

Chapter 3: Land

3.1 Summary and indicators

3.1.1 Summary

Land is a primary resource that underpins the local environment, the society and the economy. The community makes choices as to how it uses the land that is available to it. However, inappropriate land-use, or poor land management, results in degradation of the land resource. This, in turn, leads to a reduction of the capability of the land to sustainably support preferred land use.

State

There are four key land management issues that apply to the Gold Coast; soil erosion, beach erosion, vegetation cover and floodplain development.

Soil erosion, while a natural phenomenon, is accelerated due to poor land clearing and management practices. Most concern in the community arises from visible sediments that settle quickly. However, there is also a significant problem that arises from the smaller sediment particles which settle more slowly and can affect the turbidity of waterways.

Vegetation cover on the Gold Coast has been dramatically affected since European settlement. Some 50% of the total city area is covered by native vegetation with most impacts of clearing being sustained on the flat lowland areas. However, in recent times increased rates of clearing and settlement have been occurring on the lower slopes of the hinterland ranges.

The floodplains of the City provide significant habitat for wildlife, and detention storage for floodwaters. Many of these lands have been developed for agriculture due to the higher fertility of some of the soils, their proximity of fresh water and the ease of cultivation. Drains were constructed to lower the water table and improve agricultural production. This drainage resulted in increased rates of oxidation of the underlying acid sulfate soils, which in turn resulted in aluminium and other heavy metals acid water leaching from the soils. As urban development encroaches on these areas, there is an increased risk of environmental harm resulting from acid sulfate soils unless careful management of the soils is established.

Only around 23% of the City is urbanised, 28% is used for rural residential, 14% is used for rural production, 14% is protected as National Parks and Reserves, 14% as other parkland. The balance, 7% is water bodies.

The city has 801 potentially contaminated sites many of which are current service stations.

Pressure

The pressures the City faces rests mainly in the need to accommodate the growing population. The City grows by around 4.8% or 15,000 people each year. To

accommodate these people the City currently develops around 300 ha/year for urban use. This rate has declined from peaks in the 1980s for both former local authorities.

Response

The Council has developed responses to a range of these issues including, a review of the Planning Scheme; the Hinterland Density Formula; the Nature Conservation Strategy; the Merrimac-Carrara Floodplain Structure Plan; and the Environment, Urban Design, and Property Industry Advisory Committees.

Conclusion

While there are programs and strategies in place that will improve the management of the City's land resources, there is also a limited amount of detailed and accurate land resource data to further improve the City's management.

3.1.2 Indicators

Sub-theme	Indicators
State- ⇒ Degradation	Area (ha) by severity: eg. Soil erosion (wind, water) ,Salinity, Acidification ,Acid sulfate soils, Water logging /raised water tables Degradation of remnant vegetation
State- ⇒ Urban open space	Total area Area of Individual sites Time-trend in area
State- ⇒ Non-urban open space	Total area Area of individual sites Time-trend in area
Pressure- ⇒ Land clearing and drainage	Proposals, by area and intended use
Pressure- ⇒ Major land use	Area of use (ha, trend) by sector eg. Transport, Urban , Agric & Industry Native veg'n, Canal dev's,Waste disposal
Pressure ⇒ Contaminated sites	Area (ha) and severity of contamination of individual sites Total area (ha) of waste disposal sites.
Pressure- ⇒ population	Changes in total number Population density
Pressure- ⇒ Urban construction	Area of open space under threat
Pressure- ⇒ Transport	Activities to increase public transport use or decrease car use
Current Response- ⇒ Transport	Activities to increase public transport use or decrease car use
Current Response- ⇒ Zoning of land	Restrictive zoning and land use classification
Current Response- ⇒ Open-space programs	Expenditure on maintenance, enhancement and extension

3.2 Introduction

Land is a primary resource that underpins the local environment, the society and the economy. The community makes choices as to how it uses the land that is available to it. However, inappropriate land-use, or poor land management, results in degradation of the land resource. This, in turn, leads to a reduction of the capability of the land to support preferred land use. Figure 3.1 shows the proposed preferred land uses from the Draft Planning Scheme.

