Aligning land use planning with infrastructure planning, what comes first?

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Description

A key element of regional plan is the provision for regional infrastructure to service the regional land use pattern. This paper will broadly outline the process taken to align land use planning with infrastructure planning for the Far North Queensland Regional Plan and discuss what should happen first, infrastructure planning or land use planning?

Abstract

A new statutory regional plan for Far North Queensland (FNQ) is being prepared under the Integrated Planning Act 1997 (the Act) 2.5A.11.

This paper will broadly outline the process taken to align the land use planning with State infrastructure planning for the Far North Queensland Regional Plan. This will include a discussion of what comes first, the infrastructure planning or the land use planning.

Acknowledgements

The contribution of Queensland Transport, Main Roads, and Cairns Regional Council in developing alternative patterns of development and undertaking transport modelling is particularly recognized for the contribution to this paper. The contribution of Planz Town Planning in the evaluation of alternative patterns of development is also acknowledged. The efforts of the team at Department of Infrastructure and Planning in preparing the Far North Queensland Draft Regional Plan 2025 makes this paper possible. Finally, the input of community groups, industry, local government, and State Agencies into the Far North Queensland Draft Regional Plan 2025 is much appreciated.
1 Introduction

As land use planners we like to think that we are leading the way, and infrastructure is following. In reality planning happens on a number of fronts, by a range of disciplines, at different times and with different horizons.

The Planning Institute of Australia defines planning\(^1\) as the process of making decisions to guide future action. The planning profession (which is also referred to as ‘town planning’ or ‘spatial planning’) is specifically concerned with shaping cities, towns and regions by managing development, infrastructure and services.

According to Engineers Australia engineering is about developing, providing and maintaining infrastructure, goods and services for industry and the community, and about helping to identify and implement directions for the future\(^2\).

Clearly there is overlap between the professions. Generally speaking urban planners manage development and engineers provide transport, water, sewer, energy and communications infrastructure. This paper poses the question, which should come first - land use planning or infrastructure planning? Or is the question even relevant?

The focus of this paper is the strategic planning phase of land use and infrastructure planning not the business case or detailed design phase or construction phase of development\(^3\) or infrastructure\(^4\).

While discussion may lean towards infrastructure associated with engineering, the role of social planners in providing for social infrastructure such as schools and hospitals is also critically important.

Although they are not specifically detailed in this paper, environmental, resource and other constraints are an important part of a planning process.

2 Land use and infrastructure planning

A principle of the *South East Queensland Regional Plan 2005-2026* is to use infrastructure to lead and support desired regional growth. A similar objective of the *Far North Queensland Draft Regional Plan 2025* is for infrastructure to be planned, coordinated and provided to support desired regional growth in an efficient and effective manner.

Although it may appear that infrastructure comes first, the key words are “to support desired regional growth”. The implication is that there is plan for regional growth that is desirable before there is infrastructure design and delivery. The purpose of infrastructure is to support the desired regional growth. Ideally land use planning sets the strategic direction and land use intent and the infrastructure planning helps implement regional growth. At least that is the urban planners view. So how do you go about determining what is desired regional growth?

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\(^1\) Planning Institute of Australia, “About Planning”
\(^2\) Engineers Australia, Australian Engineering Competency Standards 2003
\(^3\) Section 1.3.2 of the *Integrated Planning Act 1997*: Development includes building work, plumbing or drainage work, operational work, reconfiguring a lot and material change of use in the definition of development.
\(^4\) Schedule 10 of the *Integrated Planning Act 1997*: Infrastructure includes land, facilities, services and works used for supporting economic activity and meeting environmental needs
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In reality, planning rarely starts with a clean slate in an established urban environment. There are usually a multitude of plans across a range of infrastructure classes completed or in progress. This means that land use planning does not occur in a vacuum or necessarily come first. Planning is a cyclical process involving plan making, implementation, monitoring and reporting and review. There will be a number of processes occurring simultaneously, meaning that individual planning processes may be at different stages and with different horizons.

