'ENGINEERING INHERITANCE & TRANSPORTATION PROVIDENCE'

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Abstract

New Zealander's are inveterate voyagers and travelers. We are also part of an active global transportation planet. Since the 1850s the provision of transport facilities have been a driving force in New Zealand government policy, community development, planning and engineering practice. From its formation in 1914 IPENZ members have made a significant contribution and since 1972 this has included the activities of the IPENZ Transportation Group.

Our 'inheritance' from the past century of IPENZ member's activities includes a record of successful engineering achievement including our railways, highways, harbours and airports. The future has even more rapid change in store, with more intense urbanization, more containers shuttling around NZ and the globe and increasing risks of congestion and conflict to our built and natural environment. This paper focuses on transportation planning. Having canvassed our 'inheritance' it explores what may be required to give some foresight, that may enable a reservoir of transportation 'providence' as a resource to match the needs of the next 50 years.

1. Settlement 'Inheritance' 1800s -1964

'We must see the past to be able to look to the future'

Old proverb

This IPENZ centennial year is also the 42nd year anniversary of the Transportation Group. My years of participation in all these activities have been exciting and a privilege. In this presentation I will share memories, pertinent quotations from past mentors, planning precepts and some future ambitions with you.

Kiwis are inveterate voyagers. The arrival of the canoes about 1280, followed by the tall ships of the 1840s and the subsequent 170 years of immigration and transport from all corners of the globe have brought together an inheritance of travel and mobility. Our transportation has been propelled on foot and by horse, wind, steam, fossil fuels, electricity and now solar energy as well. We are citizens of one of the most mobile communities on earth.

From 1914 to 1964 transport network improvements were consistent with the mode choices inherited from the Victorian era. Rail was singulary the most significant 'inheritance' over the past 150 years. By 1914 the New Zealand rail network was 4,700 km and this increased to 5,700 km by 1952. As recorded by Churchman (1) the growth in rail continued until the 1950s but since then 1700 kms of local branch lines have been shed and the main line haulage of passengers has disappeared.

Our engineering 'inheritance' includes a large number of transportation successes in overcoming difficult rural, inter-city, mountainous terrain and some unique bridging solutions across our sea/river crossings. There has also been major development of selected provincial harbours to accommodate the 'container' vessel revolution and airports to welcome the arrival of jumbo jets. For a brief summary of the transportation modes and landmarks from 1922 - 2006 refer to Tables 1.1, 1.2 and 1.3 in 'A Wheel on Each Corner' (2).

The issues of safety, driver education and improved engineering standards for our existing networks were the major post World War 2 priorities. The first identified traffic engineer in New Zealand was Andy Forsyth, appointed as the Traffic and Safety Officer to the then Transport Department (1928) a position he held for many years. Many others have followed and Harry Hume (PWD) was another pioneer overseas student who in 1941 took up a scholarship at Yale to study highways and highway capacity in the USA. (3).

We inherited a US/UK systems approach using traffic information, travel surveys, land use trip generation modeling and comprehensive transport and land use planning in the 1950s. In that decade more young engineers gained scholarships and were sent overseas to gain traffic engineering qualifications and planning experience. These included Ross Palmer, Dave Hefford, Ron Fisher, John Foster, Roy Leith, Harold Surtees. In the years that followed a score of us did the overseas trip to the USA, UK, and especially to Ross Blunden's course at the University NSW.

The technical and personal input made by that generation of professionals has been an important part of the 'providence' which has enriched the profession over the past 50 years.

2. Transportation Planning and Environment 1964 to 2014

> "*There is only one principle whereby an urban area can cope with large volumes of traffic and yet preserve acceptable environmental conditions. This is the deliberate canalization of the longer movements onto a network of roads (corridors) designed for movement; and the deliberate creation of environmental areas (rooms within the network) where the needs of the environment can predominate."*
>
> Colin Buchanan (Report to Christchurch City 1966)

In this centennial year of 2014 it is interesting to compare the past and emerging transport patterns. In the IPENZ 50 year history published in 1971, 'Learning, Service, Achievement' 1914-1964' (4), the chapter on railways filled 30 pages. In contrast the corresponding chapter on highways and traffic engineering at that time occupied only 9 pages. Now in 2014 these relative contributions are reversed with greater emphasis on highways and airports. Sadly the improvements to the railway network have, since the successful (if belated) electrification of the North Island Main trunk in 1985, been neglected. However some long overdue urban rail network improvements are now under way, at last, in Auckland.

