on small systems

ıg: a short-cut
*er Transport 34 (10)*

*roach to developing*
Paper No. 2.

eneration, trip
*gineers: Revised*

demand models. *New*
*To be published*
*Research Centre*
*lian Road Research*

e of disaggregate
ı transportation.
*Forecasting Project,*
*ity of California,*

ıural approaches
*for transport*
*Report No. 10*
*of Transport*

tory of system
*ransport systems*
*No. 10 at*
*Transport*

# PORTS AND URBAN SYSTEMS: FRAMEWORK AND RESEARCH NEEDS IN RESOLUTION OF PORT GENERATED CONFLICTS

P.J. RIMMER & A. TSIPOURAS

*ABSTRACT:* *A framework is provided within which academics and professional planners can grapple with the locational conflicts generated by the impact of ports on urban and marine systems. It specifies the nature of conflicts, defines the system of interest by detailing the activity structure and the roles of the actors engaged in the conflicts, outlines a planning approach, examines the nature of policy objectives, identifies the variables amenable to planning and policy-making and indicates the policy instruments available. Attention is then drawn to the need for others to test this framework in actual conflict situations before raising the vexed question of institutional responsibilities.*

# PORTS AND URBAN SYSTEMS: FRAMEWORK AND RESEARCH NEEDS IN RESOLUTION OF PORT-GENERATED CONFLICTS

PETER J. RIMMER and ANTHONY TSIPOURAS[1]

SUMMARY: A framework is provided within which academics and professional planners can grapple with the locational conflicts generated by the impact of ports on urban and marine systems. It specifies the nature of conflicts, defines the system of interest by detailing the activity structure and the roles of the actors engaged in the conflicts, outlines a planning approach, examines the nature of policy objectives, identifies the variables amenable to planning and policy-making and indicates the policy instruments available. Attention is then drawn to the need for others to test this framework in actual conflict situations before raising the vexed question of institutional responsibilities.

## 1. THE NATURE OF CONFLICTS

> The central issue confronted is a planning problem involving the strategy of port growth, changing shipping technology, land transport access, conflicting land-use patterns, and strong community opposition to some of the implications of present and future....activity. The failure of the various interest groups involved (public authority, private, community) to achieve their own particular objectives (or to reach an acceptable compromise) has strengthened the degree of opposition between those concerned.
>
> Centre for Environmental Studies (1976:xxi)

The litany of Webb Dock, Balmain and Port Botany is sufficient to conjure up visions of a series of conflicts generated by existing and proposed port developments in Australian urban areas. Rather than become enmeshed in particular situations the purpose here is to focus on the possibilities of resolving port-generated conflicts in the urban system relating primarily to the human environment. However, there is a need first to identify the wide range of locational conflicts stemming from the external impacts of major port facilities in order to develop a general planning framework. This process in turn will indicate the context within which solutions are to be found, and suggest the means whereby the necessary understanding of the scale and nature of the impacts involved may be obtained.

---

[1] Peter J. Rimmer is Senior Fellow, Department of Human Geography, Research School of Pacific Studies, The Australian National University, Canberra, A.C.T. and Anthony Tsipouras is Director, Cities Branch (Transportation and Communications), Commonwealth Department of Environment, Housing and Community Development.

Three sets of conflicts can be distilled from studies on Australian ports (see, for example, Butlin, 1976; Centre for Environmental Studies, 1976; Maunsell and Partners, 1976; and Rendel & Partners, 1976).

(a) *Activity conflicts* over the synchronisation of the location and timing of activities (e.g. dovetailing the arrival and departure of vehicles).

(b) *Vehicle (technological) conflicts* between port-generated vehicles and other modes (e.g. private cars and pedestrians) which stem from the concentrated nature of port traffic rather than its volume which is relatively small by urban standards.

(c) *Land use (activity structure) conflicts* that arise from the impact of port-generated activities and traffic on the physical and human environment (e.g. air pollution, noise, water pollution, visual intrusion, blight, community severance and dislocation, disturbance of recreational activities and natural systems).

In grappling with problems associated with major port developments we need a general framework that provides guidelines for resolving conflicts either by curtailing projects with large externalities or ameliorating their anticipated impacts. As illustrated by Wilson (1972) in seeking an improved method for the national planning of ports such a framework involves specifying and analysing the system of interest (i.e. the system affected by the proposed port development and its environment), the design of alternatives and the setting of policy to make and implement decisions based on an evaluation of alternatives in the light of established goals.

> The goals....at the national level are to provide the appropriate facilities for the transfer of the country's imports and exports, and possibly, to contribute to the country's economy as a whole by the provision of an international service where appropriate: the goals at the port level are to run an efficient organisation in such a way as to contribute optimally to the national goals (Wilson, 1973:33-4).

Such goals are too narrow for mitigating port-generated conflicts. Thus, this paper follows King (1975) and seeks to develop a general framework aimed at the maximisation of social welfare (subject to available technology) by focusing on the objectives of economic efficiency *and* environmental quality.

An essential ingredient of the general framework is the delineation of the port system and its respective interrelationships with the marine and urban systems. This activity structure can then be used to indicate the location of potential conflicts. Such an exercise is facilitated by identifying the roles played by the actors in these conflicts: port operator, shipowner, land transport operator, importer-exporter, traveller and impactee. After identifying the attitudes associated with these roles the functions of Government (Federal, State and Local) and port planner are discussed. We are then in a position to consider the variables decision-makers can change and to indicate how they can be used to develop new policies. However, a necessary prerequisite to such a discussion is the delineation of a 'minimum regret' planning approach. When this is outlined we can proceed to examine the relative feasibility of alternatives and the nature of policy instruments for resolving conflicts.