As planning is occurring on a range of fronts there is a risk of isolated planning leading to fragmented, uncoordinated and at times conflicting development and infrastructure provision. Equally, there is opportunity for collaboration and integration leading to complementary development that is efficient, timely and effective.

At a macro scale, urban growth places demands on infrastructure capacity, efficiency and safety. A major influence on the efficiency of infrastructure provision is how widely urban growth is dispersed and the sequence at which it occurs. Additional issues include affordability, deliverability and funding.

A risk for land use planning occurring in isolation is that infrastructure is not provided when required or at all. In a worse case scenario uncoordinated planning may result in development occurring without adequate or timely access to infrastructure services such as water, sewer, electricity, telecommunications, sealed roads and so on. Further, droughts and climate change place existing infrastructure capacity at risk of meeting future needs.

In contrast, infrastructure may be planned or even delivered with an expectation that significant urban growth may follow and maximise the return on investment. The trigger for such infrastructure delivery could be environmental requirements (such as treating sewage to improve water quality) or to meet the requirements of a historical approval that is outside a centre. While this provides opportunities for land use planning, there are also risks posed by other constraints. Although there is infrastructure, growth may not be desirable on environmental, economic or social grounds.

Consideration of infrastructure costs and efficiencies during the planning process can significantly assist in reducing infrastructure costs to the community as a whole. Consideration of desired urban growth in planning can also facilitate sequencing and delivery of infrastructure.

3 Desired Regional Growth in Far North Queensland

3.1 Key Steps

For the Far North Queensland Draft Regional Plan 2025, developing a preferred pattern of development involved transport modelling, multi-criteria analysis and an affordability assessment. The key steps can be broadly summarised as:

1. Review literature;
2. Profile the existing situation – settlement patterns, infrastructure, population, employment, workforce;
3. Project future situation based on current trends;

6 Priority Infrastructure Plan Guideline 1/04 2004:12
7 Priority Infrastructure Plan Guideline 1/04 2004:12
4. Evaluate the new drivers for settlement patterns including climate change and peak oil;
5. Identify existing and new regionally significant infrastructure necessary for achieving each APOD scenario;
6. Identify constraints for provision or upgrade of infrastructure;
7. Identify Alternative Patterns of Development (APODs) for comparison;
8. Seek State agency advice about the regional infrastructure cost implications of alternative patterns of development;
9. Evaluate and compare the regional infrastructure costs of each APOD scenario;
10. Model possible population, employment and transport outcomes for the different APODs;
11. Develop qualitative and quantitative social, economic and environmental criteria for assessing APODs based on the draft Desired Regional Outcomes;
12. Undertake multi-criteria analysis to evaluate the APODs;
13. Identify the most suitable pattern of development based on modelling and multi-criteria analysis;
14. Identify the most affordable APOD with regard to regionally significant infrastructure costs; and
15. Recommend a preferred pattern or patterns of development.

The preferred pattern of development was further refined through a process of constraints analysis at the cadastral level and consideration of future population, housing and employment needs.

3.2 Infrastructure Planning

The draft regional plan was informed by a series of infrastructure studies from 1993 to 2007 including:

- Cairns Mulgrave Regional Transport Study 1993
- The FNQ 2010 Regional Planning Project – Settlement Pattern and Development Sequencing Macro Assessments report\(^8\) 1997
- Southern Cairns Integrated Land Use and Transport Study 2002 (SCILUT)
- Cairns Integrated Public Transport Plan 2005 (CIPTPlan)
- Planning for future transport corridors including bypasses and transit
- *Maintaining a Reliable Electricity Supply to the Cairns Area*, 2006
- *Network Management Plan, 2007* (Ergon)
- Cairns Strategic Transport Model Scenario Testing 2007
- Draft Principal Cycle Network Plan 2007
- *Rods Implementation Program 2007–08 to 2011-12*

The Myola planning studies, SCILUTS, CIPTPlan and the FNQDRWSS, in particular, helped determine the pattern of development and establish priorities for the *Far North Queensland Draft Regional Plan 2025*.

