine whether the proposed action is the best choice. Further, the EIR must identify measures that can be taken to mitigate the adverse impacts of the project, and all such feasible measures must be taken. The lead agency—in this case Solano County's Board of Supervisors—bore responsibility for reviewing and certifying the report. (The federal EIS process played a secondary role here, because the Army Corps of Engineers merely repackaged the state EIR along with an eighteen-page appendix and outside comments.)

The Dow plan EIR (Gilbert, 1975) had four major flaws, which were pointed out repeatedly by project opponents. The first two are procedural: the author had a conflict of interest and the local government could not review complex issues. The second two are problems of content: the document contained inaccurate information and the scope of issues was overly limited.

First, state law mandates that "all local agencies shall prepare, or cause to be prepared by contract, and certify the completion of an EIR on any project which they intend to carry out or approve that may have a significant effect on the environment" (California Public Resource Code, Section 2100 et seq.). Solano County approved an EIR it had neither prepared nor contracted for. In fact, the EIR was prepared by a private consulting firm paid directly by the applicant, Dow Chemical Company. The opponents argued very strongly that this arrangement compromised the undertaking from the beginning.

The second problem was that the local government bodies were not capable of a review of the complex issues involved. Solano County government manifestly lacked the technical ability to assess complicated scientific issues or the full social and economic implications of introducing the petrochemical industry to a rural, underdeveloped area. Two examples are given to substantiate this statement. First, when the county planning director was questioned on whether an influx of workers seeking jobs might not worsen local unemployment, he was confused: "What I am saying, when you create jobs, people follow, and they will exceed the number of jobs that they provide, and your unemployment might remain about the same". Second was the reaction of the Chairman of the Solano County Board of Supervisors, a strong proponent of the project, to unfavorable testimony being given on the health hazards posed by vinyl chloride and other petrochemicals. Evidently under the impression that vinyl chloride was a pesticide, he asked the witness: "Young lady, have you ever seen a field destroyed by nematodes?" (Joint Hearings, 1976). Such problems apart, we contend that the EIR idea itself presumes too much: how can an EIR resolve the disputes of experts in various disciplines on the facts and conclusions about the art of pollution control, employment patterns, secondary economic development, and health hazards of petrochemicals.

Third, much of the basic information in the document was inaccurate. The Dow plan EIR was criticized in written comments by state agencies and citizens' organizations for misrepresenting the biophysical and socioeconomic impacts of the proposed project. Although air quality turned out to be the key issue in Dow's application and eventual withdrawal, the EIR dismissed it as an inconsequential impact. Bay area air-pollution control authorities, however, estimated potential sulfur dioxide emissions to be six times the level predicted in the EIR. The report virtually ignored the special problems of containing toxic chemical emissions. The issues of water diversions, normal pollution load, and the effects of tanker spills were also overlooked despite the presence nearby of the Suisun Marsh, the single most important area for fish and wildlife conservation in California, and the long history of attempts to improve water quality in the San Francisco Bay in the face of huge fresh-water withdrawals for agriculture in California's interior (Walker and Storper, 1979).

The fourth shortcoming was the scope of analysis. California courts ruled in 1972 that an EIR has to account for the cumulative impacts of a project, not just the immediate effects. But this expansion of scope runs counter to the long-standing 'due process' principle that companies are not liable for the 'indirect' effects of their actions. To complicate the question further, the impacts of such growth, which would extend well beyond Solano County, were to be judged solely by the local government. Because there was never any clear definition of scope, Dow minimized the project when applying for environmental agency permits; the application to the air-pollution control authorities listed the facility as *one* styrene plant, about one-tenth of the actual proposed facility. In discussing prospects for regional development, however, the project was cast as the initiator of a long phase of economic growth. The EIR contained several variants of these definitions.

The issue of scope of the EIR only begins to suggest the difficulty of taking social impacts as well as physical ones into consideration. Even an adequate physical assessment depends on economic processes, such as induced urban growth and the behavior of industry with regard to the use of natural resources and labor. Not only is the law ambiguous about what types of issues are to be discussed in the EIR, but there is no good methodology for analyzing social and economic impacts. Cost–benefit analysis has now been replaced in fashion by Social Impact Assessment (SIA), but there is little agreement about whether either is adequate.