Government's transport planning and roading programmes tend to go through 10 or 20 year cycles of high and low commitment and expenditure. The 1960s and 70s were high budget years followed by the lows of the 1980s and 90s. During the low cycles there is a loss of political commitment to transportation investment. The gap between needs and supply gets wider, planning projections become shorter and projects become confined to 'pressure point'relief. During these low periods it is inevitable that longer term capital programmes are 'parked', 'deferred' or even abandoned. Since 2005 programmes have again become more expansive including the RNS list.

We continue to have one of the highest vehicle ownership rates and are amongst the world's highest level of personal expenditure on travel. The inter-city state highway network has been largely re-built to match safety and modern rational design standards. But what of our cities? A major social change is that New Zealand population has, since the 1960s, become dominantly an urban society. The 2010 census shows two out of three now live in the three main metropolitan urban areas. It follows that the focus on transport improvements has been re-directed to street network improvements and traffic management to offset the growing urban traffic jams.

In 1963 Colin Buchanan produced the UK Government report 'Traffic in Towns'(5) which was widely accepted as 'good practice'. Nothing, since 1966 has changed as to these principles of reconciling traffic accessibility and environmental quality. However to put them into practice requires major and systematic studies, ongoing planning, institutional commitment, adequate funding, clear planning, effective political leadership and a robust programme of improvements.

In the past 50 years, alongside the issues of network capacity, there is now much more public consultation, more submissions and an articulate public concerned for sustainable resource management and environmental quality. We would not wish to have it otherwise. But it does mean that we must extend our abilities and judgements in these directions of planning as well.

These broader environmental concerns will increase, dominate and provide 'hurdles to be climbed' during the next 50 years.

3 'Providence' of Long Term Planning.

Planning explores ways to correct what is going wrong and identifies ways to achieve those improvements.
To 'breathe' good changes through the 'windows of opportunity', effective long term plans must already be agreed and in place.

C.Barclay Millar 1972

In New Zealand, from the outset of European settlement, transport has always been a vital item of central and local government activity. This is reflected in the design and construction of:-

- the extent of railway construction in the last century up to the 1950s.
- the development of our roading networks from the 1920s
- creation of motorways since the 1960s
- harbour and port improvements and accommodation of shipping containers in the 1970s
- airports have been the subject of continuous and dramatic change since the 1940s.

Transportation affects every facet of our community life and your group is in the thick of it.

Since the mid sixties traffic engineering and traffic planning has become an accepted feature of civil engineering, transportation planning and recently travel demand management. By 1969 transport, parking and network elements had also become integrated into many regional and district plans. In the 1960 to 1975 period twenty New Zealand communities had completed a full round of transportation planning and network improvement studies. Douglass and Smith RRU Bulletin No 33 (1977) (6).

Following the early 1960/70s regional planning efforts there was a drop off in this work. Unfortunately, with the possible exception of Auckland, effective regional transportation and planning teams, such as existed in the 1970s, have not yet been revived by the present generation of regional councils. This neglect was further compounded in 1986 when the government disbanded its own Works and Development Ministry. It happened that Transit, Transfund and later NZTA were retained within government to manage the state highway network.

With our larger urban population increased congestion, more complex modes and systems the challenges have changed. It is not just a matter of inter city SHs or a ring and radial street networks. A full understanding of traffic generation, trip making and assignment is now essential. We must now ensure our longer term planning is equal to, and gets ahead of, the land use and transportation relationships generated by these more complicated urban and metropolitan patterns.

Since 2000 we have seen a series of government policy and statutory changes. Some, such as the NZ Transport Strategy 2002 & 2004 (7), the establishment of the NZ Transport Agency and the prioritizing of the Roads of National Significance generally support sound transportation policies for planning and national economic development. However at the national level, the inter-modal balance and competition between land, sea and air still falls outside any rational policy framework, and remains subject only to the random trends of inter mode competition and market forces.