Myola, near Kuranda, was part of the preferred settlement pattern for the previous *Far North Queensland Regional Plan (2000)*. It had been the subject of significant investigation, including the Myola Feasibility Study in 2001, the Myola Planning Study completed in 2006 and detailed studies on a future Kuranda Range Road upgrade.

\(^8\) Spiller Gibbins Swan Pty Ltd August 1997
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undertaken by the Department of Main Roads.

The Southern Cairns Integrated Land Use and Transport Study 2002 (SCILUTS) was a priority action of the *Far North Queensland Regional Plan 2000*. SCILUTS made recommendations about land use and transport to meet the demands of urban growth south from Cairns to Gordonvale, including:

- An upgraded highway, including the Edmonton Bypass, with priority for public transport vehicles and off road shared commuter cycle paths in the corridor, plus an advanced public transport system, can provide for the anticipated future transport demand, subject to targeted land use and transport planning outcomes being achieved.

- The Bruce Highway, Edmonton bypass and the local road network should include provision for public transport, pedestrian and cycle movements. In the short to medium term the public transport system is likely to be on-road bus based transport. In the long term the road-based system should supplement an advanced public transport system. The available corridors for an advanced public transport system are the main line railway corridor, the Bruce Highway corridor, and sections of the sugarcane railway corridors.

The *Cairns Integrated Public Transport Plan 2005* recommended:

- that the introduction of transit/bus lanes occurs and high-frequency bus services are provided on the routes indicated in the plan in the medium term.

- that the system would require bus lanes on key corridors and bus priority at busy intersections throughout Cairns and high frequency bus services are provided on the routes indicated in the plan in the long term.

The *Far North Queensland Draft Regional Water Supply Strategy 2007* proposed a range of options to meet urban, rural and industrial water needs of the Far North Queensland in the long-term. Growth in some areas was constrained as there were fewer options to meet future demand.

A profile of regionally significant infrastructure in Far North Queensland (FNQ) was also compiled. This served a number of purposes including helping identify gaps in infrastructure provision. This was important information for determining the preferred pattern of development and developing policy. Amongst other things this process identified that a number of towns and settlements in the region did not have a reticulated sewer system or treatment plant. This was a constraint on growth in areas where there was no planning for reticulated sewer.

Infrastructure projects that had short term funding commitment were also identified. For example, the Department of Local Government Sport and Recreation had allocated funding under the Smaller Communities Assistance Program and Water and Sewerage Program to develop essential sewerage infrastructure to some towns in FNQ. This meant that growth in some towns was less constrained in the medium term.

A similar analysis took place of electricity infrastructure planning. Powerlink was well advanced with planning and delivery of high-voltage electricity supply to Far North Queensland.

It was also important to identify any medium to long term infrastructure planning,
including pre-project cost estimates and estimated delivery timelines. This gave infrastructure planning an opportunity to influence land use planning and to identify if there were any conflicts. For example, future highway bypass alignments influenced the edges of urban footprints.

Identifying future infrastructure planning also provides an opportunity to carry out affordability analysis. The costings used in the affordability analysis in FNQ were generally pre-project estimates, which means the earliest estimate of project cost and is undertaken before a concept design. Pre-project estimates are generally based on the cost of similar projects plus a contingency. (A hierarchy of cost estimates is provided in Appendix 2.)

### 3.3 Alternative Patterns of Development Evaluation

The Alternative Patterns of Development (APOD) were possible scenarios developed for modelling and planning purposes and are not exact predictions of the future. APODs assisted in comparing scenarios to identify preferred patterns of development. The APODs were prepared to be sufficiently different to enable meaningful comparison yet still be realistic or achievable. The APOD scenarios were:

1. Coastal Growth
2. Tablelands Growth
3. Decentralised Growth
4. Cairns CBD
5. Cairns Centres
6. Cairns Transit Oriented Development (TODs)

Each scenario was capable of accommodating the region's projected population of 317,594 by 2026, a projected increase of approximately 100,000 people. The spatial distribution of the growth changed in each scenario. Population, labour force and job forecasts for each alternative pattern of development were developed. An overview of the Alternative Patterns of Development above is found at Appendix 3.