Several areas treated very superficially in the EIR are as follows:

* Cumulative effects of all development induced by the Dow plan. The EIR did not discuss the dynamics of petrochemical expansion, the linkage between industrial and residential growth, the local fiscal impacts of growth, the stability of employment, or alternative development paths. The only economic matters treated in the document were those characteristic of local boosterism; for example, increases in the local tax base, employment creation, and multiplier effects.

* Problems of long-term economic stability and democratic control of the areas, in the face of industrial development dominated by a few large companies.

* Health problems associated with petrochemical development. The federal government is currently investigating excessively high rates of cancers generally associated with toxic chemical production in the neighboring county, Contra Costa. Similarly high rates of cancer are also found in other centers of petrochemical production in the USA (National Cancer Institute, 1976). Dow argued that health problems should not be discussed in an EIR, basing their interpretation of 'environment' on nonhuman factors.

The inclusion of social and economic considerations in an EIR remains an area of controversy. The issue is complicated by the presumption of scientific neutrality in the production of EIRs. Technical treatments of physical impacts have an aim of

legitimacy that is quickly lost when authors tackle socioeconomic subjects that are intensely political by their nature. Quite apart from the shortcomings of the EIR process in general, however, its handling in the Dow case was shoddy, particularly owing to the structure and attitude of local government.

3.2 *State permits*

State permits, unlike the matters described above, were not in the hands of the local government. Dow required permits from the State Water Resources Control Board, pursuant to the 1972 'Clean Water' Act, the State Lands Commission, and the State Reclamation Board, as well as the regional air board. In one sense, the large number of permits—sixty-five—justly reflected the broad scope and complexity of the proposed project. The total is misleading, however, because thirty-two permits were required for air quality control purposes; these were necessitated by Dow's division of the project into thirteen parts in order that air pollution emissions from each part individually would fall below legal thresholds.

The Bay Area Air Pollution Control District (BAAPCD) (now Air Quality Management District) rejected Dow's initial application for construction of a styrene unit based on an independent estimate of emissions. Dow appealed the decision before the BAAPCD Hearing Board, with opposition intervenors on the other side. Dow claimed that it had the technology to meet emission standards but did not reveal any new information to the Hearing Board. A press release issued by the state supports this view:

> "At this point, the principal obstacle to approval of Dow permits pending before the state appears to be the unwillingness or inability of Dow engineers to substantiate their claims that the proposed plant will meet state and federal air and water quality standards which California pollution control agencies are required by law to enforce." Resources Agency (1976)

Before a decision was rendered, however, Dow withdrew its application, presumably in anticipation of a final rejection by air pollution authorities.

Dow clearly understood that plant design would have to meet the standards for new sources under the Clean Air and Clean Water Acts. But in this matter it faced an additional roadblock; the Bay Area was a designated "critical air basin", that is, a metropolitan area which continued to exceed ambient air standards. Effectively, no major new sources could be allowed without extraordinary emissions controls. The conclusion must be that Dow either did not have this capability or did not want to make the necessary investment.

4 Pullout and backlash

4.1 *Defeat and withdrawal*

In December 1976, frustrated by the air board's initial permit rejection, Dow accepted an offer by the state to hold consolidated permit hearings. The hearings proved very damaging to Dow's case. The Company at times refused to divulge information about their pollution control technologies and procedures, basing their refusals on two rationales: that such information was protected as a 'trade secret', and that it would be unreasonable to expect the company to perform detailed engineering studies until approval was secured. Company officials also failed to answer questions about employment generation and health risks. This lack of useful data made regulation decisions extremely difficult. Apparently Dow felt that the burden of uncertainty should be on the regulations, not on the company. Having known what the requirements were from the beginning, Dow could have proposed a different project or mobilized company technicians and management to present a far better case. The company's decision to let local officials, with a marked lack of

expertise, carry the case, showed a remarkably cavalier attitude to the proceedings (Joint Hearings, 1976).

As a further set-back to Dow, the state Attorney General rendered a crucial opinion about the EIR on the first day of the consolidated permit hearings. The opinion confirmed most of the opposition's criticisms, stating that:
1. Each state agency is responsible for evaluating a project based on the substantive requirements of the environmental quality law (CEQA).
2. If the opponents' lawsuit were successful in challenging the adequacy of the EIR, all subsequent approvals by responsible agencies relying solely on the EIR would also be set aside if challenged (Office of the Attorney General, 1976).
Not only was this ruling embarrassing to Dow, it would have delayed all decisions for at least six months, whilst awaiting a revised EIR.