## 2. THE SYSTEM OF INTEREST

> By sea, the containers come and go, *relatively* cheaply, in *relatively* few large container ships. By land, they converge on or radiate from [the port] in a multitude of *relatively* small and *relatively* expensive container trucks, nearly all of which pass through built-up residential areas...on their way in or out (Centre for Environmental Studies, 1976:x).

Such a description emphasises the essential components in the interchange of containers between origin and destination: the container ship, the port at the land-sea interface facilitating the exchange of containers between ship and shore, the land transport system, the importer-exporter and the urban resident. Yet, at best, it is an oversimplification of the system of interest affected by port-induced traffic because it excludes inland groupage depots where less-than-container loads are stuffed or unstuffed. In addition, it completely excludes passengers and bulk cargoes from consideration. Also no mention is made of the impact of port-generated traffic on the marine system. Thus, if we are to fully understand the impacts of ports on urban systems and marine systems we have to widen our system of interest to the bounds shown in Fig 1 — a framework that also highlights the relationship of ports to the world and national economies and the need to consider conflicts between competing ports offering duplicate facilities (cf. Forward, 1970).

Within this wider system of interest urban conflicts occur between (i) the land transport system and either the port activities or activities at the import-export depot, (ii) port-generated traffic and the other modes — vehicles and pedestrians, and (iii) impactees affected by port-related land use (i.e. port, import-export depot and connecting transport links). Variants of these land-based conflicts also occur in the marine system (see Fig 1). Such conflicts are of immediate concern due to technological innovations in shipping, altered cargo patterns, improved understanding and changed perceptions about the marine environment and agitation. As a result port-induced conflicts are now firmly on the agenda of institutions and must be considered in a rational manner.

If we are to understand the nature of port-generated traffic impacts on urban and marine systems, develop predictive capability and improve the final decision we need to extend our existing channels to collect different types of information. It is no longer adequate to rely on aggregate statistics published by port authorities on the volume and composition of cargoes passing through ports. We need to go further and gauge the strength of each link in the transport chain by obtaining performance data by origin, groupage depot, transport link and berth. These demands suggest a scaling down of existing port information systems and the development of new systems oriented to monitoring the impact of port-generated traffic on the urban system to establish thresholds for determining when unacceptable limits are reached. The monitoring would include regular checks on noise and air pollution to avoid undue reliance on custom-made recordings undertaken for particular Environmental Impact Statements. These levels of pollution generation have to be related in turn to changes in socio-economic indicators reflecting what the Planning Research Centre (1974a) classifies as regional economic processes, social response mechanisms and institutional interactions. The socio-economic indicators are key variables monitoring the urban system itself.

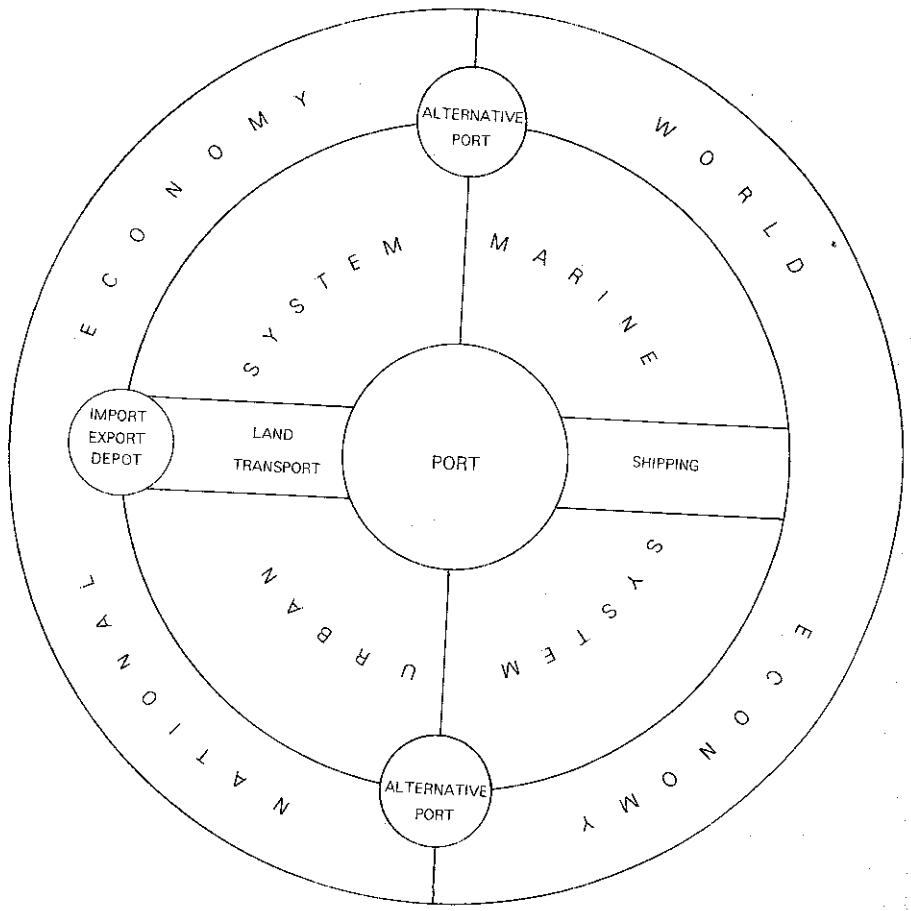


Fig 1 The system of interest

There is also a need to open up fresh information channels to gauge the effect of socio-economic indicators on the marine system. The Planning Research Centre (1974a) suggests the minimum needs in this respect involve an appreciation of shoreline processes, flora and fauna produced, meteorological phenomena and geochemical cycles — a requirement highlighted by the impact of port-related reclamations on natural systems. Our interest in this respect is on incidents in the marine system which impinge on the urban system (e.g. oil spills and beach pollution).

