

NATIONAL ENERGY, WATER AND ENVIRONMENTAL POLICIES
WHICH EXERT AN INFLUENCE ON
PLANNED URBAN DEVELOPMENT

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INFLUENCE OF NATIONAL ENERGY, WATER
AND ENVIRONMENTAL POLICIES ON
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Synopsis

The theme of this paper, which is written as a series of notes, is to link together the three issues of energy, water and environment, in order to suggest how administrators, planners and developers might best cope with them by utilising appropriate methods of town planning coupled with co-ordinated urban development programmes. The principal conclusions are that:

- . Effective conservation of energy, water and natural environments will depend mainly on the emergence of new technology and better methods of planning and management. National policies will in most countries exert only a marginal influence.
- . In developed countries water supply and drainage systems are usually high-cost technology. There is accordingly a need to develop low-cost engineering approaches which are more environmentally sensitive so that sound advice and appropriate technical assistance can be offered to resource-poor communities.
- . Few nations have established effective systems of environmental protection, and governmental policies will not be

influential unless they are backed up by adequate planning and scientific procedures.

- . There seem to be many ways in which energy and water usage might be reduced in order to conserve resources, but cities are likely to respond very slowly to the energy crisis, to water conservation measures and to the need to protect the natural environment.

Energy Impacts

Throughout the world since 1973 there has been a rapid escalation in the price of energy, coupled with growing shortages of transport and heating fuels, such that it is now widely accepted by governments that the era of relatively cheap energy is at an end. In the particular case of resource-poor countries the adverse impacts are already severe and there is accordingly an urgent need to identify how cities and towns should in future be planned and developed so as to either conserve energy or use it more efficiently.

Are National Policies Effective

Many countries have adopted - as a matter of urgency - national policies whose aim is to regulate the use of petroleum-based fuels, also to encourage oil and gas exploration, but it is too soon to know whether such policies will be effective in reducing overall reliance on petroleum-based energy. The impact of such policies on urban areas is even more difficult to predict because by their very nature urban systems are slow to adapt even when faced with quite massive technological changes.

Indications in both USA and Australia are that national fuel policies, coupled with rising oil prices, are proving to be effective in reducing oil consumption. It is difficult to establish, however, the extent to which different components of policy are material as between mandatory or voluntary requirements, taxation incentives, pricing mechanisms or public education. At the level of the individual household probably the most significant factor in relation to energy consumption is the amount of disposable income available for transport

and heating, rather than the influence of government policies.

It is also important to recognise that national energy policies will reflect overall circumstances in relation to such things as foreign exchange rates, balance of payments and the availability of local fuel resources. On the other hand individual cities and towns and private corporations will have different energy policies depending upon the specific energy sources available to them.

Water and
Environment

If one examines two other areas of public policy, namely, urban water supply and environmental protection, it may be observed that governmental policies have exerted a predominant influence on the development of water resources so as to meet the growth in consumer demand, whereas the record of governments in conserving and protecting the physical environment is noteworthy for its lack of success.

Government support
for Water
Projects

As a direct result of national policies in countries such as the United States and Australia there has been, since the 1930's, massive and continuing public sector investment in river basin projects, such as urban water supply systems, rural irrigation schemes and power generation projects. The technology of dam construction, water reticulation and water quality treatment is essentially a high-cost technology and often cannot offer solutions to the water supply problems of cities in under-developed countries. The planning and management of water resource projects might well be more important than engineering and technological questions in countries where physical and skilled human resources are limited.

Environmental
Policies are
not effective

Water and the natural environment are closely related and it has become a matter of public concern that large cities and many industrial processes are having increasingly adverse impacts on environmental protection. However, unlike national

water policies, environmental policies are not as yet effective. Their purpose is often negative or constraining and this might be a partial reason why no significant technology seems to have emerged so that environmental protection is achieved without development projects being abandoned as a consequence.