The Company cancelled their plans less than a month later, having decided to withdraw before the agencies could render negative decisions on the substance of the permit applications.

4.1.1 *Political backlash*. The business class was indignant after Dow withdrew its plans early in 1977. The pullout set the stage for an attack on California's 'business climate'. The California Chamber of Commerce, for example, declared:

> "The real importance of the Dow decision is not just the Dow plant but the overall effect it will have on California's future ability to interest other basic industries in locating here. Business people all over the country have been watching the outcome of the Dow situation. If California cannot attract new basic industry, we will not be able to provide the 250,000 jobs required each year just to stay even with an already unacceptable unemployment rate ..." (San Francisco *Chronicle*, 21 January 1977, page 6, column 1).

The appeal to labor's interest in jobs was at least partially successful, as the building trades and California Labor Federation leaders joined in the antiregulatory chorus.

The backlash to the failure of the Dow plan was a successful tool for political mobilization. Soon Governor Brown and the state legislature were working on reforms of the regulatory system, though there was, and is, abundant evidence that California's 'business climate' remains quite favorable (Wells Fargo Bank, 1978). Actions since January 1977 include:

* Assembly Bill 884 became law. It narrowed the scope of review of permit-issuing agencies, forbidding each agency from looking at the entire range of environmental effects of a proposed development. This change was specifically a reaction to the Attorney General's opinion which had indicated that all Dow permits might be invalidated if the environmental analysis contained in the Dow EIR were faulty. The bill also specifies time limits on the permit process for new industry. It requires agencies to act on applications whether or not the applicant cooperates in furnishing accurate and complete information on the project in a timely manner. If agencies are late in their decisions, applications are automatically approved.

* The Governor created an ombudsperson to expedite the permit process for industry. No equivalent office was created to aid the public 'monitoring' the permits issued by government agencies and scrutinizing proposed developments.

* The administration initiated a special approval process for a major liquefied natural gas terminal on the California coast. The facility was exempted from the routine siting procedures of the state Energy Commission and the Coastal Commission, the latter having been created by citizen ballot initiative to limit coastal development. All local regulations were superseded.

* Through the Governor's Office of Planning and Research, the administration developed a pilot plan to give industry advance indication of where they can and

cannot locate. Under the plan, potential industrial sites would be cataloged and industry would be informed where they can locate and under what conditions. One such a plan is certified at local and state levels, industries would have the right to select specific sites and permit-issuing agencies would be required to grant permits. Thus, decisionmaking would be situated at higher government level and taken much earlier in the process, before specific development projects were proposed. Because opposition can rarely be mobilized in response to abstract planning processes, as opposed to concrete projects whose location and effects are palpable, it is reasonable to expect that the public's ability to affect the course of industrial developments would be reduced.

* The state initiated an "air trade-offs" policy that allows industry to locate in polluted air basins by purchasing or eliminating emissions from existing industries (Walker and Storper, 1978). This policy has since been used to accommodate a SOHIO oil pipeline and terminal in Long Beach (although SOHIO subsequently withdrew its permit application) and an Occidental Petroleum Company refinery planned for Contra Costa County. The policy was written into the Clean Air Act Amendments of 1977 by Congress.

* At the urging of state government, some city governments are adopting procedures for unified permit approval for developers, similar to the process established for liquefied natural gas at the state level.

* The PG & E twin 800-megawatt coal-fired power plants at Collinsville have been approved, with the aid of the Governor's Office.

4.2 *Procedure and substance: some lessons*

Dow's attack on the regulatory system portrayed it as procedurally unmanageable. The pullout was accompanied by a campaign against "unnecessary government red tape", too many permits, and too long a waiting period for decisions on permit applications. This is a popular line of argument, yet it is totally misleading, for three reasons.

First, Dow did not in fact suffer untoward procedural delay. Indeed, the quickness with which local officials approved the project (4 months) precluded any serious consideration of the matter. Dow's regulatory impasse was the substance of air pollution standards.