The production of information alone, however, will not resolve port-induced conflicts. The ultimate effectiveness of the extended information channels hinges on Government and port planners becoming more fully aware of the viewpoints of the actors from which the changes to the port's activities and the port's activity structure will be considered. Attention, therefore, has to be centred on the expected behaviour (or plans of action) associated with the actors engaged in the port-generated conflicts. Interest here is confined to the task of identifying the actors and defining their usual roles in a society within which problems are not always resolvable by consensus.

## 2.1 ROLES

The task of identifying the actors affected by port-generated traffic is difficult because socio-economic organisations differ in the range of functions they perform. A conglomerate transport company, for example, may be an importer-exporter, land transport operator and shipowner. This dilemma, caused by the multiplicity of roles, is resolved by recognising that the system affected by port-generated traffic consists of a number of interlocking sub-systems each revolving around the role performed by an actor at a particular location or within a bounded area. As a result the set of interrelated, partly inconsistent, functions performed by individuals and organisations affected by port-generated traffic are divisible and can be allocated to one of six distinctive roles: shipowner, port operator, land transport operator, importer-exporter, traveller and impactee.

An importer-exporter, therefore, with an ancillary fleet of pick-up and delivery vehicles would be recognised as fulfilling two roles — importer-exporter and land transport operator. It would be possible to examine intra-organisational conflict stemming from a company's multi-role activities but such a topic is beyond the interest of this paper. Also it would be feasible to explore the substructure of roles by examining the degree of co-operation between management and employees in fulfilling a role's mission (e.g. port management and wharf labourers). In addition, it would be possible to examine the role's organisation for lobbying Government. However, attention is confined here to the use of the role concept in comprehending port-generated conflicts. Thus, interest is centred, with the aid of Table I, on highlighting the distinctive attributes, objectives, constraints and options of each of the six roles (see Rimmer, 1974, 1975) — an ideal checklist for determining if all parties are represented in an Environmental Impact Statement.

(a) The *shipowner's* objective, coastal or overseas operator, is to maximise the ship's earnings by varying the scheduling and routing of vessels in the short-term or changing the fleet's composition in the long-term within the constraints posed by the port operator.

(b) The *port operator's* objective, whether public or private, is to maximise throughput; periodic congestion may be overcome either through software solutions such as scheduling the arrival of ships and land transport vehicles or hardware solutions such as building

TABLE 1

ROLE CHARACTERISTICS

| CHARACTERISTICS | ROLES | | | | | |
|---|---|---|---|---|---|---|
| | SHIPOWNER | PORT OPERATOR | LAND TRANSPORT OPERATOR | IMPORTER OR EXPORTER | TRAVELLER | IMPACTEE |
| Land use | Transport facility | Terminal | Transport facility | Industrial<br>Warehouse, Storage<br>Distribution | Transport network | Low density household<br>Medium density "<br>High density " |
| Activities | Transport service<br>Facility purchases | | Transport service<br>Facility purchases | Resource purchases<br>Sales | | Labour<br>Consumer purchases<br>Leisure<br>Social |
| Attitudes | Overseas<br>Coastal | Government<br>Private | Rail<br>Road | Secondary<br>Tertiary | Pedestrian<br>Car occupant<br>Public transport passenger | Income group<br>Household structure |
| Objectives | Maximise ship's earnings | Maximise throughput | Maximise vehicle's earnings | Minimise perceived costs | Minimise perceived costs | Minimise disruption<br>Maximise benefits |
| Constraints | Labour relations<br>Loading/unloading facilities<br>Suitability of vessel<br>Access problems<br>Handling equipment | Labour relations<br>Loading/unloading facilities<br>Terminal congestion<br>Terminal site<br>Terminal location | Spatial/temporal access<br>Terminal congestion<br>Track congestion<br>Vehicle availability<br>Regulation | Labour relations<br>Shipping frequency<br>Land transport availability | Truck-induced congestion<br>Air pollution | Noise<br>Air and water pollution<br>Property severance<br>Community disruption<br>Safety |
| Options | Change port<br>Change type of ship<br>Change frequency of visit | Change prices<br>Change facilities<br>Relocation | Vehicle scheduling and routing<br>Size and type of rolling stock | Improvements *in situ*<br>Relocation<br>Change time shipment and despatch | | Modify perception<br>Migration<br>Insulation<br>Lobbying, appeals to unions, publicity |

new terminals and land reclamation — options constrained by the availability of navigable water, investment priorities and changing community attitudes.

(c) The *land transport operator's* objective, road or rail, is to maximise the vehicle fleet's earnings by varying the scheduling and routing of units in the short-term or the composition of rolling stock in the long-term within the constraints imposed by port-generated activities and activity structure.

(d) The *importer-exporter's* objective is to minimise perceived costs in despatching/receiving goods by tailoring loading/unloading facilities to speed pick up/delivery of goods so that maximum advantage can be taken of arrival and departure of shipping.

(e) The *traveller's* objective is to move at the least perceived cost from one place to another to engage in trip-end activity — a journey that may be frustrated by delays and congestion occasioned by port-generated rail or road traffic.

(f) The *impactee's* objective, as representative of the community at large, is to either minimise disruption or maximise benefits from port developments; a role that may be associated with lobbying or demonstrations to emphasise a sectional interest.

We are now in a position to indicate that *activity conflicts* involve (i) port operator and shipowner, (ii) port operator and land transport operator and (iii) land transport operator and importer-exporter. *Vehicle conflicts* concern either (i) shipowners and other waterborne craft or (ii) land transport operators and private cars and pedestrians (i.e. travellers). *Land use (or activity structure) conflicts* encompass (i) port operator and impactee, (ii) importer-exporter and impactee, (iii) land transport operator and impactee and (iv) shipowner and impactee (e.g. pollution of beaches). All of these conflicts involve 'differing individual preferences, conflicting concepts of equity, and conflicts about the ethics of means' (King, 1976:8).

