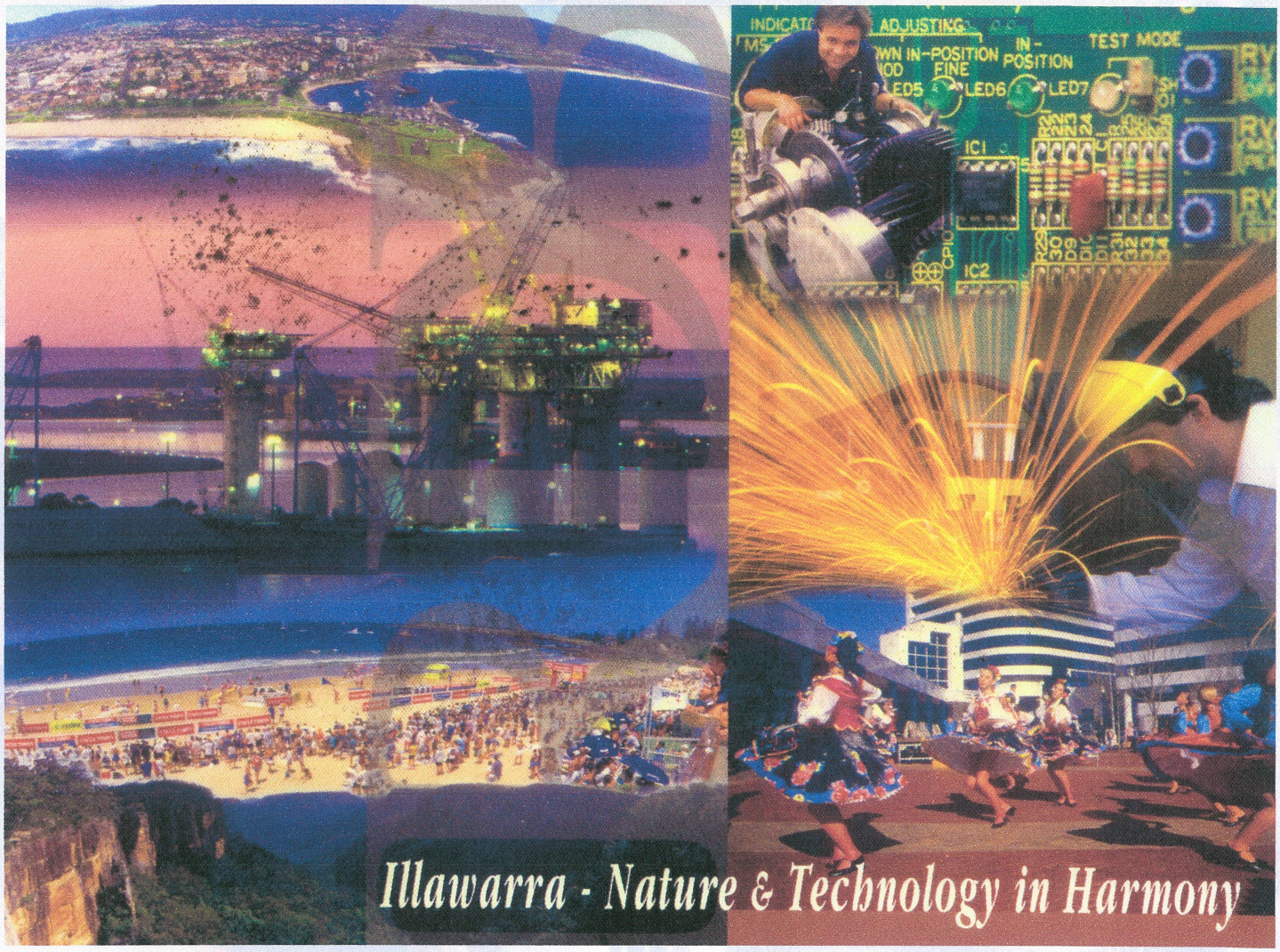

Towards the First Smart Hi-Tech Eco-City in Australia-Wollongong

Nature & Technology in Harmony

ABSTRACT

Aggregating Least Cost Carbon Emissions Abatement Domestic Off-Set Credit Schemes Starting Locally

Returning Wollongong to an Eco-City
Project 1815-2015

Modern governments and communities are increasingly pressurizing global corporations and businesses to reduce emissions, to help lessen health risks and oppose climate change. In this report (below), HTC/SIDI suggests a number of development schemes which do not only reduce carbon emissions, but which are sustainable, in balance with coastal ecosystems(s), and which efficiently sequester carbon dioxide.

HTC/SIDI established a number of low cost abatement plans to do just that and which are in step with current government policies – *"low carbon focused international engagement"*.

HTC/SIDI has the necessary strategic plans concerning the upgrade of Wollongong Harbour with the aim of providing daily sea ferry services between Sydney and Wollongong/Kiama, and which would help reverse Illawarra's carbon footprint, and from where it began. This particular project is also supported by an investment bank. Furthermore, HTC/SIDI has professional architectural plans in place to build a modern public ferry terminus on site, including tourist facilities and fully integrated express bus services.

HTC/SIDI's other low cost abatement plans are, namely

- A second opening at Lake Illawarra
- Sustainable eco-friendly infrastructures
- Efficient industrial/municipal waste collection, remediation, recycling and management schemes
- Novel parkland planning
- Re-establishment of indigenous traditions
- Restoration of particular coastal ecosystems, and
- Development of sustainable eco-homes and villages

Towards the First Smart Hi-Tech Eco-City in Australia - Wollongong

Written by Dr. Anton Dominis

On behalf of
Hi-Tech Consulting (HTC), *Community Liaison Environmental Action Network* (CLEAN) and
Sustainable Industries Development Institute (SIDI)
(HTC Report, May 2014)

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1.0 INTRODUCTION

In 1788, when the British settlers first came to Australia, the global population was about 750 million. Presently it's just over seven (7) billion, and climbing. That is to say, the global population at present is about 10 times greater relative to 225 years ago. Within this time frame, man has been just about everywhere, to the Moon and his machines beyond that, and influenced just about everything. What's more, humanity has displaced every other species for raw materials, especially for fossil fuels. As a result, the planet is at a point whereby virtually every habitat is threatened. If the global trend continues, the result could mimic the Easter Island syndrome, i.e., disaster.

As far as leaderships and businesses in the Illawarra district were and are concerned, in the name of global growth fetish, they too followed global trends. Illawarra played its part in consuming Australian resources. It transformed from the *"Garden of New South Wales"* to a *"Coal Exporter"* to an *"Industrial Centre"*, and as a side effect, produced many environmental detriments. However, now it is time to consider another change – a transformation to a sustainable *"Smart Hi-Tech Eco-City"*. Yes, Illawarra's past environmental faults should be addressed and corrected, especially as information and technology improved over the years.

To quote the President of United States, John F. Kennedy, who said *"Change is law of life. And those who only look in the past or present are certain to miss the future."* Accordingly, contemporary Illawarra businesses should look towards the future and play an active role, 'at home', to make things happen. With contemporary government guidelines and assistance, nature's economic value (and its destruction) must be renewed, made sustainable and incorporated into Illawarra's economy.

Hi-Tech Consulting (HTC), *Community Liaison Environmental Action Network* (CLEAN), *Illawarra Eco Tourism Association* (IETA) and *Sustainable Industries Development Institute* (SIDI), including a number of other local organisations are striving to help restore some of *Homo Bioeversor's* (sorry, *Homo Sapien's*) past environmental wrongs and which will subsequently help reverse Illawarra's *carbon footprint* (Refer to Appendix-I).

In brief, Illawara's businesses, government bodies and community groups must restore its endangered *blue-carbon* habitats (Refer to Appendix-I) to avoid the Easter Island syndrome and which will hopefully make an impact beyond regional borders. Illawarra's *blue-carbon system* must be restored, or at worse, impeded from further deterioration. With current government guidance and financial help, including valued community input, this said above can be achieved!

All in all, a range of consultancies are trying to reverse Illawarra's *carbon footprint*, and help restore the *blue carbon system* (Refer to Appendix-I). Hopefully, this will start with *"the Belmore Basin (Wollongong Harbour) Upgrade"* (**Scheme 5.1**, 5.1.1, 5.1.2 and 5.1.3).

2.0 A BRIEF REGIONAL HISTORY

2.1 Colonial Illawara

From 1788, *Governor Phillip* established the first Australian colony at Sydney. However, the British did not recognize any Aboriginal authority and simply did whatever they intended to do. Thus, they systematically took Aboriginal land and divided and subdivided it as they saw fit. Within about a century, six (6) colonies were formed.

As Sydney's colony needed to be self supporting its settlers methodically went about clearing native forests and scrublands to establish 'grazing lands' for their imported stock, namely sheep and cattle. They also sewed imported European grasses/seeds in an attempt to establish greener and more succulent pastures analogous to European standards.

For about the next three decades the colony developed and expanded along agricultural lines. In 1815, things took a tumble on the rural scene as it was a drought year. As a result, many of Sydney's cattle perished due to inadequate and poor quality native grasses. Nonetheless, cattle were still bred to increase stock numbers, and also as they were considered to be a valuable commodity. Unfortunately, the native grasses couldn't sustain intended stock numbers, especially cattle.

In the intervening time, *Dr. Charles Throsby* (who was a close friend of *Governor Lachlan Macquarie*) happen to learn from the Aboriginals that down (south) at the Five Islands District or at the Five Islands Settlement (now, Wollongong) there are freshwater sources and good grasses – grasslands vital to colonial livestock and its growth industry. Thus, the leading people of the colony 'employed' the local Aboriginals to guide them to specific grasslands or to particular areas of vested interest.

As for the English immigrant, *Dr. Charles Throsby* (1777-1828), at the age of 25 he settled at the colony of NSW, Sydney. In due course, he attained the titles of *'medical officer'*, *'magistrate'* and at the age of 27, *'Superintendent of Labour'*. In 1808 and at the age of 31, Lieutenant-Governor *William Paterson* allowed him to retire due to ill health and *"with indulgence of a free settler"*.

Afterward, ailing *Dr. Charles Throsby* craved to relocate from Newcastle, NSW back to Sydney as the 'climate change' might cure his ills. He was also allowed to exchange his Newcastle's farm stock numbers (sheep and cattle) with equal amounts in the Sydney Basin. Thus, Lieutenant-Governor *Joseph Foreaux* granted him 202 hectares (500 acres) at Cabramatta and another 40 ha (100 acres) at Minto, but on the proviso he surrenders the properties in two years' (at 1810), and thus Throsby relocated to Sydney.

When the land grant expired in 1810, in lieu, *Governor Macquarie* granted him 607 ha (1500 acres) elsewhere.[1] However, Throsby was disappointed. He wanted more as he was an explorer, and in due course did get more – much more.

[1] Vivienne Parsons; Throsby, Charles (1777-1828); Australian Dictionary of Biography, Volume 2, MUP, 1967; http://adb.anu.edu.au/biography/throsby-charles-2735

Meanwhile in Sydney, Throsby (1777-1828) with two other Europeans, two Aboriginal guides and their pack animals set out from Liverpool area, via Appin to determine whether the Five Islands District is as said. From Appin, the Aboriginal guides led Throsby in the eastern direction and towards the regional escarpment, then gradually down a particular Aboriginal bush trail known as the *'dreaming track'* above Sandon Point at Bulli, and which still exists.

Once Throsby's search party successfully descended down the escarpment and onto the coastal plain, the Aboriginal guides then led it to a freshwater lagoon at the Five Islands District, but which they called *Wollongong*. Then and there, adequate freshwater was found and confirmed.

Once Throsby inspected and evaluated the site he concluded that Wollongong's forested area had good soil and if cleared would make good grazing lands - cattle pastures. Yes, Illawarra's natural resources pleased Throsby. Afterward, he returned to Sydney, mustered his cattle and brought them 'down' to the chosen site. Later on, other Sydney's cattle farmers followed suit and within a few years the Five Islands District became a new cattle district of New South Wales.