Second, a fragmented process of permit applications actually served Dow's interest for a while. Fragmentation focuses attention on one part of the problem at a time, allows variable standards among reviewers, lets many issues slip through the cracks, and minimizes the apparent impacts of a project (cf Bosselman et al, 1976). Dow officials understood this. Hence, when state officials offered to hold joint agency hearings in early 1976, Dow refused. Only when the fragmented process had ceased to be useful did they reconsider. By that time, however, the balance of forces had shifted and the consolidated hearings did not prove to be a beneficial forum for Dow.

Third, the Dow plan would likely have prevailed had not an opposition evolved that forced public agencies to be diligent. Whereas the opposition was unorganized when the original EIR and zoning decisions were made in Solano County, by the time of the joint hearings a coalition of environmentalists, community groups, and organized labor had been forged that presented sophisticated testimony, held the threat of lawsuits over the regulators by mastering the legal issues, and helped keep the political spotlight on the case.

The coalition was strengthened considerably when the local branch of the Oil, Chemical and Atomic Workers Union (OCAW) broke from the more conservative building trades unions supporting Dow and appeared at the hearings to oppose the plant because of health and safety concerns (Dow's strong anti-union policy was also a factor). Not since 1973, when Bay Area environmental groups actively supported the OCAW strike against Shell Oil Company, had the two factions joined in a public action

of such importance. In part, this partnership reflected the environmentalists' growing awareness of the broader issues involved. Initially, the plant had been fought because of its effects on the ecology of the area. But as the opposition probed more deeply, made contact with other groups and heard the arguments of the labor-oriented activists among them, the socioeconomic and human health problems associated with the facility became an important issue. As a result, when the Governor's Office made an informal offer to seek relocation of the Dow plant across the river in the industrialized area of Contra Costa County if the fight against the plant were dropped, the opposition would not compromise.

Also unusual was the opposition's ability to negate Dow's apparent strategy of procedural fragmentation. Environmentalists have complained in the past about the number of decisionmaking bodies and hearings they must face and the lack of a coordinated and centralized information base on which to make decisions; these may put them at an unfair disadvantage, as they usually lack the time, money, and personnel to follow the entire permit review through. But the Dow case shows that opposition movements can also take advantage of fragmentation and delayed proceedings. Since they must build from scratch, fragmentation can give them time to learn from experience, publicize the problem, and build support.

5 Conclusion

Certain lessons may be drawn from the Dow case. On the one hand, complaints about government procedures by industry can act simply to conceal a dislike of certain regulatory standards and an inability to exploit regulatory procedures. On the other hand, in order for performance regulation to be effective, the public must be mobilized. Their success, like industry's, depends partly on preexisting regulatory standards and procedures. In other words, government regulation is not an exogenous variable, but something that contending classes fight over continuously; the state is therefore both the site and the result of political struggles (Esping-Anderson et al, 1976). Finally, given the relative power of the opposing forces, regulation tends not to be enforced beyond a degree acceptable to industrial investors. The opposition victory in the Dow case is the exception that proves the rule. Transformed into a symbol of 'excessive' government regulation of business, the short-run defeat of Dow generated political capital for the opponents of performance regulation in the long run; hence a process of 'reform' was set in motion that blunted the future impacts of regulatory laws.

The lessons of the Dow case can also be applied to location theory. First, performance regulation cannot be entirely ignored in locational analysis, since it can have an impact on individual cases. Second, however, one cannot take regulatory laws at face value (cf Council on Economic Priorities, 1975; Walker and Storper, 1978; Davies and Davies, 1975). The political element must be considered, in terms both of private power and ability to use the mechanisms of government. As a consequence, regulation is not an exogenous factor of location to which industry responds: industry is as much involved in shaping as in being shaped by public policy. Third, and most important, overall performance regulation does not matter all that much, on average. This view is supported by recent surveys which have found that site costs induced directly by regulation do not widely influence location decisions (Vaughan, 1977). Evidence in the Dow case supports the hypothesis that industrial corporations ordinarily make their siting decisions on economic grounds and deal with regulation as a secondary consideration. They can do this because of the susceptibility of most governments to corporate political power and economic largesse, community dependence on private investment, and the difficulty of educating and organizing the citizenry to oppose developments that may be detrimental.

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