The concept of land use however, does not suggest that land always remains under one type. Land resources are used in one way or another depending on the needs of the community. Land availability refers to land that is available for different uses. However, today it is implicit that the land must be capable of sustaining a use. It also recognises land that is capable of a variety of uses but may be best used in a single way. For example, Burleigh Head National Park could be capable of urban development, however few could argue that this would be a desirable outcome.

This concept of land use subscribes to ecologically sustainable development (ESD) and applies to all forms of land use, environmental, industrial, urban and rural. Consequently, the state of the land resource, as a component of the environment, must consider the capability and suitability of the land resource to sustain existing land uses (ESD principle of intra-generational equity). It must also consider the ability of the land resource to sustain alternative land uses in the future (ESD principle of inter-generational equity). The planning of land use plays a significant role in conserving the biological diversity of an area (ESD principle). Such planning should apply the precautionary principle of ESD and attempt to balance the benefits of changes with the costs, environmental and economic. State indicators relate to the health of the land resource.

Planning the land use of a city faces a number of pressures. These pressures arise from the needs of competing interests and are driven by economic and population growth. Pressure indicators attempt to measure the size of the competing needs and their impacts.

In response to the existing state of the land resource and the pressures it faces, government provides planning and legislative frameworks to try to enable a sustainable balance to be struck between the various competing needs of the community. Response indicators attempt to measure the success of the planning system in achieving this balance.

Figure 3.1: Proposed preferred landuse for the City of Gold Coast.
(Source: Draft Gold Coast City Council Planning Scheme 1997)

3.3 State

3.3.1 Land degradation issues of low significance on the Gold Coast

There are some issues which are not likely to become significant to the Gold Coast due to our geology, soils, climate and dominant land uses. These issues are soil fertility and structural decline, dryland salinity, water logging and raised water tables.

These issues are mainly associated with broadacre agriculture, broadscale clearing of trees on hills and slopes, or with irrigated agriculture. The agricultural industries on the Gold Coast, while extensive in some areas, are not likely to have the same level of impacts on these issues as has been the case elsewhere.

3.3.1.1 Soil fertility and structural decline

Soil fertility and structural decline are not likely to be significant problems for most of the Gold Coast as these problems are generally restricted to cultivated lands. There are only some 6000ha of cultivation on the Gold Coast (4% of total Gold Coast area, mainly under sugar cane) and soil fertility and structural decline have not been listed as significant issues for cane production, however, excessive leaching of applied nutrients on very sandy coastal soils has been identified as an issue (Holz 1979).

3.3.1.2 Dryland salinity waterlogging and water table rise

There are significant levels of salt in some soils on the Gold Coast, particularly on the coastal plain. However, this salt is natural to the area, resulting from past periods where these soils were inundated with seawater. In some areas these soils have been prepared for agriculture by drainage systems that allow leaching out of the salt (Holz 1979). Such drainage systems have also been associated with increasing levels of soil acidification.

Holz(1979) also identified that most ground water in the area is localised and exists as lenses of fresh water that increases in salinity with depth. This water resource if over-utilised tends to become saline. The increase in salinity is not through the intrusion of salt water from the ocean, but through accessing the deeper more saline water. This water is thought to remain from the past periods of inundation. There is thought to be little connectivity between the ground water systems on the Gold Coast. Consequently, the risk of increasing dryland salinity due to clearing of trees would be considered low.

Waterlogging is mainly an issue on agricultural land that affects trafficability and crop production. It is less an issue for urban areas as drainage systems are designed to reduce this problem. For the cane growing area of the Gold Coast Holz (1979) only identified soil structure as a limitation to trafficability on some soils after significant falls of rain (eg. 25mm). The construction of urban drainage-systems has reduced the impact of waterlogging on the built-up areas of the Gold Coast.

3.3.2 Land degradation issues of moderate to high significance on the Gold Coast

The Gold Coast has significant problems with soil erosion, beach erosion, vegetation cover, and development of the floodplain.