The participants in these conflicts can adapt by implicitly changing their aspirations or explicitly altering the location and timing of activities, the nature of their technical (transport) aids, or the activity structure. For example, the effect of port developments on impactees could force them to lower their aspiration levels; it could also produce a change in leisure activities, migration from the area or attempts to subvert the anticipated impact of the new development by lobbying and appeals to trade unions. However, none of the plans of action or expected behaviour associated with a specified role are sufficiently all-embracing to weld the disparate set of actors into a coherent organisation in such a way that they co-operate in initiatives to improve economic efficiency or promote equity. Such a decision-making task belongs to the political process in which Government and port planner also take part.

## 2.2 GOVERNMENT AND THE PORT PLANNER

As shown in Fig 2 Government (Federal, State and Local) fulfils a dual role. This embraces the allocation of resources to different sectors of the economy including transport and also the establishment of operational norms (what, how, when and where) controlling port-generated traffic so that the participants are sensitive to changing resources and standards for judging services. In fulfilling this task the Government has, according to Vickers (1965:23-5), to promote a level of satisfaction, either in their own terms or to those to whom they are accountable, while simultaneously maintaining a

| Options | Change port | Change prices | Vehicle scheduling and routing | Improvements in situ | Safety |
|---|---|---|---|---|---|
| | Change type of ship | Change facilities | Size and type of rolling stock | Relocation | Modify perception |
| | Change frequency of visit | Relocation | | Change time shipment and despatch | Migration |
| | | | | | Insulation |
| | | | | | Lobbying, appeals to unions, publicity |

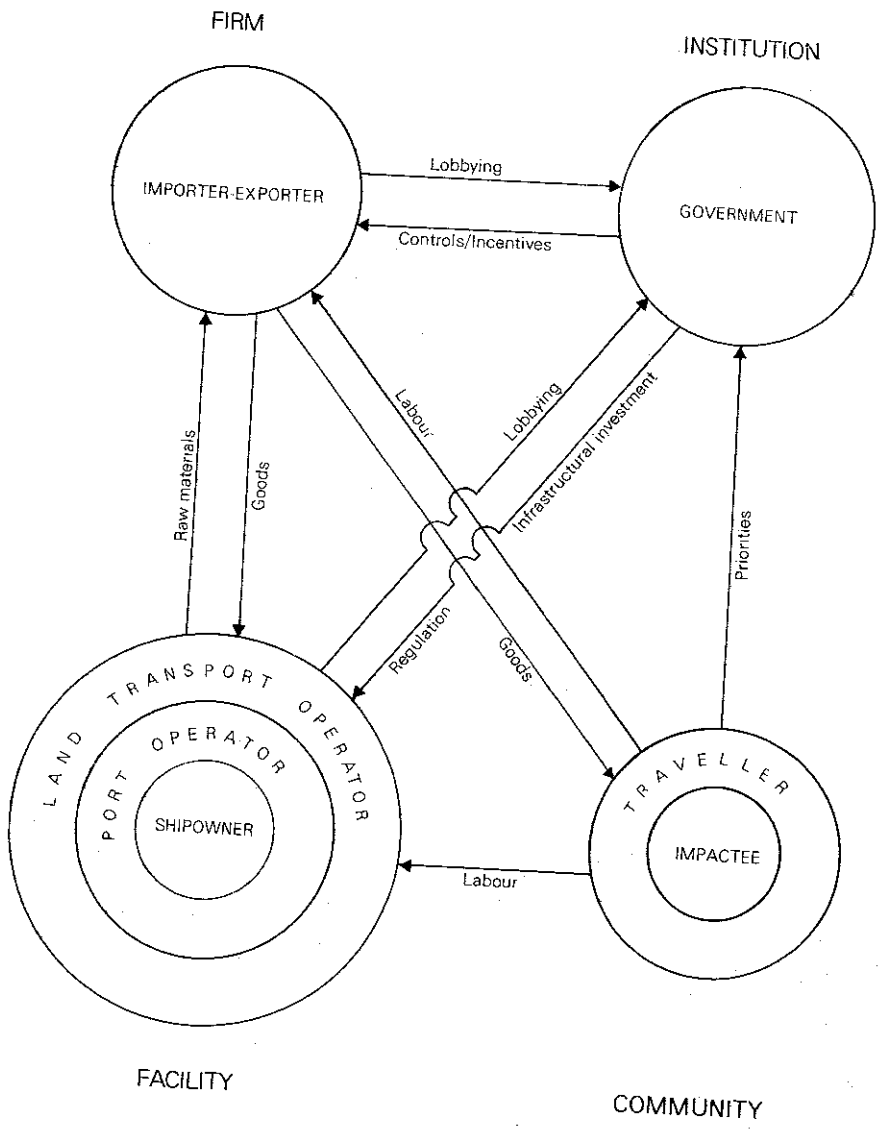


Fig 2 Functional interdependencies between role players

dynamic balance in a budgetary sense between other claims on scarce resources. Where the situation is out of line with expressed objectives the Government performing this satisficing-balancing role can intervene in the port-generated conflicts. Such intervention involves (i) varying the opportunities available for conducting *activities*, (ii) changing the regulations governing the operation of *vehicles* and (iii) altering the *activity structure* of the urban area. In controlling these variables much emphasis is placed on advice from the port planner to decision-makers.

Criticisms of traditional port planning methods have prompted suggestions that the port planner should fulfil a wider role by recasting his relationship with Government and those actors affected by port-generated traffic. It has been suggested that, as a subset of the urban planner's role, the port planner's responsibility would be to provide information on the cost, feasibility and impact of port development alternatives to both decision-makers and actors (cf. Voorhees, 1975). Particular emphasis is placed on mutual assistance between actors and the port planner in specifying problems, alternative plans and relevant evaluation issues. The function of Government in the revised planning process would be to take action on the basis of recommendations from role players (which reflect their relative value positions) and technical advice from the port planner. Where multi-level Government is involved an institutional problem may have to be resolved by specifying the functional domains of Federal and State Governments and Local Authorities (who have most to do with accommodating the physical impacts of port developments).