In conjunction with the local *"cedar-getters"* the Five Islands Settlement acquired the name, *Wollongong*. It was chosen as the Aboriginals (including Throsby's guides) called the place in question, *Wollongong,* and which in the Aboriginal language means *'the sound of the sea'.* However, other meanings are possible.

In 1834, *Governor Bourke* visited Wollongong and found it in a poor state, and as a consequence he set out to improve the place. Accordingly, he employed a surveyor-general, *Thomas Mitchell*, to 'peg' Wollongong and who did so in 1837. Thus, minute Wollongong of about a few hundred people was 'pegged' for future development. However, as a 'suitable' terrestrial link between Wollongong and Sydney could not be envisaged, as the region was landlocked by an inaccessible escarpment, the place got off to a poor start. In other words, because of Wollongong's isolated geographic circumstances, its roads were purposely designed to be narrow, as it wasn't worth developing the place relative to places such as Sydney and Newcastle.

At the time, Wollongong's only feasible access to Sydney and abroad was via the sea. To partially overcome Wollongong's 'isolation dilemma', 300 convicts were sent to the place to build a meager sea harbor, including a wind-wall off Flagstaff Point (Wollongong's coastal headland) to provide some coastal protection for small vessels. But despite such a bleak start and pessimistic attitude by colonial developers, Wollongong was born.

2.2 The start of Illawarra's *'Carbon Footprint'*

In 1858, *William Russell Robson* (a coal mining engineer from Newcastle, England) stated during the Annual Agricultural Society Dinner, that Illawarra's coking coal is of good quality and better than Newcastle's and that it should be utilized. He made the statement as he previously worked with some coalmine company at Newcastle, NSW. He also said the only thing which Wollongong didn't have is the port facility to export it and which should be built.

The Wollongong harbour development proposal was supported by *John Garrett* (founder and editor of the local newspaper, Illawarra Mercury). When the go ahead was given,

entrepreneur Robson built a tramway to carry coal from his Mt Keira mine, down (now) Robson's Road to the Belmore Basin harbour.

With ever increasing demand for Illawarra's coal the local entrepreneurs pushed for harbour upgrading and which transformed into a viable coal port. It was the start of Illawarra's *carbon footprint* (Refer to Appendix-I).

In 1880, to help meet extra demand on coal export the "*Tee-Jetty*" was built at the harbour. However, in due course it too was outstripped. To keep up with global coal demand, a nearby coastal wetland called, *Tom Thumb Lagoon,* was subsequently developed into Port Kembla Harbour (early 1900's). Heavy industry followed suit and in good time it was surrounded by coal and coke exporters, steelworks, copper works, fertilizer plant, and so on. It was the enhancement period of Illawarra's *carbon footprint*.

2.3 Towards achieving 'sustainability' in Wollongong

From the late 1980's, the lack of any feat by Wollongong's decision makers to reverse Illawarra's *carbon footprint* prompt Hi-Tech Consulting (HTC) into action. It not only wanted to reverse the *carbon footprint* but also to shift Illawarra's economic base from exploitation to sustainability, and which would then launch the next 'business revolution' in Wollongong. Hence, the 'eco-city' plan was born.

Adopting the *Organisation for Economic Co-operation and Development* (OECD's) best guidelines and practices in relation to sustainable planning of *'back casting'* (Refer to Appendix-1), HTC proposed an integrated foreshore plan for Wollongong. This includes restoring the historical *'Tee-Jetty'* in the Belmore Basin Harbour, including the establishment of a quality '*foreshore park'* spanning across four suburbs, namely Coniston, Wollongong, North Wollongong and Fairy Meadow. (Figure 1)[2]

As far as the amount of carbon sequestration it will uptake can perhaps be calculated in due course, especially by Australian researchers such as Dr. Mark Horstman, as he and his team are working with Australian plants species (e.g. eucalypts) and looking for such answers.[3] Then again, based on a reliable USA source[4], American grasslands sequester 0.12-1.0, forests 0.05–3.9 and swamps/floodplains/wetlands 2.23-3.71 metric tonnes/acre/year. Based on such data, if Illawarra's '*foreshore park'* had (say) 100 hectares (247 acres) and its vegetation contained 40% trees, 40% grass and 20% wetlands; as a guesstimate the park would sequester about 400 tonnes of carbon dioxide gas (CO_2) per annum and which would significantly help reverse Illawarra's *carbon footprint*.

Wollongong's proposed *'foreshore park'* (i.e. its vegetation) would be a significant carbon sequester - a *carbon sink* or a *'carbon dioxide absorber'*. It is what most developed nations around the globe are currently recommending and proposing to do. What's more, Illawarra's community will utilize the *'foreshore park'* for recreational purposes and be a place where carbon dioxide producing machines (e.g. cars) would be limited or disallowed.

Restoration of the *'Tee-Jetty'* and upgrading of the Belmore Basin Harbour would attract visitors/tourists to Illawarra, i.e., by sea ferry services, instead of using (mostly) energy

[2] 4-Illawarra Mercury, Monday, September 28, 1998

[3] Catalyst: CO_2 Tree Capture – *"How much carbon dioxide do trees really capture?",* http://www.abc.net.au/catalystst/s1901661.html, AEST 19.00, 27/05/2013.

[4] Terrestrial Sequestration of Carbon Dioxide; http//teeic.ani.gov/er/apptech/terrapp/index.cfm; AEST 1910, 27/05/2013

inefficient road vehicles which produce greenhouse gases - pollution. Modern sea ferries which utilize wind and solar power (and a minimal amount of fossil fuel) will also help reverse Illawarra's *carbon footprint*. Further details concerning the sea ferry service is covered in subsequent sections of this report (Chapter 5, sections 5.1, 5.1.1, 5.1.2 and 5.1.3).

Hi-Tech Consulting also released its proposal to the public which was followed closely by the Wollongong City Council (WCC) draft titled, *Central Wollongong Urban Design Strategy Vision 20/20* (see Attachment-III). The Department of Urban Affairs and Planning also released a related version called *'Shaping Illawarra'*.

In 1999, HTC submitted its comprehensive *Eco-City* plan/report for the entire CBD of Wollongong, including a fully integrated transport map (plan) and other initiatives. Ten (10) copies were forwarded to the Wollongong's Business Chamber with the objective of registering it as a *'carbon off-set plan for the city'*, and to enable Wollongong to play its part, (see Attachment-II).

In 2000, HTC joined the WCC Ecologically Sustainable Development Liaison Committee and to which it released its blueprint for the establishment of *'Australia's First Eco-City, Wollongong; City of Innovation'* including its *'Sustainability Plan'.* After that, the entire subject matter subsided and nothing more was heard.

In 2001, HTC aligned itself with the Community Liaison Environmental Action Network (CLEAN) with the aim of realizing its municipal plan. Meanwhile WCC was restructuring and which further stalled the liaison between itself, Hi-Tech Consulting, CLEAN and other community groups (Figure 2).[5]

In April 2001, during one particular WCC Ecologically Sustainable Development Liaison Committee meeting, Hi-Tech Consulting invited the Strategic Director of the Australian Conservation Foundation, *Mr. M. Krokenburger*, to present to council his proposal for a sustainable Australia and its natural advantage. The invitation was sent to *Mr. Krokenburger* was looking for local case studies in order to support the national initiative.

At the same time, the local newspaper, Illawarra Mercury, published a two page article titled *"Blueprint of the Future; Transforming Wollongong into nation's First Eco-City"* - the information sourced from Hi-Tech Consulting initiatives (Figure 3).[6]

In December 2001, the WCC Planning Department initiated another community visionary scheme dubbed *"Wollongong Futures"*.[7] It was about city management, city strategy, including the strategy dubbed *"Plan First"*. However, the scheme was based on NSW Government initiative, but with a local twist - *'Local Agenda 21 Plan'*. The underlying principle of the plan was sustainability - to manage the city in an integrated and sustainable manner. It was a broader approach than just 'land use planning' and/or reviewing the outdated *Local Environmental Plan* (LEP).

WCC's intention was also to move from bureaucratic dominance to *'community governance'*.[8] That is, to involve the community in decision making or at least to have a say

[5] 2-Illawarra Mercury, Tuesday, February 27, 2001
[6] 32-Illawarra Mercury, Tuesday, April 3, 2001
[7] http://www.wollongongfutures.com, Wollongong Futures
[8] http://www.wollongongfutures.com, Wollongong Futures, AEST 18.40, 9/05/2013

on the matter. What's more, CSIRO studies enhanced WCC's plan. A booklet was also published and titled, *'Sustainable Wollongong'*.

All things considered, the WCC plan focused on the City Centre and Crown Street (the main street of Wollongong) while the rest of the region took the minor role. The WCC promoted its plan with catchy slogans such as *"in partnership with the whole community"* and *"one of the great urban walks of the world"*, including questions such as, *"what sort of city do you want Wollongong to be?"* In the meantime, HTC already had an *'Eco-City Plan'* including a complementary *'Foreshore Plan'* and which were already open to the public and submitted to WCC, but to no avail.

HTC also realized that WCC (and the rest of Australia) had no focus or experience in developing a sustainable environmental industry, and so it lobbied with TAFE Illawarra to establish an *'Ecological Sustainable Development Course'* and start teaching it thereafter (July 2003). It was another first proposal in the Illawarra. Regrettably and for whatever reason(s), as the TAFE course was not marketed or promoted, it never got off the ground.

Later in the year the WCC planners tried once again to implement the communities visioning expectations, but *'a culture of property speculation, corruption and over development'* set in, and the end result - mass resignations of the entire *"Futures Team"*. As soon as the Planning Director left, the WCC subsequently disregarded its building code (restriction of 6-8 storey's) of which Eco-Cities are designed, including community concerns, and then drafted its new LEP laws. Such a turnaround dominated the local media.

During late 2006, the federal government initiated a *National Emission Trading Scheme* discussion paper. Meanwhile, 'reorganized' Wollongong City Council initiated another community draft called the *'City Centre Revitalization Strategy'* and which was reported in the Illawarra Mercury. This time round, the HTC's goal was to encourage its key decision makers to raise revenue for public infrastructure to reverse the *carbon footprint* by combining both plans (Figures 4-5)[9], but to no avail.

2.4 Transition towards the first eco-city in Australia - Wollongong

In the response to WCC's *"Blue Mile Foreshores Plan"*, *Carol O'Donnell*, formerly a policy adviser to the NSW Carr Labor Government, identified a pathway to an Eco-City in Wollongong [Unpublished paper, October 2007].

O'Donnell's report recommends a range of regional projects for continuing community development, research and related joint venture funding, in the light of emissions abatement incentives being offered by the Australian government and prior to the commencement of the Australian Emissions Trading Scheme (2011).

The Climate Change Group of the Department of Prime Minister and Cabinet is currently offering emissions abatement incentives. It is also assisting discussion and implementing of the National Greenhouse and Energy Reporting Bill (2007). The primary aim of the incentives is to gain greater sustainability in production through offering support for effective reduction of greenhouse gas emissions, as well as their measurement and verification. A related aim is to

[9] 45-Illawarra Mercury, Monday, September 25, 2006 and 43-Illawarra Mercury, Friday, December 8, 2006

encourage carbon neutrality through trading and investment which assists reduction of harm to environments.

Wollongong is ready for broadly agreed development and research projects. Now is the chance for Wollongong to lead ecologically sustainable development in Australia. All relevant NSW and Commonwealth funding for environment protection should be considered in this coordinated, regional planning context for better competitive outcomes.

Carol O'Donnell's document content is shown below (2.4.1). It is the first draft for general consideration in relation to sustainable project development and joint venture funding. It is a document which was drafted with the assistance of Hi-Tech Consulting, Borst and Conacher Architects, and CLEAN.