3.3.2.1 Soil erosion

Soil erosion by water, is the main erosion problem for the Gold Coast. This is not for loss of agricultural productivity as in other areas, but for off-site environmental harm and amenity degradation. A study by Mark Littleboy of the Queensland Department of Primary Industries for the SEQ2001 study (1993) used topography and soil information to develop a risk map of soil erosion for Southeast Queensland (M. Littleboy pers. com.). This map while at a broad scale, identified that the highest risk of soil erosion was mainly associated with steep sloping lands. In addition, if the soil surface or vegetation is disturbed, as it is during development or through agriculture, there is a greater risk of soil erosion.

While the effects of earth moving often associated with development are relatively short lived, their impact can be considerable. On-site erosion and sediment control, including soil disturbance, is the most likely method of reducing soil movement from development on agricultural sites. In addition to this, once areas are urbanised they continue to generate smaller but still significant loads of sediment into waterways. These sediments and urban runoff often contain other chemicals and pollutants as well.

Soil erosion by wind is not a significant problem for the Gold Coast. However, during periods of high wind dust blown from exposed and disturbed soils can, such as from development sites, can cause health and amenity problems for nearby residents.

3.3.2.2 Beach erosion

The areas at most risk from wind erosion on the Gold Coast are the dunes beach fronts. These areas are also at risk from storm erosion resulting from cyclones as discussed in Chapter 2. This problem that has become more acute due to construction of dwellings on the dune system and with the interruption of the northerly movement of sands from New South Wales through the construction of groynes.

A combination of practices has been used to reduce the risk of severe erosion events affecting the City. For example, the dune systems adjacent to the built up area of the Gold Coast have been re-developed over boulder walls and stabilised by vegetation. These boulder walls were established to protect the built-up area from erosion of the dune system due to ocean storms as mentioned above and in Chapter 2.

Furthermore, the natural northerly flow of sand has been re-established through the Tweed River sand by-pass project and after severe ocean-storms, beach profiles are recreated by pumping sand from offshore. Together, these measures repair any damage done to the dune system after each storm. Most damage is caused by the action of waves and currents, not wind.

3.3.2.3 Vegetation

The area of the Gold Coast and Southeast Queensland was once almost completely covered with bushland including forests (Catterall and Kingston 1993). Current estimates of remnant bushland vegetation is 50% of the land area (M Maher and Assoc. *et al.* 1997). Recent estimates suggest that native vegetation may cover as much as 52% when natural regrowth of vegetation is taken into account (M. Kingston, Ecograph pers. com. 1996). It is not certain at present as to the integrity of the ecosystems of these bushland areas, particularly the regrowth. Some anecdotal evidence suggests that, many areas exhibit low levels of disturbance.

Most of the clearing occurred between 1860 and 1900 and was not evenly distributed across all vegetation types. Vegetation at lower altitudes was, and continues to be most affected.

Approximately 92% of all land below the 20 m contour (20 m above sea level) in the southern part of the Moreton region, some 950km², has been cleared, while nearly 70% of all bushland above 160M remains (Catterall and Kingston 1993).

Table 3.1 compares the clearing status of remnant bushland for different environmental provinces. An environmental province is described as an area of land with similar combinations of climate, topography, and the types of biological community present (Sattler and Williams 1996).

The increased occurrence of national parks in the higher and steeper lands reinforces earlier comments regarding clearing, as do the high levels of clearing for other categories particularly the lowlands and ranges close to the coast.

The area of each province as a percentage of the area of SEQ2001 (Brisbane, Beaudesert, Boonah, Caboolture, Caloundra, Esk, Gatton, Gold Coast, Gympie, Ipswich, Kilcoy, Laidley, Logan, Maroochy, Moreton, Noosa, Pine Rivers, Redcliffe, Redlands, Widgee) give an indication of the original 'pre-settlement' proportions of each biological community in Southeast Queensland. The changes in land cover within each category are directly caused by urban and agricultural/pastoral expansion.

In the case of the Gold Coast most urban and agricultural development has occurred on the coastal lowlands, and most pastoral development on the low coastal ranges. This scenario has been repeated on the Gold Coast where most of the coastal heath has been cleared for urban development, while the more inaccessible and steeper areas have had little development and clearing. For example, Table 3.2 amalgamates data from Catterall and Kingston (1993, p.92) for the Former Albert Shire and Gold Coast Councils and shows the level of remnant cover.