It takes little imagination to see that the need for a forum through which it will be possible to explore policies of co-operation in attempting to resolve apparently conflicting interests could be provided by a land use gaming simulation exercise developed by the Planning Research Centre (1974b). Port traffic could be generated by interacting role players and its effect on aggregate behaviour and the environment simulated. It is, however, more pertinent to take the suggested revamping of the port planner's role a step further by recommending a planning approach more attuned to our level of understanding of the impact of port-generated traffic on urban and marine systems.

## 3. THE DESIGN OF ALTERNATIVES

> There are moments of history when we simply must act, fully knowing our ignorance of possible consequences, but to retain our full rationality we must sustain the burden of action without certitude, and we must always keep open the possibility of recognising past errors and changing course.
>
> Arrow (1974:29).

Rationality and foresight, according to Arrow (1974:29), occasion doubt and delay; so does conscience, respect for others and for distant and unforeseen consequences that we may worry about. These variables are apparent in the increasing time lag between the initiation and completion of major port projects (e.g. government decision to develop Port Botany was taken in 1969) — the inherent danger in such delays is that port planners may select a novel 'solution' whose consequences are not known. These delays in implementing major port developments are likely to be compounded by heightened uncertainty in the variables considered by port planners.

As instanced by King (1976) port planners are faced with a daunting set of imponderables.

(a) How will the overwhelming importance of the oil industry in the port trade be affected by escalating prices of the product in real terms, future government policies involving the pricing of petroleum and other fuels, future government policy regarding alternative energy sources and the split between energy sources?

(b) What will be the effect on the close association between ports and heavy industry of changes to Australia's share and control of industrial development and its benefits in the light of government policies about the regional distribution of industry?

(c) What will be the impact of the declining growth of general cargo on urban goods movement in the light of revised population estimates, changes in consumer demand and revised opinions as to the desirability of current methods of moving goods within the city?

(d) How will changes in differential subsidies to particular modes affect the declining importance of coastal shipping in port trade?

(e) What will be the effect of reversing the concentration of shipping on fewer ports and making regions more self-sufficient by preventing port operators and state governments pandering to increases in the size of ships used in the Australian trade.

Permutations of responses to these questions would generate a range of scenarios for investigation — a counter to the practice of only considering the build/no-build situation and assuming that port development, once commenced, is an inflexible linear function. The need to adopt incremental, 'minimum regret' strategies in designing alternatives, is further strengthened by the inherent uncertainties in the relationships between shipping and ports.

## 3.1 MINIMUM REGRET APPROACH

The incremental planning approach is conceived by Etzioni (1973) as being preoccupied with the search for realisable, short range and low capital projects as a counter to the conventional port planning approach which generally restricts policy options to capital-intensive recommendations. In developing alternatives attuned to a 'minimum regret' planning approach it is pertinent to follow Hensher (1975) in abandoning Etzioni's short-term/long-term dichotomy and assessing policy options in terms of their certainty of 'success'.

Under the proposed planning approach options are graded from the relatively certain, non-capital, flexible, short-gestation period projects through to the relatively uncertain, capital-intensive, inflexible, and long-gestation period projects. This grading system permits the adoption of a planning approach which begins at the certain end of the uncertainty-certainty continuum and works towards general projects involving greater uncertainty. The application of such a planning approach in a situation of uncertainty will emphasise realisable projects which make more efficient use of existing technologies and promise early improvements rather than capital investments in plant, equipment or technology. However, the latter options are not excluded provided they meet the criterion of relative certainty.

Such an approach is apposite for examining the key issues in major port development for it provides a measure of flexibility in accordance with changing needs. As it is difficult to obtain complete information on changing needs in advance there is a high risk in allocating resources to improvements on the basis of hazy planning and implementation horizons. Much research and development is still necessary to comprehend the pattern of changing port needs over time as part of the determination of longer term planning objectives. Such long term changes result, according to Hensher (1975:99), from the complex interactions of variations in transport activities and alterations in transport infrastructure and many other influences. Once we recognise the relative priorities in planning in a manner that permits us to make ongoing modifications in accordance with changing port needs we are ready to consider policies involving the impact of ports on urban systems — the task according to Wilson (1972:32) of goal setting (and revision), the evaluation of alternatives, implementation and decision.

## 4. POLICY

> Consider firstly a single port with one major investment project which it wants to evaluate. From the point of view of the port itself, this involves predicting the stream of costs and revenues which would result from the investment and carrying out a discounted cash flow analysis... If the viewpoint is to be wider, then the flows to be considered are flows of social costs and benefits rather than simply the port's costs and revenues... What is more interesting is to consider the cost-benefit analysis from the national viewpoint, where several ports are competing for investment funds.
>
> Wilson (1972:38).

As polices flow from the objectives of decision-makers it is important to have a statement of their aims. When these objectives are known, attention can be given to the policy variables available to the various levels of Government. Once the array of possible changes have been canvassed interest can be focused on the set of policy instruments available to decision-makers for effecting policy ends.

### 4.1 OBJECTIVES

The main objectives of a port impact policy are directed towards the reduction of generalised social cost (Hicks, 1975). In this context generalised social cost incorporates both internal and external costs.