2.4.1 Document contents

- United Nations Declaration on Environment and the Australian direction
- Global warming and calls for global emissions measurement and reduction
- Recent Australian initiatives to reduce emissions through their regulation and measurement, supported by related development, trading and research
- Developing risk management perspectives to protect communities and environments
- Requirements of the National Greenhouse and Energy Reporting Bill (2007)
- Requirements of the Emissions Abatement Incentives Program
- Greenhouse reporting and relevant recommendations about NSW electricity supply
- National opportunities to pioneer sustainable development in housing
- Opportunities for government, industry superannuation fund and other investment

2.4.2 Sustainable development emphasis on Wollongong?

- Wollongong's major employers are major greenhouse gas emitters
- Illawarra has many mutually supportive stakeholders in manufacturing employment
- The Illawarra community and Wollongong Council support sustainable development
- Indigenous communities show strong interest in South Coast development concerns

2.4.3 Projects for discussion and joint venture funding

- The Clean Energy Action Plan: Towards 50/50 by 2020 in the Bega Valley Shire
- The Wollongong City Centre Plan and the Blue Mile Vision
- The Wharf and Ferry Service proposed by Hi-Tech Consulting in their eco-city plan
- The proposed wharf
- The proposed ferry service
- Providing Development, Research and Education Support at Wollongong
- The Wollongong Innovation Campus
- The Sustainable Industries Development Institute Proposal
- Supporting education for skills development through website design

Additional information concerning any of the above topics can be obtained from the author or from Hi-Tech Consulting, Wollongong.[10]

3.0 BUILDING THE ECO-SYSTEM MARKET PLACE

Australia is a global forerunner when it comes to environmental markets. It first recognized global issues such as *carbon sequestration* and it became the first nation to sell

[10] Frank Coluccio [frankcoluccio@hotmail.com]

carbon credits (1999). Australia embraced such markets because of Kim Yeadon's foresight. Kim Yeadon was Minister for Energy and Forestry, and Minister for Land and Water Conservation in the NSW State Labor Government.[11]

Yeadon's work started during the period when the NSW timber workers and their unions, and who were pro-Labor Party supporters, wanted to maintain their traditional jobs by logging native forests (mostly) on government land. They clashed with the Federal Government because of the novel Native Forests policy. The Native Forests policy set out laws whereby the government minimized old growth logging and maximized conservation.[12] The government argued that traditional logging was unsustainable and that it was simply exploitation of native forests. However, the policy was not implemented in all states, including NSW. What's more, pro-environmentalists who were also pro-Labor Party supporters opposed the loggers.

In 1994, the timber workers saw that the Federal Government and environmentalists as a threat and which could decimate 'their' industry – their livelihood. That is, where thousands of people would lose their jobs.

In the following year (1995) the situation came to a boil whereby the timber workers put up a protest and a blockade outside the National Parliament in Canberra.[13] They even smashed the front door of the parliament house. Meanwhile, in comes Kim Yeadon and who (after many negotiations) found a compromise between the three stakeholders, namely the government, environmentalist and timber workers. Yeadon negotiated between the NSW Timber Workers Union (headed by Gavin Hillier, Figure 7) and the environmentalist movement. In the end, the government appeased the timber workers with $120 million payout, i.e., to assist them with redundancy, retraining and relocation.[14] In short, Yeadon pioneered the 'forestry policy' for the Labor Party (in an attempt to win the oncoming election (1995).[15]

Under Bob Carr, the NSW Labor Party won the elections and Yeadon became the Forestry Minister. He (and his team) subsequently attended the UN Framework Convention on Climate Change[16], recognized the global Easter Island syndrome, and became disciples on things such as environmental services, carbon dioxide sequestration, carbon credits, sustainable plantations, and so on. On their return to Australia Yeadon instigated the concept of Environmental Markets in NSW. Early in 1999, he even sold carbon credits (or offsets) to Tokyo Electric Power Company, Japan, i.e., carbon credits equivalent with a minimum of 1,000 hectares of plantation forests per year over 10 years.[17] The bilateral contract can be accessed from: *www.forest.nsw.gov.au/env_services/carbon/investments/tepco/default.asp*[18]

[11] Ricardo Bayon, http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=649&section=carbon_market&eod=1, Accessed Tue, 30/05/2013 AEST, 14.15
[12] Ricardo Bayon, http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=649&section=carbon_market&eod=1
[13] Ricardo Bayon, http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=649&section=carbon_market&eod=1, Accessed Tue, 30/05/2013 AEST, 14.15
[14] Ricardo Bayon, http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=649&section=carbon_market&eod=1, Accessed Tue, 30/05/2013 AEST, 14.15
[15] Ricardo Bayon, Ecosystem Marketplace, People "Australia's Minister of Environmental Markets": A Profile of Kim Yeadon. The Katoomba Group's Ecosystem Marketplace, pp1-4, 2006; Accesses 10/06/2006
[16] Ricardo Bayon, http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=649&section=carbon_market&eod=1, Accessed Tue, 30/05/2013 AEST, 14.15

[17] Ricardo Bayon, Ecosystem Marketplace, People "Australia's Minister of Environmental Markets": A Profile of Kim Yeadon. The Katoomba Group's Ecosystem Marketplace, p4, 2006; Accesses 10/06/2006
[18] Ricardo Bayon, http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=649&section=carbon_market&eod=1, AEST 18.22, Tuesday, 21 May 21013

In due course, Yeadon became the State Minister for Energy (2001) and then instigated the greenhouse reduction policy.[19] By doing that he *"created a whole new industry of people interested in creating, buying and selling of carbon credits"*[20] as it was good for conservation and the communities of NSW.

3.1 AUSTRALIAN CARBON ECONOMY CHANGES FROM 1991 to 2013

From the proposal of the Kyoto Protocol (1997) to the most recent Australian policy on the subject matter, some of noteworthy events are chronologically documented in Table 1.

Table 1:

Date	Brief History
1997	Proposal of the Kyoto Protocol
1998, September	Hi-Tech Consulting Pty Ltd proposed a *Eco-Tourism Park Plan* for Wollongong
1999, early in the year	First carbon trade by Australia to Japan
2001, 3 April	Hi-Tech Consulting Pty Ltd announces *"Blueprint of the Future; Transforming Wollongong into nation's First Eco-City"*
2003, 1 January	The start of the NSW Abatement Scheme
2005, January	EU - Emission Trading Scheme
2005, 16 February	Australia signs the Kyoto Protocol but did not ratify it
2007, 31 May	The Secretary of the Prime Minister, Dr. Peter Shergold and the head of taskforce recommends a *Emissions Trading Scheme (ETS)*
2007, 17 July	Howard commits in establishing the *ETS*
2007, 24 November	Under the leadership of Kevin Rudd, the Labor Party wins the federal election and commits Australia to the Kyoto Protocol
2007, 12 December	Australia ratifies the Kyoto Protocol
2008, 16 July	Government releases its legislation policy concerning *Carbon Pollution Reduction Scheme* (CPRS), and with the intention to begin in 2011
2008, 30 October	Treasury releases its economic modeling on CPRS
2009, 1 December	Tony Abbott substitutes the leader of the opposition, Malcolm Turnbull, and announces to oppose the CPRS
2009, 2 December	Coalition & Greens overturn the CPRS legislation in the senate
2010, 27 April	The Government delays the start of the CPRS
2010, 24 June	Julia Gillard substitutes Kevin Rudd as Prime Minister and in due course (17th August) states *"There will be no carbon tax under the government I lead."*
2011, 24 February	"heads of agreement" to set a price on carbon per tonne ($23/t), from 1 July 2011
2011, 10 July	"*Multi-Party Climate Change Committee"*(MPCCC) announces that the price on carbon has been reached
2012, 1 July	The carbon scheme starts

[19] Ricardo Bayon, http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=649&section=carbon_market&eod=1, Accessed Tue, 30/05/2013 AEST, 14.15

[20] Ricardo Bayon, Ecosystem Marketplace, People "Australia's Minister of Environmental Markets": A Profile of Kim Yeadon. The Katoomba Group's Ecosystem Marketplace, p4, 2006; Accesses 10/06/2006

2012, 28 August	Climate Change Minister, Greg Combet, announces that the base price of $15/tonne will be scrapped.
2013, September	Coalition elected *'Direct Action Plan'* to be implemented by July 2014
2013, November	Hi-Tech submits *'Carbon Abatement Domestic Off-set Credit Scheme'* to *'Emissions Reduction Fund Terms of Reference'*

Australia's nature's economic value (and its destruction) was incorporated into the Australian economy. This can also be validated by CEO and Founder of Mission Markets Inc, Michael Van Patten, who said *"living ecosystems on which we all depend are worth more alive than dead – and only when that reflection is made will the creative forces of our economy become focused on the preservation of nature rather than on its destruction."*[21]

Thus, due Kim Yeadon's foresight (NSW Minister for Energy) the Australian Federal Government brought nature's resources and services into the economy. As a result, many national schemes were subsequently set up to meet the challenge, such as carbon farming, Mandatory Renewable Energy Target, the NSW Greenhouse Gas Abatement Scheme, and so on.[22]

According to the current national trend, most of the above national schemes are government controlled and grants and funding distributed to particular stakeholders, such as tertiary institutions[23], established businesses and large landowners. Presently there are 985 environmental market companies in Australia.[24] Unfortunately, smaller stakeholders, perhaps with better ideas, miss out, especially due to bureaucratic complexities.

If governments want genuine changes to help its vital habitats, then national schemes must apply across the board, to capital market mechanisms targeting all stakeholders and investors in general, i.e. big and small. Australia has many national schemes in support of its vital habitats and to finance them, it acquires monies via (mainly) carbon taxes, and so on. However, it must not only encourage its stakeholders and citizens to invest in such schemes (e.g. via superannuation funds) but to inform them that they are secure, long-term and low dividend. It must involve the entire nation and not only the privileged.

Most recently the Clean Energy Regulator is at this time formulating its methodology along the format of Verified Carbon Standard Association (USA), for *carbon offset schemes* for the Australian carbon market, such as carbon farming industries. For example, the Australian Government's, Department of Agriculture, Fisheries and Forestry regularly advertises its intensions, such as *"Clean Energy Future, Grant applications open, $99 million Action on the Ground program, as part of the Australian Government's Carbon Farming Futures fund."*[25]

A more comprehensive policy is also being prepared by the "*Multi-Party Climate Change Committee"*, comprising Christine Milne, Tony Windsor, Bob Brown, Greg Combet, Julia

[21]Michael van Pattern, Building the Ecosystem Marketplace; CEO and Founder of Mission Markets Inc, p1: http://www.ecosystemmarketplace.com. Accessed 27/03/2013
[22] Environment al Marketplace in Australia, http://www:envex.com.au/environmental.htm, accessed 27/03/2013
[23] UNSW, Centre for Energy and Environmental Markets, http://www.ceem.unsw.edu.au, accessed 27/03/2013
[24] List of Environmental Markets Companies in Australia, http://www.manta.com/world/Oceania/Australia/environmental_markets--E4/, accessed 27/03/2013
[25] Daff.gov.au/actionontheground, Inquirer, p14, The Weekend Australian, April 13-14, 2013

Gillard and Rob Oakeshott.[26] However, as the topic is beyond the scope of this report it will not be discussed here. Interested readers should seek information elsewhere.

3.2 Carbon Tax or The Carbon Pricing Scheme

The Australian Federal Government established a form of *carbon tax* (or *permits*) for major national polluters. Whether the scheme is called a tax or something else it is irrelevant – it is a form of payment or compensation.