Table 3.1 The status of remnant bushland in the environmental provinces⁴ of Southeast Queensland (from Catteral and Kingston 1993, p. 33)

Environmental province	% area of integral bushland	Province occupied by: environmental National Parks	Province area as % of SEQ2001 area	Comments
Coastal Lowlands ²	30	5.7 ¹	29	many reserves <100ha Current rate of clearing high
Coastal Ranges ³	50	3.6	16	Also includes large areas of State forest
Subcoastal Ranges ³	25-30	0.7	22	Drier habitats especially poorly conserved
Subcoastal lowlands ²	15-18	0.1	26	Most habitats unrepresented in reserves
Lamington National Park ³	not given	49.7	2	Relatively large areas reserved
Western Scenic Rim ³	not given	20.7	5	Relatively large areas reserved.

1. Includes substantial reserved areas on offshore islands; percentage on mainland considerably lower.
2. Lowlands are relatively flat lands of low altitude
3. These areas describe various mountain range areas
4. Environmental Provinces are different combinations of climate, topography and the types of biological communities present.

The Gold Coast has a higher proportion of cover than SEQ as a whole, particularly in comparison to coastal lowlands and ranges. While it is clearly evident that the urbanised area of the Gold Coast has lost much of its lowland heath and dune ecosystems, principally to urban and agricultural development, a similar proportion remains when compared to neighbouring local authority areas. In addition the Gold Coast contains as much as 7.8% of the total remnant bush of the SEQ2001 region.

Table 3.2 : Remnant bush of the Gold Coast area.

(Source: Catteral And Kingston 1993)

Percentages are relative to the total area of land not the area of each category.

Land unit	Area (sq. km)	Continuous bush (%)	Clearance mosaic (%)	Littoral vegetation (%)	Total bushland (%)	Non-bushland (%)
Including South Stradbroke Island	1364	36.4	2.7	3.6	42.5	57.5
Excluding South Stradbroke Island	1342	39.15	3.0	3.9	45.6	54.4
South Stradbroke Island Only	22	48.5	0	6.8	55.3	44.7

3.3.2.4 Floodplains and soil acidification

Floodplains are a significant part of the City of Gold Coast and fulfil important environmental and hydrological roles. The history of their use has included drainage and agriculture but increasingly also includes urban development. Such developments can have significant affects on the environmental and other roles of these areas.

An additional issue, for these lowland areas is the potential presence of acid sulfate soils. These soils can cause environmental degradation when they are disturbed for agriculture or urban development. Such disturbance does not automatically result in degradation of the land itself, but exposing the soil to air by excavation or drainage may result in scalding of areas and acid runoff and leachate. The acid products from these soils often result in a degradation of surrounding ecosystems. Such soils may affect land that lies below 5M above sea level. This land represents 20% of the total area of the City.

3.3.3 Open space

3.3.3.1 Urban public-open-space

Some 23% of the Gold Coast is urbanised. This compares with 37% of Brisbane (BCC SoER 1996). Within this urbanised area there is a total of 7219 ha of urban public-open-space representing nearly 22% of the urbanised area. This equates to an average of around 200M² (0.02 ha) of urban public-open-space per resident. This open space includes neighbourhood parks, sporting areas, and environmental, conservation and undeveloped reserves. The Council spends around \$12 million to manage these assets each year.

The total open space, including public open space in the urbanised area of the Gold Coast is 10,877ha. This is comprised of either Crown land, owned by the State Government, or is freehold land owned by the Council. In addition to the public open space land, this land includes easements, footpaths and road reserves. The data here do not include the beaches and waterways which add a further 7,900ha (6% of the total area). There are 724ha of canals and lakes in the City.

It is always difficult to compare statistics between cities due to the derivation of the data, and the differing natures and pattern of development. For example, Melbourne is reported as having 225M²/person of open-space in the fringe suburbs (State of the Environment Advisory Council 1996).

Brisbane City Council does not report a comparable figure in its State of the Environment report for 1996. However, Brisbane appears to have only around 48M² of major recreational space per resident based on 1991 data (BCC SoER 1996, p62). This figure is similar to that of inner Melbourne (45M²). It is important to note that comparison between cities is difficult as the data may not include the same categories of open-space.