The absence of rational comprehensive long term planning, results in our communities stumbling into poor land use plans, predictable congestion and endless delays in the development of our future major corridors. The resulting congestion and traffic conflicts inevitably compromise environmental standards and degrade the quality of new development and re-development areas.

I believe the most important future 'providence' feature would be to secure the re-introduction of a reliable stream of long term (30-50 years) indicative regional strategic development plans including their transportation plans. These are essential pre-requisites to re-establishing ongoing regional transportation strategies, the quality and level of service of our future transportation system and of the consequential sustainability of our future urban and rural environments.

4 Interdisciplinary Integration

"Humanity has not been able to see the city as a whole system of life, and its policies in dealing with cities have been unwise. Action was left in the hands of those representing the knowledge of part only (e.g. transportation) rather than on the whole system of life. The specialists became the decision makers in their field, while the city needed a specialist in leadership."

Constantinos Doxiadis to U.S. Senate Committee 1970

Frequently the dilemma for transport improvements is their propensity to generate really 'head line' conflicts. The "car v environment", or "motorways v public transport" or "rich v poor" or "neighbourhood v city" or just a straight "NIMBY" syndrome. Such simplifications are both misleading and unhelpful. In the long term curiosity must be answered by better quality information drawn from many sources.

As professionals we must contribute to the public debate and help remove prejudice, ignorant fixations and overcome gaps and a lack of understanding. The start point is interdisciplinary integration encouraged in our training and education at universities and polytechs. The university courses at Auckland (since 1972) and Canterbury (since1981) have provided the backbone of our transportation graduate master degrees. Other universities, eg Lincoln, Waikato, Massey and also several polytechs have associated courses, which include lectures on transportation and planning skills.

The New Plymouth NZIHT has for many years had technical middle group courses and is now accredited for university degree courses. In 1991 Roger Dunn and Alan Nicholson also began the very successful Fundamentals of Traffic Engineering five day courses which welcome professionals from a range of disciplines. There are also a number of ongoing road safety courses, technical workshops and seminar programmes. Many colleagues have entered the profession through these NZCE and middle group courses and this is to be encouraged.

However I ask the question 'Is our present training pattern sufficient for the higher level needs of the next half century? I believe we have reached a plateau where our planning tools for both major routes and spatial regional planning must be lifted to another level of integrated cross professional skills. The 2002 and 2004 NZTS required that in future all land transport strategies embody the concepts of sustainability. This is a fundamental shift beyond our traditional scheme planning and engineering design approach requiring further post degree education. Sustainability requires an integration of engineering with the skills of economics, social, spatial and environmental planning as we discussed in 2010. 'Potentials for Integrated Planning' IPENZ Conference 2010. (8).

The country's complex transportation scene also requires better description using multi modal modelling. To explain the national mix of trip generation and trip making by goods and people, using all the major modes on a national scale, and to conjecture how these could or should be varied in future, is a major and complex modelling exercise. To master this the engineering profession should insist that a proper national modelling exercise is undertaken to identify the role of all modes in the national transport system. This will of necessity be a multi disciplinary exercise.

Integrated Transportation Planning is only possible with a full matrix of planning horizons

1-10 years 'short term' for immediate implementation programmes.
10-30 years 'medium term' for projects, asset management and scheme planning.
30-50 years 'long term' strategic planning for metropolitan and regional planning.

These three planning horizons must all be undertaken and such planning needs to be coordinated between national, regional and local agencies. Each agency has a different role in these time frames. The NZTA and the RCA's will be most concerned with 'short' and 'medium term'. The Regions and Government will be more concerned for the 'long term'.

As we move to larger metropolitan areas with more urbanised settlement the support for integrated multi-discipline planning teams with multiple objectives and horizons is essential. Providing the resources and know how to undertake this more effective planning is a 'providence' for transportation planning which you should be supporting over the next 50 years.