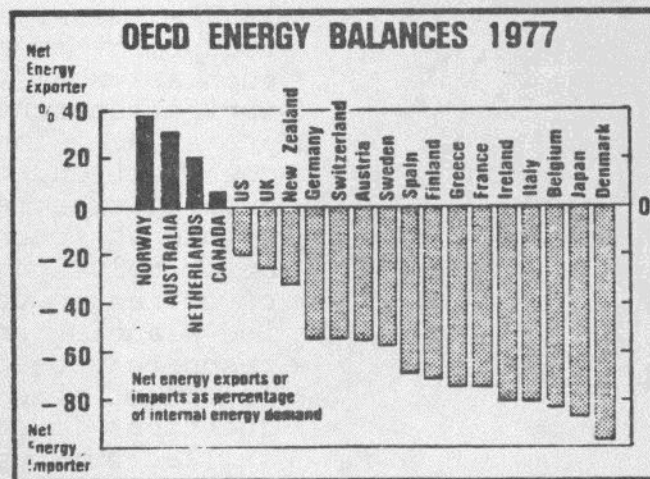
Purpose of this paper

The purpose of this paper is to examine how public and private sector agencies might better cope with key urban issues of water, energy and the environment. To some extent governmental policies might be of assistance to city managers, planners and developers, but often they will not. The best prospects might well lie in the realm of town planning and in order to identify what the relevant town planning procedures might be Canberra has been selected as an example of how a particular city is attempting to deal with -

- (a) the energy crisis
- (b) urban water supply
- (c) protection of the natural environment

Australia is energy rich

Looking firstly at energy. Australia is an energy-rich nation and is a net exporter of energy, as the accompanying diagram shows.



The energy crisis so far as Australia is concerned is really an 'energy substitution dilemma' since there are substantial sources of non-oil energy in Australia, particularly coal, but the difficulty is to predict whether or not in the near future a combination of government policy and technology will materially improve the availability of substitute fuels.

National
Energy
Policies in
Australia

The Federal Government's energy policies may be summarised as follows:-

- . Domestic consumption price for petroleum fuels is set in accordance with world parity prices based on Saudi-Arabian light crude
- . Tax and subsidy incentives for oil and gas exploration
- . Tax incentives for oil substitution
- . Funding of oil-replacement research
- . National fuel economy goals with particular reference to passenger vehicles
- . Coal liquification R & D programme
- . Electrification of state and national railways
- . Energy conservation in government buildings.

Energy
Consumption
in Canberra

The current cost of Australian crude oil is \$27.50 per barrel and in the last two years this price has increased by 100% because of the Federal Government's parity policies. Substitution fuels are unlikely to become economically viable until crude oil prices exceed \$35-\$50 per barrel and when coupled with a variety of technical factors, such as the long lead time to develop and commission new plant, also equipment modification and replacement, it could be at least a decade before substitution fuels are in widespread use.

In the case of Canberra fuel price levels are likely to have the greatest impact on transport. In most other Australian cities the situation would be similar.

Energy consumption in Canberra by fuel	
electricity (hydro)	13%
electricity (coal)	13%
oil	70%
LPG	2%
other	2%

Energy consumption in Canberra by sector	
domestic	20%
commerce & industry	20%
transport	60%

Impact of oil
prices on
Transport

Because Canberra has no significant industrial activity the transport sector accounts for 80% of total oil consumption. Oil prices will increasingly have an effect on all

aspects of transport throughout the city. It is expected that the following effects will gradually materialise:

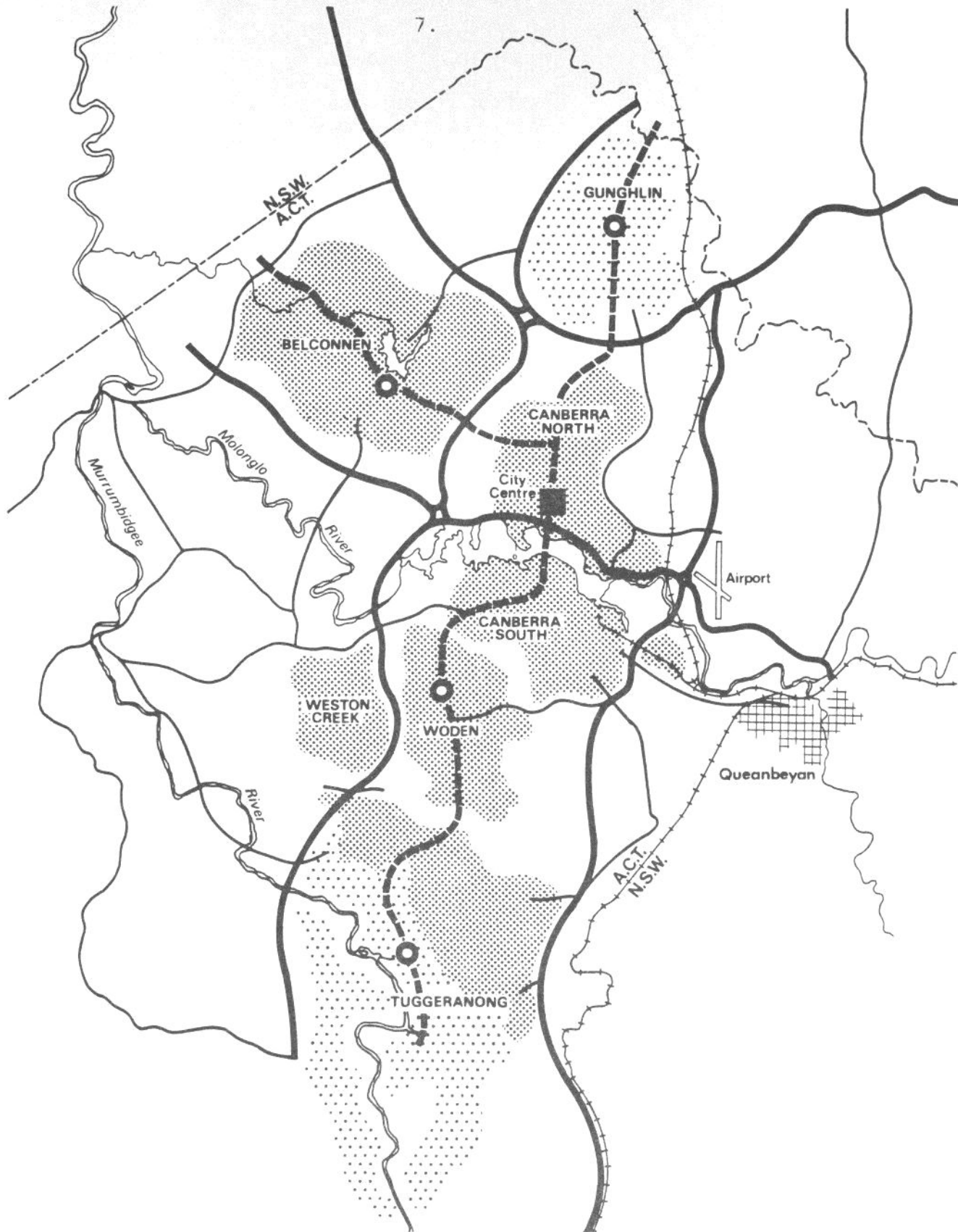
- . Slight reduction in work trips by private car and a consequent shift of up to 10% in the modal-split in favour of public transport
- . Public transport fares will rise and annual deficits will continue to worsen
- . Number of private cars per family will stabilise at about 1.4 or decline slightly
- . Consumer preferences will favour smaller and lower powered motor cars
- . Car occupancy levels are low at 1.38 persons per vehicle and may rise somewhat
- . Frequency and length of non-work trips, particularly shopping and leisure trips, are likely to decline slightly.

Planning
Procedures
related to
Energy and
Environment

In a city such as Canberra where the transport system consists of buses and cars and is therefore totally dependent on oil fuels, there are various town planning procedures which can be utilised in order to conserve energy and at the same time reduce adverse environmental impacts.

Urban Form
and
Structure

Canberra's urban form is essentially linear. The plan comprises a group of individual urban districts or "towns" arranged in the shape of a Y along a spine formed by a mass transit system. Each town has a population in the range of 60,000-100,000 and is designed to be relatively self-contained and provide for most of the needs of its residents including employment, retailing, community facilities, leisure and recreation. The focal point of each town is a town centre containing major retailing and employment. By providing a range of employment and shopping facilities in locations much closer to the population than would occur if all commercial developments were located in a single



- INTER-TOWN PUBLIC TRANSPORT ROUTES
- ARTERIAL ROADS
- TOWN CENTRES
- EXISTING URBAN
- PROPOSED URBAN



CANBERRA
METROPOLITAN POLICY PLAN
(Y - PLAN)



metropolitan centre, considerable energy savings are achieved by shortening the length of trips to work and to shops.