The carbon tax (or permits) was introduced by the Gillard Government on July 1, 2012. Under the Australian Government *Clean Energy Act 2011*, the *Clean Energy Regulator* (CER) was empowered to oversee the polluters in question (dubbed as *'liable entities'*) using a database called, *Liable Entities Public Information Database* (LEPID). [27] In general, *'liable entities'* which emit over 25,000 tonnes of carbon dioxide into the atmosphere are obliged to purchase *permits* from the government. Currently there are 360 such *'liable entities'*.[28] However, according to media report there are many major companies in Australia which are still not fully prepared for such a change and could face carbon penalties.[29] The remainder and the majority of Australian businesses will be exempt.

Such a scheme brought both positive and negative aspects into the Australian society. Some community groups foresee that the scheme will increase consumer prices, especially electricity and fossil fuels (coal, oil and natural gas), and subsequently everything else. In other words, users and consumers of energy sources will be 'penalized' in the form of price hikes. So the dilemma is that Australians will be slogged with price increases and the global net result, perhaps insignificant. What's more, Tony Abbott (Federal opposition leader) has been claiming *"carbon pricing will devastate the economy"* but in the end he didn't oppose or repeal the carbon price.[16]

The positives of having a carbon tax are many. Firstly, it will compel major polluters to change, to reduce their emissions. It is a way of 'forcing' polluters to reduce their emissions and to modernize their business operations, especially as the Earth's fragile atmosphere, hydrosphere and lithosphere should not be used as free dumping grounds. Thus, higher energy costs is a noble thing as it will compel consumers to buy less, and which will result in less greenhouse gases, namely carbon dioxide (CO_2), methane (CH_4), nitrous oxide (NOx), hydrofluorocarbons (HFC's), perfluorocarbons (PFC's) and sulphur hexafluoride (SF6). The assumption is 'if energy cost more, then less will be consumed and burnt (combusted), and there will be less pollution.' Thus, by inclining Australia towards that direction will help meet its national target and as a result have a cleaner environment.

The industries and businesses which are adversely affected by the carbon tax, the Gillard Government will compensate them by *free permits* and incentives. To counteract higher costs of living the Gillard Government will also assist households and smaller businesses. For example, it will consider adjusting (increasing) the tax-free threshold. The people in rural areas (farmers and graziers) will also get carbon credits for planting trees, and so on. All in all, carbon pricing will not devastate the economy. It is the opposite as to what Federal opposition leader,

[26] Marcus Priest, www.afr.com, 27-28 April 2013

[27] Clean Energy Regulator – Liable Entries Public Information Database (LEPID), Clean Energy Act 2011; www.leanenergyregulator.gov.au/Carbon-Pricing-Mechanism/Liable-Entries-Public-Information-database/Pages/default.aspx

[28] Clean Energy Regulator, Carbon Pricing Mechanism, LEPID for 2012-13 financial year; www.leanenergyregulator.gov.au/Carbon-Pricing-Mechanism/Liable-Entries-Public-Information-database/Pages/default.aspx

[29] News, Top 200 face carbon penalty, The Australian Financial Review, www.afr.com, 27-28 April 2013

Tony Abbott, initially alleged. Interested readers in this topic should seek information elsewhere, as it's beyond the scope of this text.

The main greenhouse gas and contributor to global warming is carbon dioxide. Scientists claim that human-induced emissions caused the average global temperature to increase by 0.6^{o}C, and if the trend persists it will increase between 1.4 and 5.8^{o}C by the end of this century.[30] Because of global warming, the average sea level will rise by 0.5m. If such named things happen, it will bring about climatic extremes, e.g., droughts, floods, ocean chemistry changes and expansion, and so on. With such adverse climatic changes, world population trends will reciprocate, e.g. mass migrations could occur and economies will be affected.

Despite all the negativity global warming may bring, Australians are polarized on the subject matter and state things such as:-

- *"Why burden us with such a tax when major global polluters, USA, China, India and Brazil are not abiding by the rules? They don't care! So, why should we?"*

- *"Why is the government forcing us to use public transportation which is inefficient and/or nonexistent, especially as former government policies stripped away public transportation down to a bare minimum (e.g. tramways) to make ways for cars."*

- *"It's about time polluters pay. They shouldn't rape planetary resources and then pollute for free."*

Even though the world's major polluters (USA, China, India and Brazil) not fully committing in cleaning up the planet, the rest of the world is. At present, the Australian and European Union (EU) scope is to reduce its greenhouse gases by 5% below 2000 levels by 2020 and then to reduce them by 80% below 2000 levels by 2050.[31]

4.0 BEYOND COAL & STEEL AND THE *'BLUE MILE COAST',* AND TOWARDS A *'SMART HI-TECH ECO-CITY',* WOLLONGONG - an open document from Hi-Tech Consulting written by Carol O'Donnell.[32]

This report is an open approach instigated by Hi-Tech Consulting in conjunction with other community groups to enable Wollongong to become a *'Smart Hi-Tech Eco-City'*. It also follows the Wollongong City Council (WCC) consent, outlined in the Community Engagement Report on the WCC *'Blue Mile Vision'*, and in response to earlier Hi-Tech Consulting submission to Council. The author's report centres on eco-development requiring more open regional planning. It also comments some key regional proposals within the new global context for recommending direction and action, namely

- That the WCC works with the Commonwealth Government to support eco-friendly development on the foreshore precinct

[30] Intergovernmental Panel on Climate Change (IPCC), 2001: Climate Change 2001: the Scientific Basis, Cambridge University Press, Summary for Policymakers and technical summary at:www.ipcc.ch/pub/reports.hmt: A report of Working Group I of the Intergovernmental Panel of Climate Change, p5 & p13. Accessed 26 March, 2013

[31] Renee du Preez (March 9, 2012); "The Carbon Farming Initiative and how it works?" ABC News (Australian Broadcasting Corporation); June, 14, 2012.

[32] Carol O'Donnell, St James Court, Rosebank St. Glebe, Sydney www.Carolodonnell.com.au

- That it considers environmental protection or ecological sustainability or vital sustainable development, and

- Propose the possibility of establishing an historical wharf and ecologically friendly ferry service as part of Belmore Basin re-development forward direction

The author's report can be obtained from her website (see Footnote). HTC and SIDI recommendations are subsequently covered in Sections 5.0 and 6.0 (below).

5.0 ECO-DEVELOPMENTS - PROPOSALS AND ACTIONS FOR WOLLONGONG by HTC, SIDI and CLEAN

Australian Government set up specific government bodies to meet its (already mentioned) challenges. Some such bodies are namely, the Clean Energy Regulator (CER) and its subdivisions, and the Industry Innovation Precincts. CER focuses on *"Carbon Farming Initiatives"*[33] i.e. environmental plantings. The Industry Innovation Precincts promote such themes as *"Is your industry ready for growth through collaboration and leadership?"*[34]

The Grattan Institute supports complementary themes, such as *"Productive cities, Opportunity in a changing economy."*[35] The media also regularly reports corresponding things, such as *"Tax carbon to pay for better infrastructure"*,[36] and the list goes on.

The aim of Hi-Tech Consulting (HTC), Community Liaison Environmental Action Network (CLEAN), Illawarra Local Aboriginal Land Council (ILALC) and Sustainable Industries Development Institute (SIDI) is to cooperate with government bodies, local businesses and institutions to help 'clean up' and restore some of Illawarra's damaged environments and provide job opportunities, as over the last two decades it was its primary theme. Thus, with the help of such Australian Government bodies the goal is to see some of the aims come to fruition, and which are:-

5.1 Belmore Basin (Wollongong Harbour) Upgrade

Brian Dooley, Manager of Southern Projects, Department of Primary Industries, Catchments and Lands, sought development proposals for the Wollongong Harbour. However, the harbour is on the NSW Heritage Register and so if any work needs to be carried out on site a formal approval is required from the Heritage Council (Section 60 Application). Furthermore, from the start of Illawarra's industrial downturn (1990's) and as stringent pollution/environmental controls were put into effect, the region and its city transformed. It is now considered to be - *'clean'*. Yes, Wollongong is no longer envisaged to be a *'steel city'* or a *'dirty city'*, it is a *'clean city'* – cleaner than Sydney!

Because of Wollongong's cleaner image it's time to incline more towards tourism, especially when environmental and tourist potential is now recognised. As a result, Borst and Conacher Architects, HTC, CLEAN and SIDI took the initiative and publically submitted novel development proposals and which are, namely:-

5.1.1 Public Ferry Terminus and Fisherman's Wharf

[33] Seminar, The Menzies Hotel Sydney, 14 Carrington St, Sydney Monday 20 2013, www.cleanenergyregulator.gov.au
[34] The Australian Financial Review 4-5- May 2013; News, p5, www.afr.com
[35] Jane-Frances Kelly and Peter Mares, Grattan Institute report, 'Productive cities, Opportunity in a changing economy', May 2013.
[36] Philip O'Neill, Opinion and Analysis, The Newcastle Herald, Monday, July 28, 2008

One such proposal is to build a *Public Ferry Terminus* (one building) at Wollongong Harbour and a *'Fisherman's Wharf'*, and to restore the historical *'Tee Jetty'* at the site where current boat slipway exists. Further details/plans of such a scheme can be sourced from Borst & Conacher Architects.[37]

5.1.2 Tourist Ferry Services from Sydney via Wollongong to Kiama

In addition to the above, HTC in consultation with marine enterprise(s) and a boat/ship maker will seek a business proposal for the establishment of a new company entitled *'Illawarra Ferries Pty Ltd'*. The aim is to operate an international standard eco-friendly tourist ferry service from Circular Quay, Port Jackson, Sydney via Wollongong to Kiama Harbour and back, 350 days a year. The type of craft is still under re-evaluation, i.e., whether it will be a mono-hull, dual-hull or tri-hull. The would-be vessel will operate (up and down the coast).

The would-be vessel would be designed to incorporate solar panels and sail(s). If the ferry was to incorporate such features, and take advantage of favourable sea conditions, it would save fuel and subsequently help reduce the carbon footprint. The craft's efficiency relative to road vehicles would be significant.

According to data published by the *National Transport Commission* (NTC) *Australia* and its account, "*in 2008, the national average carbon emissions from new passenger and light commercial vehicles was 222 g/km"*[38] some preliminary in-house calculations were made. For example, if 500 road vehicles (e.g. cars, buses, trucks, and so on) travel from Sydney to Wollongong, a distance of say 100 km, in combination the vehicles would emit 11.1 tonnes of carbon, i.e., 222 grams of carbon per km per vehicle (0.222 kg/km). This value extrapolates to 11.1 tonnes of carbon per 100 km per 500 vehicles. What's more, as the vehicles are only driven by the driver/chauffer (i.e. 500 people) it means that each person or vehicle emits 22.2 kg of carbon, and which is significant.

If, on the average, there are three (3) people per vehicle (i.e. driver plus two passengers), it means that 1,500 people travelled to Wollongong and also emitted 11.1 tonnes of carbon, but which is equivalent to 7.3 kg of carbon per 100 km per person. All in all, the more people per vehicle, the better the carbon footprint per capita.

Relative to road transportation, solar-wind powered sea vessels can significantly reduce the *carbon footprint*, especially when Mother Nature provides some means of power – during daytime (i.e. sunlight) and during favourable maritime conditions (i.e. winds and sea currents). To be precise, the craft's solar panels will utilize the sunlight and the higher the intensity (Watts/m^2) the greater the efficiency/electrical power. A similar thing applies to winds and sea currents.

The negative side of utilizing sea ferries is during adverse weather conditions, i.e., during rough seas and head-on winds. Fortunately for most of the year, the annual maritime conditions between Port Jackson, Sydney (33º51.55S/151º.12.50E) and Wollongong (34º26.40S/150º.58.00E) are considered 'mild'.