5 Providence Through Corridor Planning.

"*There is a lesson to be learned from the "motorway revolt" and "no urban motorways" lobby. The lesson is simple "urban motorways are only acceptable if positively linked to an environmental betterment on a scale that outweighs the damage done through the insertion of the roads."*

Colin Buchanan - 1965

Comprehensive corridor planning considers both the primary function of communication and accessibility and also how transportation corridors are key tools for regional structuring. They can provide a framework for the community's 'corridors and rooms'. This applies to new developments as well as redevelopment at times of urban renewal. There is an urgent need to identify and protect major land-transport corridors for the future. These corridors would be capable of being used by two or three modes for future travel; they also form part of the regional open space framework. In these ways our future metropolitan regions, our major cities and provincial towns can be built with confidence so they are more convenient, avoid needless congestion and enjoy fewer accidents in travel by all modes and have higher environmental and amenity values.

Recently, with my planning colleague John Dryden, I completed an NZTA research report '*Transport Corridors and Community Structures'*, NZ Transport Agency research report No 496 (9). We took a sample of 24 cases of major corridors planned since 1955 and in most cases now built and operating. Major transportation corridors are of national and regional significance, and take a long time to achieve. Sometimes this could be 40 to 50 years from inception. This research summarized the planning practices, institutions and legislation that currently affect how major transport corridors are selected and managed in New Zealand. This was a telling exercise and on analysis only 4 of the 24 corridors investigated came through with flying colours.

The research observes that many recent schemes have been squeezed in to narrower substandard corridors. Yet, on the evidence of the witnesses, they were still considered to meet the criteria justifying approval of the Notice of Requirement under the RMA 1991. In many cases the corridor width for transportation future proofing and the non-transport functions such as the regional landscape, transition buffer spaces and recreation areas was not even considered.

Regional Councils must take the lead role in this process. They are the agency with both the comprehensive land use and RLTS transportation policy information for the longer term regional development strategies.

The research concluded that to achieve the criteria of sustainable planning for New Zealand's future major transport corridors it will require a 'quantum leap' forward. The investigations and scheme planning in future should accept that:-

*Corridor planning is essentially a regional council responsibility. It requires greater integration between all modes and agencies and should be undertaken by an integrated cross discipline team.

*This work should include the definition of 'corridor protection zones' as a basis for administration, purchase and the management of activities in the widened corridor.

The research also recommends a new feature. The corridor would, in the first instance, be established and approved by the planning authorities and they would take the responsibility for the initial land purchase. Responsibility for the corridor protection and management of the land would rest with the respective regional or city/district councils as planning authorities. The space required for road construction would be transferred to the road controlling authority at a later date as and when it is required for the work programme.

It appears New Zealand settlements and corridor management has reached a threshold. When this approach to corridor planning and corridor protection becomes accepted practice then it will be adding enormously to the nation's transportation and urban development 'providence'.

6 The Nature of the IPENZ Transportation Group

"**New Zealanders should be and can be activists.*
**There must be a single authority responsible for transportation planning in each region and that authority should not be an operator.*
**People and the community should act before the issue is irreversible because it is nearly impossible to repair the damage after."*
Dr Ariel Alexandre Urban Affairs Division OECD 1991.

The IPENZ Transportation Group was established in 1972. It is a diverse group with many talents in its membership. You probably have insights on the 'way' to anticipate future changes but have you the 'will', to facilitate and lead any public debate on future transportation and planning solutions in a more complex future. I hope so.

In 2007, we published the history of the Transportation Group titled "A Wheel on Each Corner'(2). There are five chapters tracing the history of the group and the nomadic journeyings of the Management Committee. The annual Traffic Management Workshops and Conference, flagship events of the Group over many years since 1973, are captured in Chapters 6 & 7.

The two closing Chapters 8 & 9 discuss the Group's strengths and future prospects and include the paper 'Quo Vadis - Whither Goest Thou' presented in 1999 by Graham Dickson where he identifies two key points that the Group must pursue:-

First:- *'Ensuring that all of the members are fully informed as to best practice currently available and of the importance of uniform good practice'*

Second:- *'Fostering in decision-makers the importance of making the best possible decisions and the importance of good information in making those decisions.*

These two 'bollards' are rock solid and accepted and generally well pursued with 'Roundabout', conferences and workshops. However in the closing chapter of 'A Wheel on Each Corner' I added two further 'bollards':-

Third:- *Expansion of good practice through a greater range of publications, more active technical focus groups (eg TDB, MUGS, ITS, MOTSAM etc.) with a variety of shared technical databases, codifying the techniques in modelling and skills accessible to all members.*

Fourth:- *Increased status and influence with more outspoken leadership on transportation matters, including promotions, submissions on national transportation matters, sustainability, environmental issues and increased inter-disciplinary collaboration.*

We live in a political world and when systems don't appear to deliver they, the politicians, change them. So it is essential that engineers and the Group have clear and defensible strategies and take a much longer future view than the triennial elections. In this way you can have resilience to withstand the vagaries of government and help members weather the storms and to keep public opinion focussed on pressing for longer term transportation strategies and solutions. Other institutions, like the AA, have learned these lessons and accept the recurring cycle of debate of what goes around and comes around.