Queensland Transport, Main Roads, the Department of Infrastructure and Planning and Cairns Regional Council used transport models to forecast future road network and public transport demand and to analyse the impacts of alternate patterns of development for the Cairns urban area and the broader region. The Alternative Patterns of Development were evaluated against the following criteria:

- Accessibility
- Value for money
- Alternative transport
- Efficiency

Multi-criteria analysis (including assigning different weightings to the evaluation criteria) was undertaken. The criteria were based on preliminary drafts of the Desired Regional Outcomes of the regional plan. The findings were tested in a workshop with a Technical Working Group. The criteria were also assigned equal and different weightings, to further validate the results.

The transport modelling and multi-criteria results ranked the APODs in the following order:
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1. Cairns TODs (most preferred)
2. Cairns CBD
3. Cairns Centres
4. Decentralised
5. Tablelands
6. Coastal (least preferred)

After considering the results of the APOD Evaluation, a hybrid option of the major regional towns – Mareeba, Atherton, Innisfail, Tully and the Cairns TOD was considered most likely to meet the region’s needs.

A strategic evaluation of State infrastructure costs associated with Alternative Patterns of Development in Far North Queensland was carried out to determine the Preferred Pattern of Development based on financial affordability criteria. For the purpose of the affordability exercise all three Cairns APODs were considered to be one scenario, as ultimate infrastructure provision was similar. Future infrastructure costs were identified and allocated to scenarios.

The affordability evaluation found that the Coastal and Decentralised scenarios were the least affordable (most expensive). All three Cairns scenarios (as a generic group) were estimated to be significantly most affordable (lowest cost). The affordability evaluation ranked the APODs in the following order:

1. Cairns (most preferred)
2. Tablelands
3. Decentralised
4. Coastal (least preferred).

3.4 Preferred Pattern of Development

The multi-criteria analysis results, the transport model results and the affordability analysis all arrived at a similar conclusion with all three Cairns APODs rating highly.

An evaluation report of the alternative patterns of development was prepared in December 2007. The report recommended that the Preferred Pattern of Development be a Hybrid based predominantly on the Cairns Transit Oriented Development scenario and partly on the Decentralised scenario. The most suitable towns for growth were considered to be the Principal Regional Activity Centre located in Cairns city, and the Major Regional Activity Centres located in the towns of Mareeba, Atherton, Innisfail, and Tully, rather than dispersed growth.

The analysis reinforced the merits of Mount Peter as the priority site to accommodate future growth in the region and should be the focus of more detailed planning. Mount Peter in the Southern Corridor of Cairns was declared a Master Plan Area, under section 2.5B of the Integrated Planning Act 1997, on 9 May 2008 (the same day as the draft Region Plan). A number of infrastructure studies are being undertaken to inform the structure plan including:

- Traffic, Transport and Mobility (including strategic pedestrian and cycle networks);
- Water Cycles (sewerage, water and stormwater);
- Urban Open Space (including sport and recreation);
- Community Facilities;
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- Infrastructure Services (including energy, telecommunications, waste management).

The findings also suggested that development at Myola, near Kuranda, should be delayed. One of the reasons was that Myola was dependent on a future upgrade of the Kuranda Range Road. Even when funding is provided it may take approximately 10 to 15 years to construct the road to a level of service that would accommodate the growth proposed for Myola. Myola was no longer an immediate priority.

4 Conclusions

The purpose of infrastructure is to support the desired regional growth. Ideally land use planning sets the strategic direction and land use intent and the infrastructure planning helps implement regional growth.

In reality, planning rarely starts with a clean slate. There are usually a multitude of plans across a range of infrastructure classes completed or in progress. This means that land use planning does not occur in a vacuum or necessarily come first. Planning is a cyclical process involving plan making, implementation, monitoring and reporting and review\(^9\) across a range of activities and by a range of disciplines.