Nevertheless, within this part of the world, *gales* (34-40 knots and 5.5 meter waves) can occur. As for *strong gales* (41-47 knots, 7.0 m waves), *storms* (48-55 knots, 9.0 m waves) and *violent storms* (53-63 knots, 11.5 m waves), well, they do occur but are infrequent. *Hurricanes*

[37] www.bcarchitects.net.au, 69 Auburn St Wollongong NSW 2500

[38] NTC Australia (November 2009), New Australian Vehicles-Information Paper, Carbon Emissions from New Australian Vehicles Information Paper, ISBN: 978 1 921604 07 2 http://www.ntc.gov.au/filemedia/general/carbonemissionsfromnewausvehicle.pdf

(64-71 knots, 14.0 m waves) may also occur.[39] Further information on this topic may be obtained from sources such as NSW Maritime – *Boating Safety Access Line* on (13 12 56 toll-free in NSW) or 02 95638557 (other areas).[40]

Comparative data concerning solar-wind powered sea vessels with that of rail transport (and which is the most efficient form of land haulage) cannot be estimated at present.

5.1.3 Wollongong Harbour Terminus and Express Bus Services

The sea ferry enterprise will also organize eco-friendly express buses from Wollongong Harbor Terminus for passengers/tourists to pre-planned destinations around the Illawarra (and which are currently being planned). If the above proposal comes to fruition it will be a catalyst which will help propel Wollongong as Australia's first "Eco-City".

5.2 Sustainable Eco-Village Windang

From 2011 to the present (2013), the Illawarra Local Aboriginal Land Council (ILALC) and the Egyptian Coptic Orthodox Church (ECOC) pooled and coordinated their skills and resources to establish a common *"Sustainable Eco-Village"* at Windang, a coastal suburb about 12 km south of Wollongong. The project is also supported by HTC/SIDI.

In a two-way partnership, the *Sustainable Eco-Village* will function as a tourist resort and be of community service, particularly to the local Aboriginals and the Coptic community. Naturally, the construction of the village buildings will provide jobs. What's more, a number of Aboriginals will be trained and employed during project, and thereafter.

After the completion of the village, it will be managed on a sustainable basis and a place where community events will take place, such as Aboriginal traditional dances/shows, and which will be promoted Australia wide. It will be a 'draw card' for the Illawarra. In essence, there will be a village 'hall' where community groups can promote their cultural events, such as arts and crafts, studio work, exhibition and performances. What's more, the Coptic community will also function along similar lines. All in all, the *Sustainable Eco-Village* aims are namely:-

- to establish a variety of different Eco-homes, both owned and rented
- to function with minimum carbon emissions and wastes
- that generated wastes be a resource and subsequently reduced, reused and recycled
- to maintain the site in a sustainable and ecologically conservative manner
- to use renewable energy systems, such as solar panels
- to grow community's own organic food, i.e., to have vegetable gardens

Currently the project has 60 active supporters, including another 100 on the mailing list. Further details about the project can be accessed from Dr. Fady Sidrak (project organizer and founding member).[41]

5.3 Puckey's Estate Restoration

[39] Marine Board of Queensland, Small Ships Manual, Beaufort wind scale, 7th Ed, February 1986, p10-11
[40] *Crawford's Mariners Atlas*, Jervis Bay to Port Stephens, Compendium of Australian Hydrographic Service Chart, 2008, A CHP Productions, ISBN 978-186333-327-6
[41] Dr. Fady Sidrak, Founding member of Sustainable Eco-Village Windang Project, NSW; fady_sidrak@hotmail.com

In 1996, the University of Wollongong (UoW) initiated a Fairy Creek floodplain study[42] to *"investigate an alternative floodway south of Wollongong University Campus East"*. Fundamentally, the study was carried out to

- *"investigate an alternative floodway arrangement to that originally proposed in the Floodplain Management Study (FMS)"*[43]
- *"put forward by the University's consultants to:*
    - *reduce the size of the floodway and hence impact on existing playing fields and the proposed science centre*[44]

However, for whatever reason(s) such an endeavour was abandoned. As a result, HTC proposes to revive the concept, and on top, to complement the project with additional ideas and by using the *'blue-carbon'* offset scheme. Further details on the project can be accessed from HTC[45]

5.4 Aboriginal Dreaming/Throsby Track-Old Bulli Mine Site

The overall aim of the Aboriginal Dreaming/Throsby Track-Old Bulli Mine Site project is to:-

- Fix up the coalmine and make it safe - with a 'Heritage Mine Theme'
- Improve mine site surroundings, such as restore the native rainforest environment
- Establish an eco-tourist village including a centre (or hall) for localized recreational activities, such as bush walks
- *The Black Diamond Museum* would also play a part in rainforest activities
- *Illawarra Eco Tourism Association Incorporated* (IETA) is also a supporting organisation

Further details on such a project can be accessed from HTC/SIDI.[46]

5.5 Towards 2015 – Wollongong's Bi-Centenary

The Illawarra Local Aboriginal Land Council (ILALC), *Illawarra Eco Tourism Association Incorporated* (IETA) and HTC/SIDI are three local organizations with a common goal, and which is to complement the *"Wollongong Bi-Centenary 2015"*, but with *"a different historical perspective"*. Our coordinated endeavour deals *"Towards a 2015 Wollongong Bi Centenary"*. The aim inclines towards themes, such as:-

- Past Aboriginal-European divergence to 2015 Aboriginal-European convergence
- Sustainable environmental-development convergence

[42] Fairy Creek Floodplain Management Study, Kinhill, 1996
[43] Flood Study- Alternative Floodway South of Wollongong University Campus East, p:\sv\SV8502\003\docs\presentn.doc, 21 April, 1988
[44] Flood Study- Alternative Floodway South of Wollongong University Campus East, p:\sv\SV8502\003\docs\presentn.doc, 21 April, 1988
[45] Frank Coluccio [frankcoluccio@hotmail.com]
[46] Frank Coluccio [frankcoluccio@hotmail.com]

6.0 RESTORING BLUE-CARBON HABITATS TO HELP REVERSE ILLAWARRA's CARBON FOOTPRINT

"Blue-Carbon" (BC) is a technical term initiated by *"The International Working Group on Coastal 'Blue' Carbon"* in February 2011.

"*The working group is convened by Conservation International, International Union for Conservation of Nature (IUCN), and the Intergovernmental Oceanographic Commission and consists of 22 scientists from around the world. Funding for the group has been provided by the Waterloo Foundation, National Aeronautics and Space Administration (NASA) and the United Nations Environment Programme (UNEP)".*[47]

The term refers to the global role of oceans and its coastal systems, i.e., saline and freshwater wetlands. In other words, coastal wetlands are now known to be valued resources and play crucial environmental roles, including carbon sequestration. What's more, BC systems are mostly shallow water habitats, water logged areas and swamps and which may be temporary or permanent. Such areas have also been categorised by its vegetation – aquatic plants. A more definite explanation is given below:-

"BLUE CARBON – THE ROLE OF OCEANS AS CARBON SINKS
Vegetated coastal habitats – mangrove forests, salt-marshes and seagrass meadows – have much in common with rain forests: they are hot spots for biodiversity, they provide important and valuable ecosystem functions, including a large carbon sink capacity, and they are experiencing a steep global decline (Duarte et al., 2008, Duarte, 2009).

Indeed, the world is losing its coastal habitats four times faster than its rain forests (Duarte et al., 2008, Duarte, 2009) and the rate of loss is accelerating (Waycott et al., 2009). However, whereas society is well informed of the benefits and threats associated with rainforests, there is a comparative lack of awareness on the status and benefits of vegetated coastal habitats.

This is perhaps because of a "charisma" gap, where these often submerged, out of sight coastal habitats, are not as appealing to the public as their terrestrial counterparts (Duarte et al., 2008). Yet, because of their similar functions and threats, coastal habitats can be considered as blue carbon sinks".
[48]

Subsequent sections/articles will periodically refer to the terms *'blue carbon'* and *'blue carbon systems'*. Additional information on the subject matter is given in Section 6.1.1; *A New Vision for Eco-City Wollongong, November (2012) Report - Part I. Section 1.3, p21*

[47]http://www.marineclimatechange.com/marineclimatechange/bluecarbon_recommendations_files/bluecarbon_recommendations_3.28.11.FINAL.HIGH.pdf; Accessed 11.00 AEST, Friday, 31 May 2013
[48] http://www.grida.no/files/publications/blue-carbon/split/6 BLUE%20CARBON%20_%20THE%20ROLE%20OF%20OCEANS%20AS%20CARBON%20SINKS.pdf, Accessed 15.40 AEST.

6.1.1

Below is a November 2012 report by Dr. Anton Dominis, *Parts 1-3*

A NEW VISION FOR ECO-CITY WOLLONGONG[49]

November 2012
Part-I

Introduction:
The Illawarra district is located in an ideal climatic zone and blessed with many natural resources, so why not take advantage of this? Together as a community, let's renew Illawarra and make it an even better place to live in a *Smart/Hi-Tech/Eco-City.* Thus, *Sustainable Industries Development Institute* **(**SIDI), along with a number of community organisations, took the initiative to help make it happen (see Appendix-I).

Sometime this year (2014) SIDI proposes to start the scheme somewhere in or around Wollongong, in a developing city which is also striving to become the first Australian eco-city.

I. GREEN INFRASTRUCTURE

1.1 The Grand Regional Park:

In 2006, the residents of northern Illawarra proposed the idea of establishing an *"Illawarra Foreshores Regional Parklands"*.[50] They argued it would: -

a) provide jobs
b) boost tourism
c) help flood abatement
d) generate sustainable long-term income
e) provide visual attractiveness
f) preserve European heritage sites
g) preserve Aboriginal sacred sites
h) restore flora and fauna
i) restore wetland ecology functions
j) preserve and enhance water quality, and
k) provide transport/accessibility to southern and western Sydney

Regrettably and for whatever reason(s), it didn't come to fruition. But, now (2013) under new domestic and international government policies, acts and legislations, such a beneficial economic, social and environmental concept must be seriously reconsidered.

So, let's think big and embark on establishing something grand. Perhaps something comparable to *New Yorks' Central Park*, *London's Hyde Park*, *Munich's Englischer Garten* or something even better. Besides, Illawarra already proved it on a smaller scale - at the Wollongong's Botanic Garden. In addition, colonial Illawarra was dubbed *"the garden state"* of NSW.

[49]Anton Josip Dominis; November 2012, "A new vision for Eco-City Wollongong*",* Report Part I, Written on behalf of *Hi-Tech Consulting (HTC), Community Liaison Environmental Action Network* (*CLEAN*) and *Sustainable Industries Development Institute (SIDI).*
[50] Proposal for a Illawarra Foreshores Regional Parklands (March 2006) by residents of northern Illawarra

Illawarra's minor recreational areas should also be renewed, upgraded and linked with the would-be *'grand regional park.'* Illawarra's 'exposed' sporting facilities, road networks and industrial sites should also be integrated or at least surrounded by native trees.

Perhaps, the *'grand regional park'* can be started on the site which is now *Puckey's Estate,* North Wollongong and subsequently extended up and down the coast. If planned well, it can have many facilities such things as, lagoons, walkways, running tracks, cycle tracks, picnic areas, theatre, camping sites, amphitheater, kiosks, restaurants, conference sites, museum, swimming pool, ice skating, wildlife sanctuaries, marine sanctuaries, aquatic centre, aquariums, children's playgrounds, carrousel area, sporting facilities, mini zoo, grassy areas, native woodlands, and so on. All this above said is up to the imagination of city planners and engineers.