In 'A Wheel on Each Corner' it is observed that The Government of 2002 - 2006 appeared to place transportation *'at a level of planning and funding that better reflects the real needs of a 'transportation hungry' New Zealand community'*. The Group might like to devise an index of government performance and undertake an analysis of the level of past and immediate government programmes e.g. was last years Government Road Fund expenditure more or less than the minimum threshold of 2% of the GDP?

One thing is certain your Transportation Group can, and should, take an expanded and leading role in these debates and show the 'way' over the next 50 years. In this way the Group will be able to continue to harbour the 'providence' necessary to both its members and the community you have chosen to serve.

7 Providence and Issues for 2064

A Maori Proverb

> "Whaia te pae tawhiti kia tata, whata te pae tata kia mau"
> "Live with one eye on the work immediately before us and the other on the distant future".

Colin Buchanan's wisdom is also relevant as we consider future 'providence':-

> "By concentrating merely on an expanded view of the present and its projection into the future, the tendency, in the conurbations, has been to favour the short term interest which may, in the long term, actually worsen local environmental conditions".

Future transportation planning must be better integrated, meet higher environmental standards and make flexible provision for all modes. For the next 50 years I conjecture and leave you with eleven issues to ponder:-

1. Explore and widen your reciprocity with other sister professions, CIT, IHT, ITE, NZPI, NZILA; and other transport advocate groups and share your knowledge through these forums.
2. Maintain a keen interest in all modes of travel including land, water, air systems, public transport systems and active modes. Support policies that encourage balanced mode use and flexible transportation systems.
3. Continue to support a national planning framework that recognises the differences between the national, regional and local planning realms. Also respect the value of planning for different time horizons i.e. 'short' (1-10 yr), 'medium' (10-30 yr) and 'long term' (30 -50 yr).
4. Continue to strengthen your focus groups (such as TDB, MUGS, ITS etc) and foster other technical and modelling skills. Support the development of modelling techniques that test future changes in energy use, transportation, urban development policies and plans.
5. Support the establishment of national transportation and economic models that explain the inter-regional transport of goods, people and the interaction of the major mode networks.
6. Advocate for widened multi-purpose transport and open space corridor planning as part of the strategic solutions for transportation, environment and regional urban development plans. Ensure such planning is integrated through the resources of multi disciplinary teams.
7. Plan to ensure that the increasing density and larger metropolitan areas produce network efficiencies through the integration of land use and better utilisation of all travel modes including ITS management and interchange facilities.
8. Over the next 50 years there will be a great increase in air travel. The variety of intercontinental, national and local aircraft movement will result in a big increase in terminal use, intensity of traffic access, adjacent land uses and noise protection/separation of residential areas.
9. There will be greater public participation in transport proposals including increased consultation, environment court actions and increased litigation. This will extend the lead time for planning and implementation and may affect future solutions. 'Watch this space".
10. By 2064 energy sources are expected to change significantly. Nuclear and fossil fuels may decline in favour of environmentally friendly energy e.g electricity. The emerging alternatives may create unexpected vehicle types and modal splits. 'Watch this space'
11. International government financial systems are likely to change from just 'income tax' to include 'resource use' taxation systems. This may suppress travel and alter mode preferences, including again favouring public transport. Surprisingly it may also result in greater investment on our existing network systems so bringing economies by reducing congestion and improving the overall networks levels of service.

So finally I ask 'Has the Group the 'will' and the 'skill' to become informed to a level where it can take a position and influence the public debate on options for the nation's transportation policies?'

I am sure the Group and its members can look to an increasing demand for your professional skill, independence and your judgements over the next 50 years. I wish you well on your journey.

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