A reduction of community costs incurred in the provision and operation of ports (by government in assuming responsibility for activities best performed by a public authority) can only be achieved through a better knowledge of *internal costs*. We need to know, for example, what preferences ports enjoy in raising loans in money markets, to what extent port charges cover costs and if they pay rates at the current market value for the land they occupy. Costs (and benefits) determined by this exercise should, in turn, be distributed by actors (i.e. importer-exporter, land transport operator, shipowner, traveller and resident) to gauge the project's impact on the income distribution within an urban system already experiencing what King (1976) describes as 'differential disequilibrium'. In other words, we need to know what is the expected social rate of return when compared with other Australian ports and *who* is advantaged or disadvantaged by the major port development.

The balance sheet of a major port development must go further and also encompass *external costs* which include noise, air pollution and vibration stemming from port activities, delays caused by transport to travellers, personal and property damage and psycho-social disturbances in individuals. If these costs outweigh any benefits (e.g. views of ships) and are suffered by residents without compensation they represent a subsidy from this section of the community to the beneficiaries of port-based activities. Hence, we also need to know *who* are affected (i.e. by income group and status in household) and to gauge these differential impacts. If possible we should express these impacts in dollar terms using such partial indicators as shadow prices (i.e. real or inferred market values) and the value of travel time lost by port-induced congestion and, where inappropriate, in non-dollar terms. We also need to know the costs of amelioration in total and by incidence. We then end up with a balance sheet which indicates the nature of the external costs and their importance to individuals. In this way we can avoid Stretton's (1976:221-2) charge that we talk only:

> about conflicts between vehicles and pedestrians, or between rival land uses - as if conflicts of class interest were not [our] business. In fact the structure of cities distributes costs and benefits as drastically as the structure of income does.

This balance sheet of internal and external costs allocated by individuals will need to be continually revised because the perceptions of impactees and their valuation of outcomes are themselves in a continual state of flux. Such shifts may, for example, result in resistance to Port Botany being mitigated by the need for jobs.

At best, the balance sheet is a means by which port planners can trade off their desired project against competing claims for land in the vicinity of ports by other instrumentalities (e.g. power station, roads, bridges and railways). All of these projects may not be possible as the community has a limited capacity for absorbing spatial dissonance. Hence, the need to complement the balance sheet with an information system monitoring the activities of other instrumentalities as a means of gauging community tolerance and achieving the object of reducing generalised social cost. The possibility of reducing the total commitment of resources to ports and their impacts prompts an investigation of the elements that can be controlled by decision-makers.

## 4.2 CONTROLLABLE ELEMENTS

Policy-makers engaged in port developments are, according to Hägerstrand (1974), able to alter the *variable constraints* in the decision-making environment (see Rimmer and Hicks, 1977). Such constraints comprise the hierarchy of activities, vehicles and activity structure, which is reflected in the three types of conflicts. In the short-term vehicle types and the activity structure are fixed and the policy-maker is only able to alter the scheduling and routing of activities. However, this important option is often neglected by those wishing to ameliorate the impact of existing port-induced activities. In the medium-term the policy-maker can alter the vehicle mix and bring about a switch in mode by, for example, increasing the carrying capacity of the railway for moving containers and banning their movement by road transport. In the long-term the policy-maker is also able to make substantial changes to the activity structure by changing the nature of ports and transport links to effect, for instance, the development of container depots at suburban locations to disperse the impact of a major port development involving container movements. Policy changes involve a

different response rate before the system reaches a new equilibrium and this factor has to be borne in mind in assessing the fairness or unfairness of policy changes on the actors involved in the system of interest.

In general, however, the policies that take longer to implement are less easy to control (unless bureaucrats are determined to make them into self-fulfilling prophecies). Such an observation prompts a review of the policy instruments that decision-makers have at their disposal for making more immediately realisable changes.

## 4.3 POLICY INSTRUMENTS

Six main policy instruments are available to decision-makers for reducing the generalised social cost of port development:

(a) *financial* involving either disincentives or incentives/compensation[2],

(b) *regulations* that cover land use zoning, traffic control, vehicle design, noise and air pollution,

(c) *institutional* which could include either a two-tier port authority or public ownership,

(d) *mitigating action* using, for example, insulation such as double glazing,

(e) *procedures* such as scheduling, and

(f) *planning* involving such strategies as port specialisation.

These instruments will rarely involve a reduction in all elements of social costs simultaneously. There must always be a compromise in which increases in certain costs will be accepted to get an overall reduction in costs (Hicks, 1975). Such trade-offs illustrate the basic nature of the various conflicts which have to be resolved by government policy.

In resolving the differing conflicts it can be assumed that each role player is capable of assessing his needs and capabilities and taking action to achieve these objectives. At least, there can be no doubt that each actor *tries* to do so. The system in operation is the combined result of their efforts. Only by the greatest coincidence will these unco-ordinated efforts result in a port system which is desirable from the wider community viewpoint.

It is this omnipresent conflict of interests and activities which presents the major government policy problem. Virtually whatever action the Government takes, some actor perceives his own interests to be harmed. There is an obvious temptation for Government to minimise its involvement. Yet, without further knowledge, we cannot be sure of how many areas there are in which government activity would yield useful results.

---

[2] Compensation should be used to ensure that low income, blue collar households — the principal sufferers of port developments — are adequately reimbursed by those creating the negative externalities. Such compensation should dissuade some instrumentalities from choosing the least line of resistance in locating their activities in such areas in preference to more volatile higher income areas.

A start to resolving some of the complex issues stemming from the impact of major port developments involves the development of a two-tier organisation with a new central authority and the existing port authorities as indicated by Wilson (1972:41).

> The crux of the method is that the Central Authority should judge between alternative submissions by an optimisation method based on the calculation of shadow premiums to account for budget constraints, and ensure that a certain minimum rate of return is achieved. All of the detailed calculations are done by the Port Authorities on the basis of their local knowledge. It is also clear that the Central Authority will have to co-ordinate the systems analysis of flows resulting from alternative schemes ....and make sets of forecasts available to the Port Authorities.