1.2 Active Community Organizations:

In conjunction with numerous community groups (see Appendix), SIDI is actively pursuing to help advance our community's need. The residents of northern Illawarra proposed annual activities to be organized, namely[1]:-

a) Epic walking trails that follow Aboriginal Trade routes from Cambelltown to Kuradji (Standon Point) onto Kiama
b) Epic Cycleway Sydney to the Gong extended to Kiama
c) Iconic World Class Surfing Place
d) Hang gliding
e) Nature trails, wetland boardwalks and bird watching, and
f) Whale watching

If the *'grand regional park'* and associated assets are to be established it should be maintained by the local council – people's representatives and on a 'non-profit' basis. It is because the council can recoup its outlay from *Eco-Tourism, entertainment facilities, sporting venues,* and so on. That is, the *'grand regional park'* would create specialty jobs. To quote the residents of northern Illawarra *"the range of employment opportunities will be varied suiting many levels of qualifications and experience from entrepreneurs, small business, builders, designers, restoration ecologists, bush regenerators, maintenance staff and contractors."*[51]

More recently, the current Australian government embarked in supporting the reduction of emissions or pollution – both nationwide and globally. Such policy matters have been assigned to *"The Climate Change Group of the Department of Prime Minister and Cabinet".* As a result, the government is now offering:-

a) Abatement incentives
b) Assisting discussions and implementing of the National Greenhouse and Energy Reporting Bill (2007)
c) Encouraging national carbon neutrality, through trading schemes and modern investment opportunities

With government input, SIDI and community groups believe that the *'grand regional park'* can be initiated (in stages) and progressively come to fruition.

1.3 Importance of the "*Blue Carbon System"*

[51] Residents of Northern Illawarra, Proposal for a Illawarra Foreshores regional Parklands, March 2006

Illawarra's waterways and wetlands are public assets and wildlife environments which should not be exploited, mistreated (as some have over the past) or sold. They should be seen as vital public assets and not as liabilities, such as stinking swamps and drainage systems. They are important parts of the global *blue-carbon system* (combined coastal environments) which act as *carbon sinks, i.e.,* they help prevent global warming and climate change. Because of their importance they should be maintained and in some cases even restored.

The *blue-carbon system* supports *phytoplanktonic* habitats and organisms e.g., microorganisms, sea grasses and mangroves, which in turn support higher life forms. The benefits of the *blue-carbon system* are summarized in dot point, namely

a) *Phytoplankton* capture the sun's energy or radiation, carbon dioxide and nutrients to make its own food (via *photosynthesis*), and in turn provide oxygen and food (raw materials) to higher living things. Despite being the lowest form of plants, all other life forms depend on it. It maintains the animal kingdom. ***Fact****: Phytoplanktons are the basis of life.*

b) Not only do they do that, but relative to terrestrial plants, they produce food and oxygen on a grand scale. As a result, humanity should look after the blue-carbon system or habitats. ***Fact****: Phytoplanktons maintain the animal kingdom, including you and me!*

c) The blue-carbon system provides refuge for aquatic birds (e.g. mutton birds, plovers, sandpipers, stints, curlews, and so on) which migrate from northern to southern hemispheres, and back.

Regrettably, man-made pressures (especially throughout eastern and south-eastern Asian developing countries) are contributing to wetland habitat loss and wetland degradation, and which is a major threat to such migratory waterbirds. Such detrimental impact not only affects the migratory waterbirds, but also global climatic conditions and subsequently coastal communities. Thus, the conservation of the blue-carbon ecosystem is crucial as far as global constancy is concerned.

> *"To ensure their conservation the Australian Government has fostered international cooperation through a range of important agreements, including the Ramsar Convention and the Convention on Migratory Species, bilateral agreements with Japan, China and the Republic of Korea, and through the recently launched East Asian — Australasian Flyway Partnership. A range of important activities have also been undertaken within Australia to conserve migratory waterbird populations and their habitats."* [52]

d) The blue-carbon system provides habitats even for endangered animal and plant species.

> *"The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is the Australian Government's principal piece of environment legislation.*
> *The EPBC Act protects Australia's native species and ecological communities by providing for:* [53]
> - *"identification and listing of species and ecological communities as threatened*
> - *development of conservation advice and recovery plans for listed species and ecological communities*
> - *development of a register of critical habitat*
> - *recognition of key threatening processes*
> - *where appropriate, reducing the impacts of these processes through threat abatement plans"* [2]

[52] Australian Government, Department of Sustainability, Environment, Water, Population and Communities; Migratory Waterbirds; http://www.environment.gov.au/biodiversity/migratory/waterbirds/index.html
[53] Australian Government, Department of Sustainability, Environment, Water, Population and Communities; Threatened species & ecological communities, http://www.environment.gov.au/biodiversity/migratory/waterbirds/index.html

e) The blue-carbon system acts like a highly efficient *carbon sink* or a global carbon absorbent - a carbon collector.

f) *Aquatic phytoplanktons* also absorb and 'hold' more carbon and produce more global oxygen relative to terrestrial plants. They produce more oxygen than the Amazon rainforest. In other words, *phytoplanktons* are the true lungs of our planet.

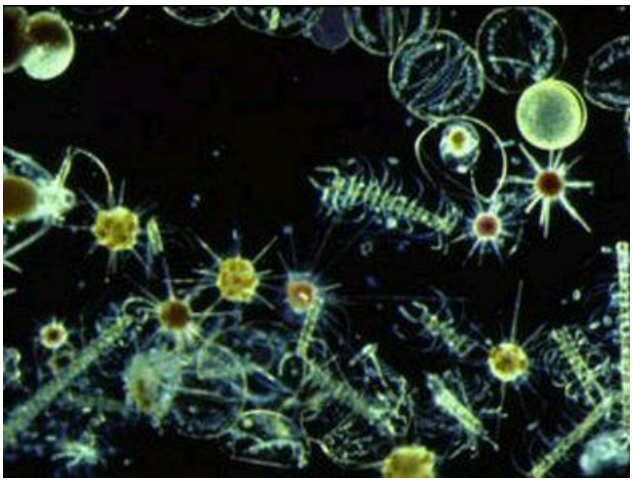

Figure 1: Marine *phyoplanktons* (microscopic plants).[54]

Just like terrestrial plants, the *microalgae* (*phyoplanktons*), *macroalgae* (*seaweeds*) and *seagrasses* utilize sunlight, nutrients and carbon dioxide to produce its own food. The major difference between the algae and seagrasses is that the algae obtain their nutrients directly from the water through their body while the seagrasses from the sea sediment and via their roots. The phytoplanktons live for only a short time (days-to a few weeks) before being eaten by z*ooplanktons* (microscopic animals), which in turn are eaten by higher animals, Figure 2.

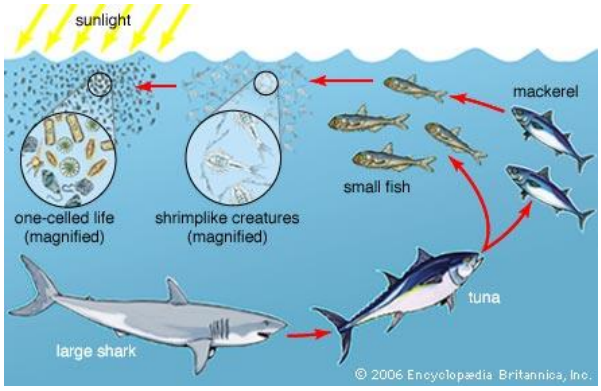

Figure 2: Oceanic *food web*[55]

[54] Image: http://www.youthareawesome.com/plankton-planet/
[55] Credit: Encyclopedia Britannica, Inc.

All in all, algae and seagrasses are categorized as *"primary producers."* They bring in *energy* into the *food web* by *"fixating solar energy"*, and releasing oxygen into the water and atmosphere. This can be shown diagrammatically by Figure 3.

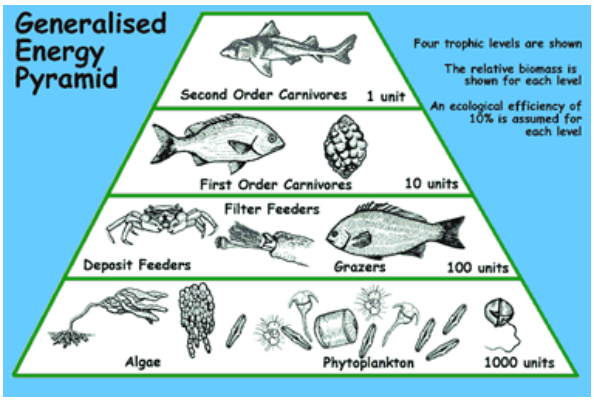

Figure 3: Phytoplanktons bring (sun's) energy into the food chain[56]

g) Scientists mapped the global distribution and abundance of phyoplanktons. They show that high concentrations are generally found around higher latitude or within colder waters. Southern and South-Eastern Australia (including Illawarra) falls into this category, (Figure 4).[57]

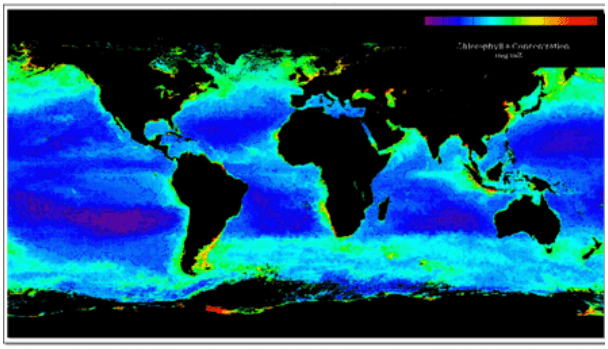

Figure 4: Global phyoplanktonic distribution and abundance[4]
(Green, yellow and red are high density areas)

h) Also relative to terrestrial plants, the blue-carbon system sequesters carbon more effectively, up to 100 times faster and more permanently.[58] This is because when coastal vegetation dies off and deposits on the seafloor, under *anoxic conditions* (without oxygen), the dead plant matter does not decompose (rot). Decomposition is inhibited underwater as *aerobic bacteria* (oxygen bacteria) are limited. Because it fails to rot or is extremely lethargic the organic matter simply amasses (collects) over time. Over longer periods, such sedimentary organic matter turns into beds and some transform into peat and sometimes into coal. Reliable scientific data support the fact that the blue-carbon system acts as:-

[56] Keith Davey, MESA, Life on Australian Seashores, http://www.mesa.edu.au/friends/seashores/energy_pyramid.html
[57] Donat-P.Häder, Neue Str. 9, 91096 Möhrendorf, Germany; donat@dphaeder.de
[58] http://www.thebluecarbonproject.com/the-problem-2/

i. a global ‘aquatic nursery’ for a myriad of marine life
ii. breeding and resting ground for wildlife
iii. buffers against floods
iv. supporters of a wide variety of flora (plants) and fauna (animals)
v. a filter and detoxifier of pollutants[59] and bacteria. It improves water quality
vi. a living habitat for scientific research and educational purposes

Part-I summary:

If a quality *‘grand regional park’* is to be built in the Illawarra region, it would be a significant *blue-carbon sink* and a *vital ecosystem for a myriad of coastal life forms*. In conjunction with that, it would enhance Wollongong’s image, attract visitors/tourists, and who would subsequently complement the Illawarra’s economy. It will create jobs.

Furthermore, the Wollongong Council and associated businesses will recoup their outlay by means of sustainable and permanent Eco-Tourism. Illawarra’s grand enterprise should be vied as a regional asset and not as a liability.

[59] Pollutants (refer to Appendix-I)

6.1.2

A NEW VISION FOR ECO-CITY WOLLONGONG[60]

Part-II

II. Waste as a Resource:

Introduction:
By recycling municipal and industrial wastes we not only help clean up the environment, but we also reuse old and unwanted materials to make new products.

Energy wise, it is also beneficial (cheaper) to recycle rather than to process new supplies from raw materials, especially scrap metals, e.g., from bauxite to aluminium or from iron ore to iron and steel.

2.1 Municipal and industrial wastes

Within the Illawarra region, waste recycling is quite advance. Numerous businesses are already recycling scrap metals, glass, plastics, uncontaminated wooden materials (paper and cardboard), industrial liquids and solids, tailings, chemicals, building materials, and so on.