The policy of the Council is to increase the total amount of public open-space in the City, so the time-trend in total open-space is increasing. However, to increase the area

of open-space per resident from the current 200M² will require an increase in urban public-open-space of more than 200ha per year to cope with growth in the City's population. If less than 200ha per year are acquired then the rate per resident will fall.

3.3.3.2 Non-urban open space

Around 77% of the Gold Coast is non-urbanised. The non-urbanised area of the Gold Coast includes 58,231ha of land zoned rural. This land is predominantly used for rural residential, for agriculture and for grazing and dairying. There are also 12,600ha of National Parks and Council parks and reserves in the City of Gold Coast. This gives a total of around 70,831ha of non-urban open space in the City, which is 49% of the total area and represents 0.20ha/resident of the City. Of this area, only the National Parks are available for recreational use, but the total area adds to the diversity and visual amenity of the City. It should be noted that most (66%) of the remnant bushland on the Gold Coast is on private land and is not held in reserves.

3.4 Pressure

The main pressure facing the City's land resource is the growth in the population. The population of the Gold Coast is forecast to grow at an average of nearly 4% for the next 10 years. While there will be some annual variation around this, it is equivalent to the addition of a small city (the size of Warwick on Queensland's Darling Downs) each year. To accommodate this growth, pressure will be placed on areas currently zoned, and used, for other purposes. This is despite there appearing to be enough land currently zoned for urban expansion to the year 2050.

One measure of this pressure is the rate of conversion of land into urban land uses. Between 1970 and 1993 there were 3,375ha of land approved for urban development in the Albert Shire. Most of this, around 2209ha, was approved for development in 1989. This surge followed a boom development period in the former Gold Coast around four years earlier. Between 1988 and 1993 this conversion rate corresponded to around 650ha of land per year. This rate of conversion appears to have declined since the peak in 1989 and was only around 300ha/year between 1991 and 1993.

3.4.1 Major land uses

The area of the Gold Coast is 1,451km² or 145,100ha. As shown in Table 3.3 nearly 7% of the total area is water bodies, leaving 134,697ha of land. Nearly 41% (64,954ha) of the City is zoned rural. Within this zone, only some 21,233ha is used for agriculture (dairying, grazing, cane, horticulture) the rest is estimated to be used as rural residential. Around 9% of land (12,600ha) is under reserve for parks, National Parks, State Forests and catchment protection. The water supply catchment (20,700ha) includes land used for dairying and land set aside as reserves.

Table 3.3: Major land uses in the City of Gold Coast

Land use	Area	%
Waterways	10,403	7

Agriculture	21,233	15
Rural Residential	36,998	26
National Parks and reserves	12,600	9
All other Residential	25,691	17
Commercial, Resort or Industrial	16,306	10
Public Open-Space	7,219	5
Total area of Roadways	9,641	7
Future Development	5,463	4
Total	145100	100

3.4.2 Contaminated sites

There are 801 contaminated sites on the Gold Coast. These areas represent only a tiny fraction of the Gold Coast. Of these 801 sites, 231 are contaminated with unexploded ordinances (bombs, bullets etc.) from the activities of the army in the Coomera area over many years. The remaining 510 sites are considered to be contaminated with chemicals.

Chemically contaminated sites are classified into five types; former, possible, probable, released and restricted. Table 3.4 shows the number of sites listed by the Department of Environment (DoE) Former sites are where action has been taken to remediate the land and the DoE is satisfied that the land is no longer contaminated. Possible sites are where there has been a report of contamination or the use of the land may have lead to contamination. Probable sites are where the land use in place at the site is known to cause, or may have caused, contamination. A released site is where a possible or probable site was investigated and found not to be contaminated. Restricted sites are where the contamination is such that the DoE will only allow limited, or on site activity.

Table 3.3 Number of chemically contaminated sites on the Gold Coast by type.

Type	Former	Possible	Probable	Released	Restricted	Total
Number	63	3	472	30	2	801

Most of these chemically contaminated sites are former service stations and are listed as contaminated due to probable leakage of underground fuel storage tanks. There are some sites that were contaminated with arsenic when used as cattle dips. Also included in contaminated sites are waste disposal sites of the Council.