As planning is occurring on a range of fronts there is a risk of isolated planning leading to fragmented, uncoordinated and at times conflicting development and infrastructure provision. Equally, there is opportunity for collaboration and integration leading to complementary development that is efficient, timely and effective.

While it was not the only input, infrastructure planning played a key role in determining the preferred pattern of development for Far North Queensland. The draft regional plan was informed by a series of infrastructure studies over fifteen years. Multi-criteria analysis, transport modelling and the affordability analysis built on the previous planning work to evaluate alternative patterns of development. At times it was difficult to distinguish when infrastructure planning stopped and when land use planning started.

Although I have a planner’s view, the important question about infrastructure planning or land use planning, is not which should come first? Rather the important question is what planning has already occurred and the challenge is how to best align multiple planning processes, often with different planning horizons, in a new phase of planning.

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References


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Appendix 1 - Definitions

In the *Integrated Planning Act 1997* development\(^{10}\) includes building work, plumbing or drainage work, operational work, reconfiguring a lot and material change of use in the definition of development. Infrastructure\(^{11}\) includes land, facilities, services and works used for supporting economic activity and meeting environmental needs.

Regionally significant infrastructure includes infrastructure provided to catchments at a regional / metropolitan, sub-regional and, in some cases, district level that are generally provided by the State government, although there may be joint funding with Federal or local government. State infrastructure\(^{12}\) is any of the following:

a) State schools infrastructure
b) Public transport infrastructure
c) State-controlled roads infrastructure
d) Emergency services infrastructure
e) Health infrastructure, including hospitals and associated institutions
f) Freight rail infrastructure
g) State urban and rural residential water cycle management infrastructure, including infrastructure for water supply, sewerage, collecting water, treating water, stream managing, disposing of water and flood mitigation
h) Justice administration facilities, including court or police facilities.

State-controlled roads infrastructure also includes pedestrian and cycle paths. Although not defined as State infrastructure, electricity infrastructure, such as transmission lines and sub-stations, are considered to be regionally significant.

In the *South East Queensland Infrastructure Plan and Program 2008-2026* infrastructure investment is classified into five types depending on the level of investigation, approval and progress as follows:

**Type 0** = Pre-project estimate: is the earliest estimate of project cost and is undertaken before a concept design. It is generally based on the cost of similar projects plus a contingency.

**Type 1** = Concept estimate: is typically undertaken in the initial planning stages, and is based on a concept design.

**Type 2** = Pre-Market estimate: based on a more detailed review of scope and requirements. This estimate is determined after the government has assessed the costs and benefits of a project.

**Type 3** = Market price: the price agreed with the contractor. It is no longer an estimate nor is it a cost, since it has not been incurred.

**Type 4** = Completed project cost: the total cost of the project, which will normally consist of the market price plus any variations.

\(^{10}\) Section 1.3.2 of the *Integrated Planning Act 1997*
\(^{11}\) Schedule 10 of the *Integrated Planning Act 1997*
\(^{12}\) Schedule 10 of the *Integrated Planning Act 1997*
Appendix 2 – Alternative Patterns of Development

Seven APODS were developed of population, land use and employment assumptions. Each APOD is capable of accommodating the estimated additional population of 100,000 people by 2026:

1. Coastal Growth  
2. Tablelands Growth  
3. Decentralised Growth  
4. Cairns CBD (Baseline APOD)  
5. Cairns Centres  
6. Cairns Transit Oriented Development  
7. Hybrid

### 4.1 APOD 1 – Coastal Growth

Cairns remains the regional centre and continues to grow, but slowly. Half of new residents shift to other towns, with the strongest growth in other coastal towns.

By 2026, the population of Innisfail and the surrounding Palmerston area doubles, linked to expanding industrial & transport activities.

By 2036 the towns of Babinda, Cardwell, Mission Beach, Mossman, Port Douglas and Tully have doubled in population. Growth is driven by strong & diversifying agricultural demand, sea-changers and increased industrial activity in the towns of Innisfail, Cardwell, Mossman and Tully.