For example, the *Wollongong Wastewater Recycling Plant* (WWRP) is treating and recycling municipal and industrial wastewater. By doing that, it is reducing outflow dumping into the sea, thus helping the *Blue- carbon system*.

Yes, it was only in the recent past that our major cities (e.g. Sydney's Malabar sewage treatment works) used the ocean as a grand cesspool and dumping ground. The policy of the time was, well, *"it's free dumping."*

Today, the practice is a great deal better as sewage treatment stations along the eastern seaboard of Australia dispose 'treated outflows' deep and far under the sea or they recycle it. Using bacterial digesters, sewage solids are converted to methane and which is subsequently used to make electricity.

Despite all the good intension, Australia is still 'freely dumping' a lot of its wastewater into the Pacific Ocean, and its sewage stations are still not carbon neutral. The existing philosophy is, 'whatever effluent goes to sea, well, it was treated and so it seems acceptable – and of course the sea currents will take it far and wide, and disinfect and disperse it.'

Anyway, the treated wastewater from the WWRP subsequently passes to the steel industry. In turn, the steel industry uses it in lieu of potable water from public water supplies managed by the Sydney Water Corporation.

All in all, objectives of wastewater treatment plants of Illawarra are:[61]

1) Address water quality issues at beaches
2) Protect aquatic ecosystems

[60] Anton Josip Dominis; November 2012, *"A new vision for Eco-City Wollongong"*, Report Part II, Written on behalf of Hi-Tech Consulting (HTC), Community Liaison Environmental Action Network (CLEAN) and Sustainable Industries Development Institute (SIDI)

[61] Sydney Water Corporation-Illawarra Waste Water Strategy, Consolidation of Ballambi, Wollongong and Port Kembla Sewage Treatment Plants; Director-General's Report, Section 115C, Environmental Planning and Assessment Act, May 2001: NSW Department of Urban Affairs and Planning, www.duap.nsw.gov.au ISBN 0 7347 0135 7

3) Reduce the impacts of unsewered areas and sewage overflows to Lake Illawarra, rivers, lagoons and streams in the region
4) Facilitate effluent reuse
5) Improve the performance of the existing systems, and
6) Service growth and new development in the region

2.1.2 Industrial wastes to value added by-products

It was only in the recent past (pre-1970's) that Illawarra's industrial wastes were simply dumped into places of easiest access or convenience. However, due to government and community pressures such practices were stopped. Thus, it became feasible to recycle wastes.

Morally speaking, it also wasn't fair for profit making industries to dump their wastes into public areas and destroy natural flora and fauna - *and for free*. That is, into oceans, rivers, swamps, lowlands, and so on.

Because of government environmental restrictions (at least in the developed world), polluters were 'forced' to change their practices or were heavily fined. Thus, they turned to recycling wastes or to pass them on to those who could.

To make things happen faster, sometimes technological expertise was acquired from abroad. For example, the so-called *"Bug Plant"* within Port Kembla steelworks was established by a German company. The treatment plant processes hot toxic Coke Ovens wastewater (both biologically and chemically). After the treatment of toxic wastewater, it's then recycled back within the industry.

Previously to that, such wastewater was partly treated (cooled and stagnated within large open pits to deposit its particulates) and then gradually released into the public harbour (Port Kembla Inner Harbour), and which sometimes cause fish kills. Thanks goodness such a practice is now history.

By processing such wastewater, it not only helped the industry and appeased the government and community groups, but it also helps preserve the marine environment – the *blue carbon system*.

Regrettably, some 'recycling' projects throughout the Illawarra region did not come to commercial fruition. Private research groups also carried out similar R&D, but again, to no avail.

Because of such tendencies, it seems that the local people with knowledge, skills and the will to bring about a change for the better are somehow impeded by a plethora of bureaucratic complexities and most of all, finances. Despite good intentions, and one way or another, smaller players are squashed.

2.1.3 Compost for farms, parks, gardens and green roofs

The benefit of composting (*decomposition* or *rotting* by *aerobic bacteria*) using uncontaminated wastes is globally well known and widely practiced.

It's also well known that composts are rich in organic matter and improve physical, chemical and biological characteristics of soils. That is, soils retain moisture and nutrients, and thus

become stable to microbial activity and pH conditions, more resistant to drought, diseases and toxicity. Under such conditions, crops yields can increase.

Knowing all this, untainted composts can be used on farms, parks, gardens, balconies and green roofs. It can also be sold and used further afield – to improve arid soils.

As far as Illawarra is concerned, which is in an ideal climatic zone and technologically resourceful, it produces a lot of uncontaminated organic matter (municipal and farm wastes). If treated centrally or at specific places and on a grand scale, it would be beneficial. It would not only produce compost but also methane gas from which electricity could be made. SIDI believes that the *Smart/Hi-Tech/Eco-City* should take advantage of such resources.

2.1.3.1 Detrimental effects of composting

Excluding the release of water and heat, compost heaps, which are *anthropogenic* or *biogenic sources*, discharge a number of environmentally detrimental gases, namely

- *Carbon dioxide* (CO_2)
- *Carbon monoxide* (CO)
- *Ammonia* (NH_3)
- *Methane* (CH_4)
- *Nitrogen dioxide* (N_2O)
- *Hydrogen sulphide* (H_2S)
- *Organic acid (fulvic, humic, phenolic)*
- *Ozone (O_3),* and
- *Other volatiles*

Fact: *Anthropogenic or biogenic sources* are due to agriculture and waste disposal. That is, by enteric fermentation, rice culture, human and animal wastes, biomass burning and rubbish dumps (landfills).
Methane is also emitted *naturally*, by wetlands, oceans, seas, lakes, ruminants (grazing animals such as cattle, sheep, horses and pigs), termites, humans, volcanoes, coal mines (and ignited coal mines), and underground gas deposits which leak. The ratio of anthropogenic versus natural sources is 2.75:1
There is only one major methane sink and two minor ones. As for the atmosphere (or more specifically, for the troposphere, i.e., atmosphere below 10,000 meters in altitude), atmospheric hydroxide radical (OH), can remove ~90% of atmospheric methane. In other words, it destroys methane.
The remainder 10% is dispersed. Some is lost to the stratosphere and some is absorbed by the soil and which reacts (oxidizes). Atmospheric concentration of methane is measured in *teragrams* per year (Tg CH_4/year).

With the exception of ammonia, compost heaps release *'greenhouse gases'* which contribute to the *'enhanced greenhouse effect'* or to the environmental problem. Thus, SIDI believes they should be utilized.

According to a scientific study,[62] atmospheric methane concentration from pre-Industrial Revolution (mid-19th century) to the present increased dramatically, and especially during the last century, and which collates well with global temperature rises.

According to supplementary scientific data,[63] atmospheric methane pre-Industrial Revolution was about 650 ppbv (*parts per billion (10^9) by volume*). During the early 20th century it

[62] Wuebbles. D. J. and Hayhoe K; Atmospheric Methane: Trends and Impact: Department of Atmospheric Sciences, University of Illinois, Urbana, Il; 2002; http://www.atmosphericresearch.com

[63] Etherige, D., Steel, L., Francey, R and Langenfelds, R., 1998. Atmospheric methane between 1000AD and present: Evidence of anthropogenic emissions and climate variability. Journal of Geography Research; 103, 1597-15993;

increased to 800 ppbv and during the early 21st century to 1500 ppb, and is still rising. So over the last two centuries, atmospheric methane more than doubled and which is not good.

It's also known that atmospheric methane longevity is less relative to carbon dioxide, and breaks down (*dissociates*) to carbon dioxide. Furthermore, that it absorbs 20 times more heat (*infrared radiation*) relative to carbon dioxide. Thus, it is a major 'greenhouse gas' – and a real threat!

Excluding the Siberian (now, Russian) cataclysmic event that happened about 250 million years ago, including global subsequent atmosphere which needed to stabilize over the next 20-30 million years, a stable atmosphere of gases was produced and which was analogous to pre-Industrial Revolution (~ 200 years ago).

A factual story:
About *250 million* years ago, a cataclysmic event took place in Siberia (now, central northern Russia) which subsequently affected the entire planet. The event was so huge that it caused mass extinctions all over the planet. It took the planet between 20 and 30 million years to recover. This is how it happened.
This cataclysmic event occurred when a *mantle bubble* or *magma plume* (a huge underground bulge of molten rock) ruptured the Earth's crust and in the process ignited vast underground coal deposits which formed in the region more than 300 million years ago. Because of the area's vast coal deposits, scientists portray that it must have been covered by swamps and forests, and inhabited by all sorts of animals – dinosaurs. What's more it was a climatically warmer region relative to the present.
Scientists also estimate that the area in question was about the size of Australia or USA and that such violent volcanic activity lasted about 1 million years. Scientists (volcanologists, geologists, chemists, biologists, and etc) confirmed this said by studying the *"Siberian Traps"* (or the *Siberian landform*).
During the cataclysmic period, Siberian swamps and forests quickly perished and with them most animals. The place turned into a vast region of black basalt rock, and as said - void of most life.
Beneath the Siberian ground and under *reduced conditions* (absence of air) volcanic gases and coal volatiles (*methane, ethane, carbon dioxide, carbon monoxide, ammonia, hydrogen, hydrogen sulphide, tars (phenols, naphthalene, antracene and pitch), light oils (benzene, toluene, xylene), water vapor, and etc*) spewed into the air and polluting the atmosphere and which added to surface destruction.
In due course, the poisonous pollution spread all over the planet and caused global warming, i.e., enhanced greenhouse effect. With that, the polar ice melted, seas rose, and the flora and fauna strived to adapt under the changes. Scientists predict that the global effect was so cataclysmic that it killed most living things on the planet, i.e., over 95%.
What's more, that the Earth's atmosphere (~250 million years ago) had three (3) times the carbon dioxide relative to the present and which added to the concoction of spewing coal volatiles.
Animals which survived were those that perhaps adapted within less affected areas of the planet (underground and/or underwater), and that the humanoids species may have evolved from one such an animal. Yes, at the time living thing tethered on the verge of total destruction and it could happen again.
The moral of the story is that global warming can be a natural phenomenon and that it plays a role in shaping our planet. However, over the last century, mankind perhaps acerbated the problem by excessive burning of fossil fuels and exploitation of world resources.
Currently and in general, most developing countries, with large populations (e.g. China, India, Brazil and South-East Asian countries), ignore environmental problems as their priority is to match the living standards of the developed world (and quickly). That is, just like they see on Western films and TV. If the trend continues the world will definitely become a different place.

According to geological history going back 250,000 years, our planetary atmosphere was low in carbon dioxide and methane. However, and as said, both gases increased dramatically from the Industrial Revolution to the present, particularly over the last century.

Thus the question; *'is global warming a natural thing or is it acerbated by humanity?'* Nonetheless, the impact is of great concern and which must be addressed. Thus, to help minimize the problem (at least in the Illawarra) SIDI believes that large scale modern compost treatment plants should be established and properly managed. Under apt management, compost

gas emissions can be scrubbed out or collected and reused. For example, methane gas can be used as a fuel.

2.2 Farm wastes:

Illawarra's outlying region is considered to be a 'prime dairy country'. Unfortunately, and like many other major dairy areas of the developed world, it is gradually becoming a 'factory farming' region. That is, it has high concentrations of cattle (and other grazing animals), and which naturally produce a lot of wastes, namely faeces, urine and methane. Accordingly, such animal wastes need to be treated.

In combination, unrestrained animal waste is in essence *'farm pollution'* which (at times) some of it ends up as runoff and can pollute waterways. In some countries this is a serious problem. According to scientific sources, 18% of global 'enhanced greenhouse emissions', measured as $CO_{2(gas)}$ equivalents, is due to livestock production. What's more, global ammonia, $NH_{3(gas)}$, accounts for 64%.