Such a procedure would have to be augmented by merging environmental amenity with internal costs and benefits (see Butlin, 1976:93).

## 5. THE AGENDA

> Conflicts of values confront all port planning. And...port planning must be analysed and evaluated in terms of conflicts of values. At present, however, neither the port planners nor their antagonists seem able to effect this sort of analysis, and the real nature of the conflicts remains incomprehensible, and the conflicts intractable.
>
> King (1976:22).

This study has carefully avoided entanglement in specific issues involving particular Australian ports because the emotion generated by various interest groups has, to some extent, obscured the evaluation of the impact of ports on urban/marine systems. Instead, the study has focused on outlining the three basic ingredients of a planning framework — the system of interest, design of alternatives and policy. Having achieved this objective continued aloofness is no longer warranted and the framework must be tested in actual conflict situations by others.

A primary constraint on undertaking such a task is raised by Rendel & Partners (1976:19) who, in the course of studying the interaction between ports and urban systems, found that:

> the subject....has received scant attention to date. The scope of most port planning currently undertaken is largely confined to requirements inside the port gate and even first order links between ports and the cities they serve are rarely examined in detail. Extant theoretical work tends to be of peripheral relevance and offers little in the way of solutions in the Australian context.

They go on to recommend a program of research directed to real applications and oriented towards the development of practical solutions and management policies (Rendel & Partners, 1976:20-26). This includes:

(a) the conversion of a port and urban system interaction checklist, identified in the course of the study, into an operational guide for port and urban planners;

(b) a detailed study of the impacts of port operations on an urban community in order to reduce them through the modification of port planning processes;

(c) the establishment of a hierarchy of industries requiring port area locations for use by planning authorities in the allocation of land and in providing for flexibility in port development;

(d) the quantification of the effects of container systems on the urban environment through the use of case studies to provide guidelines on locational and operational criteria for container terminals and decentralised depots;

(e) the observation and analysis of the processes by which port developments interact with urban systems before and during a period of major change to provide an understanding of the processes involved and resulting impacts, an indication of the associated threshold levels of port activity, and an assessment of the viability of various port development planning policies in reducing impacts; and

(f) investigation of the scope of a national approach to port impacts reduction by determining the extent to which the landbridge concept can mitigate such impacts compared with the costs of modification required to the physical infrastructure.

The need for such a program of research was confirmed at a recent Seminar on the subject of ports and urban systems organised by the Commonwealth Department of Environment, Housing and Community Development (DEHCD) in co-operation with the Commonwealth Department of Transport (DOT) at which shipowners, port operators, land transport operators, importers and exporters, Government (Federal, State and Local), port planners and community groups were represented.

Other constraints to the testing of the planning framework presented have also been identified. It has already been stressed that the efficacy of government policy instruments that can be applied to port-generated conflict situations has yet to be demonstrated, and the range of such instruments remains to be established. The fundamental requirement for developing information systems oriented to monitoring the impact of port-generated traffic on the urban system has also been highlighted.

Finally, King (1976) has emphasised the need (i) to examine the assumptions underlying port planning, and (ii) to undertake a comparative analysis directed to gauging the impact of port-generated traffic on urban systems. The first proposal involves assumptions about such significant planning parameters as energy use and technology, distribution and control of industrial development, levels and forms of future consumption, attitudes to transport subsidies, and centralisation or decentralisation; such a study would enable a broader range of port development options than currently available to be examined before decisions are taken. The second proposal is for a comparative analysis of Melbourne (and Westernport) and Sydney (and Port Botany), two areas which would allow us to examine what Butlin (1976:95) terms:

> the aggregate effects on the environment and to project some of the characteristics of the *total* environment arising from Port development that will induce major manufacturing, distribution, transport and storage expansion, together with increases in shipping, rail and road transport movements.

While King goes on to suggest that both of these studies could usefully generate Green Papers for discussion by States and participants in the port system the main thrust of research should be directed at the second proposal.

Given that a research program into the interaction of ports and urban systems is required, it is necessary to determine the context within which it should be framed. Rendel & Partners (1976:14, 187) suggest that:

> the causal forces at work (in the port and urban systems interaction process) have a much greater spatial extent that the localised effect. It follows that solutions or strategies to lessen or control impacts must recognise the nature and spatial extent of the various systems and linkages which lead to urban area impacts...[Thus] local strategies which do not take account of the role of ports in regional and national systems are not likely to be successful, and solutions will be of a regional or national nature.

They go on to discuss three possible strategies. One is illustrated by Perth where industrial and transportation planning has been integrated in the total context of the urban and regional system. Another regional strategy demanding the same degree of planning co-ordination is the Western-port case where additional port facilities are developed remote from the metropolitan areas of the major cities. A national strategy suggested is the landbridge concept which involves the centralisation of cargo on a single terminal port (e.g. Fremantle) and the use of rail to distribute and collect freight to and from other centres (see Bureau of Transport Economics, 1975).

The view that port development should be evaluated in a regional and national context was also stressed at the DEHCD/DOT Seminar into the interaction between ports and urban systems. Such a process will ensure that port planning takes account of impacts on both the nature of land use and the quality of life in the immediate hinterland. This implies that assessments of port investments and functions must be made in the context of urban, regional and national development policies.

The research task outlined and the approach proposed raises the question of institutional responsibilities. Clearly, this is a very sensitive issue both within and between governments and is likely to remain so. The need for a national perspective in port planning and development has been articulated by Bird (1968:228-34) and others since. That the Commonwealth Government has a role in this area is beyond doubt following the verdict of the High Court confirming the validity of the *Seas and Submerged Lands Act* 1973; this view is bolstered by the *Report of the Botany Bay Port and Environment Inquiry* (Parliament of New South Wales, 1977:80-1, 141-2, 144). The definition of the Commonwealth Government's role is a thorny problem although the framework of 'co-operative federalism' provides an appropriate context for resolution (see Sawer, 1975:134). One would hope that an element of this role would be national assistance — of a professional as much as a financial kind — in the development of information systems to monitor port-urban/marine system interactions. Equally important is the recognition that other actors have significant parts to play in reducing the impacts of port developments on

urban/marine systems. The critical questions that remain to be answered are who will be the first to take up the research challenge and who will be the first to grapple with the problem of institutional responsibilities.