The amount of vacant commercial or industrial land in current zoning may give an indication of land available for development and consequently indicates the pressure the City faces to accommodate new growth. Using the Council's Geographic Information System (GIS) to derive an estimate of the number of vacant lots within existing zones suggests that most is already taken-up. However, this may be an artefact of the zoning history rather than a true indication of land availability. That is, as land is taken up for development, the zoning was amended to reflect the change.

Table 3.4 gives the breakdown of current (1996) vacant commercial and industrial land for the City in 1996 when the new Council was still operating with the planning schemes of the former Albert Shire and Gold Coast City.

Table 3.5: Current vacant land for selected zones for the City of Gold Coast.

(Source: GCCC GIS, 1996).

Former boundary	Zone	Total number of lots	Number of vacant lots
Former Albert Shire	Commercial Ind (zone14)	1192	7
	General Ind. (zone15)	279	1
	Extractive Ind (zone 17)	46	2
	General Com. (zone 12)	18	0
Former Gold Coast City	Commercial Ind (zone 42)	595	74
	General Ind. (zone 44)	407	112
	Light Ind (zone 43)	340	74
	General Com. (zone 40)	273	15

3.5 Response

The Council has responded to these pressures on land use decisions in a number of ways, in addition to the provision of statutory planning which ensures that the relevant laws and codes that apply to development and building are correctly applied in the City.

These initiatives include:

- Planning Scheme Review - this is a comprehensive review that seeks to develop a single consistent planning scheme that will become a statutory document for the future development of the City of Gold Coast. This will include the Hinterland Density Formula which is designed to protect the amount and contiguity of open-space. While there are exceptions, in most cases this formula has been very successfully applied, an example of this is in the Tallebudgera Valley where the contiguity of the bushland, particularly along the ridges, has been preserved.
- Nature Conservation Strategy - (Identification of the Conservation values for remnant bushland on the City of Gold Coast, see Chapter 6: Biodiversity)
- Local Area Planning - (Reedy Creek, Kopps Road, East Coomera, Coomera and Hope Island)
- Development Control Plans - (Albert Development Corridor).
- Floodplain Committee - (Merrimac/Carrara Floodplain Structure Plan).

The Council has also established a number of advisory committees with industry and community involvement to provide advice to Council for the planning of the city.

These are the:

- Environment Advisory Committee
- Property Industry Advisory Committee
- Regional Economic Development Advisory Committee
- Urban Design Advisory Panel
-

3.5 Conclusions and possible future responses

The major issues threatening the land of the Gold Coast are soil erosion, beach erosion, vegetation management, and floodplain management including acid sulfate soils. These issues mainly arise due to the increasing use of land for urban expansion. Conversion of land into urban forms occurs at around 300ha/yr due to population growth.

Land management within the City appears to be improving with the use of more open and consultative processes to establish the future directions for planning in the City. The Council's Nature Conservation Strategy and the Planning Scheme will, among others, play a significant part in managing the City's land.

However, data on the land resource, such as consistent and adequate soil resource data, and the effects on the environment of different forms of development and land use on the Gold Coast is limited. The consequences of not establishing these data may be unsustainable management practices that ultimately lead to environmental degradation and increased costs of managing the City.

3.7 References

BCC (1996) *State of the Environment Report*, Brisbane City Council

Catterall, C.P. and Kingston, M. (1993) *Remnant Bushland of Southeast Queensland in the 1990s: its distribution, loss, ecological consequences and future prospects*. Institute of Applied Environmental Research, Griffith University.

Holz, G.K. (1979), *Rocky Point: A sugar cane land suitability study*, Division of Land Utilization, Technical Bulletin No.38, Queensland Department of Primary Industries.

Sattler and Williams (1996) *The conservation status of Queensland's bioregional ecosystems*, Conservation Technical Report, Queensland Department of Environment and Heritage.

State of the Environment Advisory Council (1996) *Australia: State of the Environment Report*. Department of Environment Sport and Territories, Commonwealth of Australia