Woden, the first new town now has an employment level within the town equal to half the number of workers living in the town. A 1975 survey of travel patterns in Belconnen, Canberra's second new town, showed that half of all trips made by residents were internal to the town.

In Canberra, 21% of shopping trips are made from work. Where shopping facilities are sited with employment sub-centres these journeys can be made on foot, cutting energy consumption.

Residential Area Planning

Energy efficiency is also facilitated through the physical layout of Canberra's residential areas. The neighbourhood unit has been extensively utilised in the physical planning of the towns. The size of these units was determined by the need to ensure an acceptable walking distance to primary schools and local shops which led to the selection of a unit about 1.2km square. A small centre containing shops, personal services, a service station, within 0.8km of all parts of the neighbourhood and close to the school. A system of pedestrian ways linked small children's play areas and focussed on the central area where the school, shops and community buildings were sited. This concept has worked well. Surveys have shown that about 60% of primary school students walk or ride bicycles to school. The local centres are well patronised, 26% of the trips being made on foot or bicycle.

While the average residential density is low at 25 persons per hectare, higher densities in the form of small lot or medium density housing are increasingly being achieved. The policy for these housing types is to generally place them, in order of priority -

- (i) adjacent to commercial and development centres in City, Woden and Belconnen Town Centres;
- (ii) along the route of the future public transport system currently served by local and express bus services;
- (iii) adjacent to commercial sub-centres;

in order to generate shorter trip lengths between residential, work, recreation and education activities.

Peripheral Parkway System

Inter-town traffic moves on a peripheral parkway system at the outside edges of the urban area whereas the bus (public transport) system operates on an internal spine route linking each of the town centres. The purpose of the peripheral parkways is to allow vehicles to maintain high average speeds and to avoid traffic congestion by relying on grade-separated intersections and allowing no frontage development within the parkway corridor. This tends to both improve fuel economy and reduce air pollution. It also tends to protect residential areas from the noise and disturbance caused by through-traffic which is otherwise provided for by the peripheral parkways. Vehicles using the peripheral parkway system are able to operate within an optimum speed range 65-80 kph which means that on average there is a gain of about 30% fuel efficiency compared to the stop-go conditions which characterise most urban areas.

Approximately 95% of vehicle fuel consumption is attributable to private car use because of a low modal split (15:85 public:private transport) coupled with low car occupancy rates, especially during peak journey-to-work periods.

Tri-Partite Transport Policy

The overall aim of Canberra's transport policy is to progressively restrict the use of the private car, particularly for work trips, and at the same time achieve a gradual shift in favour of public transport. This is done by controlling -

- . the availability of road space
- . the availability of parking space in town centres
- . the capacity of the public transport system and the quality of service.

Capacity of
the Public
Transport
System

The bus system's performance is being progressively upgraded by regular acquisition of new rolling stock and by improvements to the comfort and convenience of service. There are basically two parts to the system. There is a line-haul system of express buses operating between town centres on either the normal arterial road system on bus priority lanes, or on exclusive busways having no frontage development. There is also a secondary or feeder network bringing travellers from the residential neighbourhoods to the town centres where they transfer to the line-haul express system. The line-haul system is efficient in both energy and overall cost terms but the feeder system is not.

Under present circumstances the bus system is only marginally more efficient in energy terms than the private car. The need is to discover more effective means of handling the feeder network.

Controls
over Road
Space and
Parking
Space

Reduction of private car travel, particularly for the journey-to-work, tends to significantly reduce levels of atmospheric pollution. Private car commuting trips are discouraged by maintaining most town centre parking facilities in public ownership and using pay-parking mechanisms to reduce the availability of all-day parking by means of appropriate pricing policies. Arterial road space is also 'rationed' by the creation of bus-priority lanes thereby forcing cars on to the peripheral parkways so as to avoid congestion and thus achieve decreased travel times for both buses and private cars operating on segregated routes.

Vehicle
Size

National oil pricing policies are promoting a trend in favour of smaller cars. A 25% shift from 6-8 cylinder cars down to 4 cylinder cars would result in a 10% reduction in fuel consumption but it is too early to know how far this trend will go, particularly in a country like Australia where travel distances tend to be long.