## ACKNOWLEDGEMENTS

The authors are grateful to the Commonwealth Department of Environment, Housing and Community Development for access to their studies on interactions between ports and urban systems. However, the paper does not necessarily reflect the Department's policy in this area. Thanks are also due to Norman Fisher and Bill Faulkner for comments on the paper and to Manlio Pancino, Cartographic Section, Department of Human Geography, Research School of Pacific Studies, The Australian National University, Canberra, for drawing the accompanying figures.

REFERENCES

ARROW, K.J. (1974). *The Limits of Organization*. (Norton: New York.)

BIRD, J. (1968). *Seaport Gateways of Australia*. (Oxford: Melbourne.)

BUREAU OF TRANSPORT ECONOMICS (1975). *The Economics of Australian Landbridge*. (Australian Government Publishing Service: Canberra.)

BUTLIN, N.G. (ed.) (1976). *The Impact of Port Botany*. (Australian National University Press: Canberra.)

CENTRE FOR ENVIRONMENTAL STUDIES (1976). *Port of Melbourne Environmental Study: Volume 1 - Assessment of Land Transport Alternatives for Webb Dock*. (University of Melbourne: Melbourne.)

ETZIONI, A. (1973). Mixed scanning: a 'third' approach to decision-making. In A. Faludi (ed.), *A Reader in Planning Theory*. (Pergamon: Oxford.) pp. 217-29.

FORWARD, C.N. (1970). Waterfront land use in six Australian state capitals. *Annals*, Association of American Geographers. 60(3), pp. 517-39.

HÄGERSTRAND, T. (1974). The impact of transport on the quality of life. In OECD, *Transport in the 1980-1990 Decade*. (Fifth International Symposium on Theory and Practice in Transport Economics, Organisation for Economic Co-operation and Development: Paris.) pp. 1-51.

HENSHER, D.A. (1975). Incremental planning and uncertainty. In K.W. Ogden and S.K. Hicks (eds), *Goods Movement and Goods Vehicles in Urban Areas*. (Commonwealth Bureau of Roads: Melbourne.) pp. 100-5.

HICKS, S.K. (1975). Urban goods movement: a political economist's viewpoint. In K.W. Ogden and S.K. Hicks (eds), *Goods Movement and Goods Vehicles in Urban Areas*. (Commonwealth Bureau of Roads: Melbourne.) pp. 26-50.

KING, R.J. (1975). An approach to social evaluation in transport planning. In The Institution of Engineers, Australia, *Metropolitan Transport: The Way Ahead*. (Institution of Engineers, Australia: Melbourne.) pp. 74-8.

KING, R. (1976). Port and urban system: conflicts, assumptions and Evaluation. (Unpublished paper, Centre for Environmental Studies, University of Melbourne: Melbourne.)

MAUNSELL AND PARTNERS PTY LTD (1976). *Environmental Impact Statement Proposed Botany Bay Container Terminal [Incorporating Public Comment]*. (Australian National Line: Melbourne.)

PARLIAMENT OF NEW SOUTH WALES (1977). *Report of the Botany Bay Port and Environment Inquiry together with Appendices thereto*. (Second Session No. 103, Government Printer, New South Wales: Sydney.)

PLANNING RESEARCH CENTRE (1974a). Research proposal submitted to the Botany Bay project committee: accompanying statement. (Unpublished paper, Department of Town and Country Planning, University of Sydney: Sydney.)

PLANNING RESEARCH CENTRE (1974b). *An Interactive Land Use/Transport Gaming Simulation, MATE:2 Operational Manual*. (Department of Town and Country Planning, University of Sydney: Sydney.)

RENDEL & PARTNERS' ECONOMIC STUDIES GROUP IN ASSOCIATION WITH URBANGROUP (1976). *Study of Sea Ports/Land Use Interaction*. (Commonwealth Department of Environment, Housing and Community Development: Canberra.)

RIMMER, P.J. (1974). Transport decision-making and its spatial repercussions: shooting an arrow at a moving target. *Monash Publications in Geography No. 11*. (Monash University Geography Department: Melbourne.) Revised version in D.A. Hensher (ed.), *Urban Transport Economics*. (Cambridge University Press: Cambridge, 1977 [in press].)

RIMMER, P.J. (1975). A conceptual framework for examining urban goods movements. In K.W. Ogden and S.K. Hicks (eds), *Goods Movement and Goods Vehicles in Urban Areas*. (Commonwealth Bureau of Roads: Melbourne.) pp. 15-25.

RIMMER, P.J. and HICKS, S.K. (1977). Urban goods movement: process, planning approach and policy. (Unpublished paper to be presented at Third International Behavioural Modelling Conference: Tanunda.)

SAWER, G. (1975). *The Australian Constitution*. (Australian Government Publishing Service: Canberra.)

STRETTON, H. (1976). *Capitalism, Socialism and the Environment*. (Cambridge University Press: Cambridge.)

VICKERS, Sir G. (1965). *The Art of Judgement: A Study of Policy Making*. (Chapman and Hall: London.)

VOORHEES, A.M. AND ASSOCIATES INC. (1975). A prototypical study design. (Unpublished report to the Commonwealth Bureau of Roads: Melbourne.)

WILSON, A.G. (1972). National planning for ports: towards an improved methodology. In A.G. Wilson, *Papers in Urban and Regional Analysis*. (Pion: London.) pp. 31-45.