### 4.1 APOD 2 – Tablelands Growth

Cairns remains the regional centre and continues to grow, but slowly. Half of new residents shift to other towns, with the strongest growth on the Tablelands.

By 2026, the towns of Mareeba, Atherton & Malanda double in population.

By 2036 the areas of Kuranda / Myola, Dimbulah, Herberton, Julatten / Mt Molloy and Ravenshoe have doubled in population. Growth is driven by a strong & diversifying agricultural demand, tree-changers and rain-changers and industrial and mining expansion in Mareeba.

In addition, the coastal plain becomes less desirable due to climate change impacts such as increased temperature, increased flooding, more severe cyclones and sea level rise.
4.3 APOD 3 – Decentralisation

Cairns remains the regional centre and continues to grow, but slowly. Half of new residents shift to other towns, with strong growth recorded in all the region's towns.

By 2026 no area has doubled in population.

By 2036 the areas of Atherton, Innisfail, Kuranda / Myola, Malanda, Mareeba, Mossman, Tully and Yarrabah have doubled in population. Growth is driven by a variety of economic, social & climatic factors but relies on the ability of each town to attract adequate employment and services.

4.4 APOD 4 – Cairns CBD

Most of the region's 100,000 new residents settle in Cairns. Employment remains centred in the Central Business District (CBD) while housing is scattered at low density throughout the urban area. Edmonton & Smithfield town centres fail to deliver any measurable employment or increased housing densities.

The region's towns continue to grow, but slowly with no one area growing more than another.

4.5 APOD 5 – Cairns Centres

Most of the region's 100,000 new residents settle in Cairns. There is some increased residential density around the major centres of the CBD, Smithfield and Edmonton. These town centres also experience moderate job growth and the CBD consequentially diminishes slightly in importance for employment.

The region's towns continue to grow, but slowly with no one area growing more than another.
4.6 **APOD 6 – Cairns Transit Oriented Development (TOD)**

Most of the region’s 100,000 new residents settle in Cairns, with the highest growth experienced in the southern growth corridor between Edmonton and Gordonvale. A strong rapid transit system is operational, and the land use pattern supports this system.

The CBD experiences strong residential growth while decreasing in importance for employment. Most new jobs shift to the Edmonton town centre and industrial estate. Some new jobs shift to the Smithfield town centre and JCU technology park.

The sub-regional centres of Palm Cove, Redlynch, Earlville and Gordonvale feature increased residential densities within 1km of transit stations as well as some increased employment.

The region’s towns continue to grow, but slowly with no one area growing more than another.

### 4.6.1 What is a Transit oriented Development

Transit oriented developments (TOD) are mixed-use residential and employment areas designed to maximise the efficient use of land through high levels of access to public transport. A transit oriented development has a walking and cycle-friendly core with a public transport station surrounded by relatively high-density residential development, employment or a range of mixed uses.

4.7 **APOD 7 - Hybrid**

By 2025, around 70,000 of the region's 100,000 new residents settle in Cairns, with the highest growth experienced west of the Bruce Highway in the southern growth corridor between Edmonton and Gordonvale. A strong rapid transit system is operational, and the land use pattern supports this system.

The CBD experiences strong residential growth while decreasing in importance for employment. Most new jobs are created in the Edmonton town centre and industrial estate. Some new jobs are based in the Smithfield town centre and James Cook University technology park.

Transit stations are either planned or established for the sub-regional centres of Palm Cove, Redlynch, Earlville and Gordonvale. These centres are experiencing increased residential densities within 1 kilometre of the planned / established transit stations as well as some increased employment.

The region’s towns continue to grow, with the main growth occurring in Mareeba, Atherton, Innisfail, and to a lesser extent Tully and Mossman. By 2025 Mareeba has become a major centre for the Tablelands, as it is central to the mines, has ample industrial land, and its expansion is relatively unconstrained by good quality agricultural land or areas of environmental significance. Mareeba, Atherton and
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Innisfail have experienced population growth of up to 50 per cent. Tully will have similar growth, but from a smaller population base, while Mossman continues to have similar growth to current trends.