Present farming practices in Illawarra is to mix water with animal wastes to form a slurry (*liquid manure* or *fertilizer*) and then to spread it onto grazing lands. Unfortunately this is a short-term solution and with associated risks. That is to say, if the grasses or soils are unable to absorb the liquid fertilizer or if it's used in high concentration, the excess can make its way elsewhere. It can seep belowground and eventually percolate into the underground water system, and beyond. As a result, it can contaminate soil(s), surface water, groundwater and eventually seawater.

2.2.1 Detrimental 'farm pollution'

Liquid fertilizer can spread easily. It can mix with water and 'flow' through soil, i.e., due to gravity. It can easily soak into topsoil and get into the subsoil, water table and eventually into aquatic habitats.

Liquid fertilizer is environmentally detrimental as it contains high levels of *nitrogen* (N), *phosphorus* (P) and other minerals, i.e., it has *macro* and *micro nutrients*. If unchecked, liquid fertilizer can lead to uncontrolled plant growth (*weeds*), including uncontrolled algal growth (*algal blooms*) in water systems.

In turn, algal blooms have detrimental effects on fish including other animal species living within the water habitat. For example, algal blooms produce toxins and consume *dissolved oxygen* (DO) from the water, especially at night, causing the fish to suffocate.

Milk spill (either intentional or unintentional) is also considered a rural pollutant. It is a highly nutritious bacterial food. Bacteria (animal microorganisms) readily consume it along with DO, and add to the decline in DO and regrettably, to fish kill(s).

Farm rubbish (*dumped vehicles* and *machinery*) and agricultural chemicals (*herbicides, pesticides, fungicides, agricultural medicines* and *detergents*) sometimes end up with farm liquid fertilizer, and which together become a poisonous concoction. If it gets into the waterways it can bring about parasitic infections on higher animals living within such habitats, namely to frogs, fish, birds, reptiles, e.g., some become severely deformed.

In such highly polluted waterways common bacteria can metamorph into *'antibiotic resistant bacteria'*, which in turn can spread havoc further afield. In addition to the ecological effects,

such polluted aquatic systems are unsightly, smelly, and unsuitable for irrigation, for animal drinking, including for recreational purposes.

As of yet, dairy farmers of Illawarra efficiently manage their dairies (and small farms), including water systems which are on their properties. However, because of ever-increasing competition from corporate sectors (domestic or international), traditional small farming is looking evermore so ominous. Once under such new management(s), small diverse farming practices transform into a large mono-farming. That is, large 'factory farms' which are driving small farmers into extinction.

The scope of HTC, SIDI, CLEAN, IETA, and a number of other associate community groups throughout the Illawarra district is to support traditional diverse farming practices in conjunction with proper waste management practices and blue-carbon values, and that they become sustainable and permanent. To meet the Australian-Kyoto accord, 'factory farm wastes' should be treated according to 'factory-style' processes. So, let's take the initiative and start in the Illawarra region.

Summary-Part II
This above said can be summarized in dot points:-

- To help prevent pollution, i.e., atmosphere, soil and water
- To help restore and maintain regional ecosystems
- To conserve materials, including precious water
- To reduce garbage in landfills
- To save energy
- To help Australia meet its policies as according to the Kyoto Protocol, and
- To encourage people with knowledge, skills and the will to bring about a common good to succeed, and if need be with government help

6.1.3

A NEW VISION FOR ECO-CITY WOLLONGONG[64]

Part-III

III. Building Infrastructure:

3.1.0 Solar panel power, white roofs and skylight systems

"Solar energy is the cleanest and greenest source of renewable energy generated electricity available to help power your home, business or community building - and nowadays, the cheapest too!"[65]

The meaning of the above quote means is: instead of using fossil fuels, households can use solar energy for their everyday household appliances, e.g., hot water systems and swimming pools. By adopting solar technology, greenhouse gas emissions are significantly lowered, including energy bills.

"In a country like Australia with abundant sun and rising electricity costs, a technology like solar that requires no maintenance, makes no noise and produces electricity for 25 years will always have strong customer appeal."[66]

The government and energy providers can help consumers fit a system whereby they can use solar power and eventually save. This can be done in two ways, namely by:-

1) Feed-in Tariffs (FiT's) and
2) Solar credits through Small-scale Technology Certificates (STCs)

FiT's are designed to encourage more Australians to generate their own clean electricity and to help the government meet its 20 per cent Renewable Energy Target, which has largely been a success. However, over the past 12 months, state governments have begun winding back the amount paid to household generators causing an outcry from consumers."[10]

In simple terms, STC means 'rebate' or 'discount'. What is means is that the customer pays for the solar equipment and installation, and the government give some discount, e.g.,

Installation of 1.5kW solar equipment:	$10,000
Government rebate:	$2,000
Customer pays:	$8,000

The criteria to install the solar equipment are that it is approuved by the Clean Energy Council, installed by an accredited trade's person and is less than 100kW. For added information, readers should seek information elsewhere.

3.1.1 How much power do solar panels generate?

Relative to other types of solar panels (e.g. *polycrystalline*, meaning *'many crystals'*), if *monocrystalline* (meaning *'one crystal'*) solar panels are used, as they have high efficiency and slow degradation rate, it will be viable to install such solar panels.

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[64] Anton Josip Dominis; November 2012, "A new vision for Eco-City Wollongong", Report Part III, Written on behalf of Hi-Tech Consulting (HTC), Community Liaison Environmental Action Network (CLEAN) and Sustainable Industries Development Institute (SIDI)

[65] http://www.energymatters.com.au/renewable-energy/solar-power/

[66] http://au.pfinance.yahoo.com/compare/energy/article/-/12721003/solar-panel-rebates-how-much-you-could-save/

At present, most household solar panel systems are either 1.0 kiloWatt (kW) or 1.5kW. Table-2[67] shows the average daily solar energy production throughout Australia.

Table 2:[16]

Average Daily Solar Energy Production					
City	**1kW system**	**1.5kW system**	**2.0kW system**	**3.0kW system**	**4.0 kW system**
Sydney	3.9kWh	5.85kWh	7.8kWh	11.7kWh	15.6kWh
Melbourne	3.6kWh	5.4kWh	7.2kWh	10.8kWh	14.4kWh
Brisbane	4.2kWh	5.4kWh	8.4kWh	12.6kWh	16.8kWh
Adelaide	4.2kWh	6.3kWh	8.4kWh	12.6kWh	16.8kWh
Hobart	3.5kWh	5.25kWh	7.0kWh	10.5kWh	14.0kWh
Perth	4.4kWh	6.6kWh	8.8kWh	13.2kWh	17.6kWh
Darwin	4.4kWh	6.6kWh	8.8kWh	13.2kWh	17.6kWh

3.1.2 How much money will households save on electricity bills using solar power?

"The average Australian house consumes around 18kWh per day so the size solar system you choose will depend on if you want to partially offset your energy consumption or completely offset your household's electricity use.

For example, a resident in Sydney with a 1.5kW solar system could produce 5.85kWh and with the current NSW feed in tariff scheme of 20c per kWh, they would save $427.05 per year (approximately 35% off the average annual electricity expense)."[10]

So, imagine if 10 households utilize such a system, the saving would be *$4,270.50 per year*. For100 households it would be $42,705. For 1,000 households it would be $427,050 and for one million households it would be $427,050,000.

According to the 2011 Census of Population and Housing Basic Community Profile Illawarra,[68] there are 114,124 private dwellings in the district. So, if each one saves $427.05 per year by installing solar panels, the total saving would come to $48,736,654.20 (about $49 million).

What's more, if the non-private sector (government buildings and its other properties, shopping centres, schools, CBD and industry) follow suit, it would account for much, much more. Thus, for the Illawarra district and the third biggest city in NSW, Wollongong, the energy saving costs would be enormous. However, it's up to the government to set proper incentives and guidelines for that to happen.

3.2.1 White Roofs

According to the Lawrence Berkeley National Laboratory Heat Island Group in Berkeley, California, *white roofs* reduce energy use by about 20 percent.[69]

[67] Data Source: PV-GC spread sheet based on the CEC Design Guidelines
[68] 2011 Census of Population and Housing Basic Community Profile Illawarra; http://www.abs.gov.au
[69] Mother Earth News, http://www.motherearthnews.com/Green-Homes/Cool-Roof-White-Roof.aspx

Also according to Hashem Akbari, a professor of Building, Civil and Environmental Engineering at Concordia University in Montreal, Canada, he claims that by switching to reflective roofing (and pavements) in world's urban areas, it would offset the equivalent of emissions from the planet's 600 million cars for the next 18 years. He also claims that a 1,000-square-foot (92.9 m^2) cool roof saves air conditioning power that would otherwise emit about half a ton of carbon dioxide per year.[70] *(The average total square footage of a home in the United States is more than 2,000 (more than 200 m^2).* Professor Akbari says *"if you need cooling in the summer and heating in the winter, no matter where you are, a white roof will most likely save you money."*[71]

Figure 1: Installation of a *'white roof'* [72]

All things considered, *white roofs* will save energy costs and thus are deemed important, especially for Australian conditions. Lets' promote white roofs in Wollongong!

3.3.0 Skylight Systems

Skylight systems complement *white roofs* and *solar panels*. That is, they let sunlight into buildings, thus avoiding the use of electrical power (e.g. lights/heating) during daylight hours.

If households, shopping centres, government and industrial buildings adopt some king of skylight systems, to some degree, they would offset the equivalent of carbon emissions.

[70] By Amanda Kimble-Evans, February/March 2010 http://www.motherearthnews.com/Green-Homes/Cool-Roof-White-Roof.aspx#ixzz2CScw4QRd
[71] By Amanda Kimble-Evans, February/March 2010 http://www.motherearthnews.com/Green-Homes/Cool-Roof-White-Roof.aspx#ixzz2CScw4QRd
[72] Courtesy of NREL/CRAIG MILLER PRODUCTIONS/DOE; http://www.motherearthnews.com/multimedia/image-gallery.aspx?id=2147485997

Figure 2: Skylight systems save electrical power during daylight hours[73]

[73] Photo by Anton Dominis and Frank Caluccio, Rouse Hill, Sydney, December, 2012

Figure 3: Skylight system at Rouse Hill Shopping Centre[74]

[74] Photo by Anton Dominis and Frank Caluccio, Rouse Hill, Sydney, December, 2012

APPENDIX-I:

Glossary:

Blue carbon; the term refers to the global role of oceans and its coastal systems, i.e., saline and freshwater wetlands.

Carbon footprint; is a modern term which denotes the amount of carbon dioxide gas (CO_2) emitted into the atmosphere by daily activities, i.e., by burning fuels such as wood, coal, oil products and natural gas. Everything that is combustible (able to be burnt in air) produces carbon dioxide gas. The greater the anthropogenic (man-made) activity and material use, the greater the air pollution (carbon dioxide, a *greenhouse gas*) and greater the *carbon footprint*.

Back casting; "The concept of '*back casting'* is central to a strategic approach for sustainable development. It is a way of planning in which a successful outcome is imagined in the future, followed by the question: 'what do we need to do today to reach that successful outcome?" [75]

Organisations:

1.	Borst & Conacher Architects, Wollongong	
2.	CLEAN	Community Liaison Environmental Action Network
3.	ECZMC	Estuary Coastal Zone Management Committee –WCC
4.	ETV	Eco Tourist Village
5.	HTC	Hi-Tech Consulting, Wollongong
6.	ILALC	Illawarra Local Aboriginal Land Council
7.	NPA	New South Wales National Parks Association – Illawarra
8.	NPWS	National Parks & Wildlife Service
9.	RMS	Roads & Marine Services [former Roads & Traffic Authority]
10.	SIDI	Sustainable Industries Development Institute
11.	SRA	State Recreation Area
12.	WCC	Wollongong City Council
13.	WEA – IR	Workers Educational Association – Illawarra Ramblers

Pollutants:

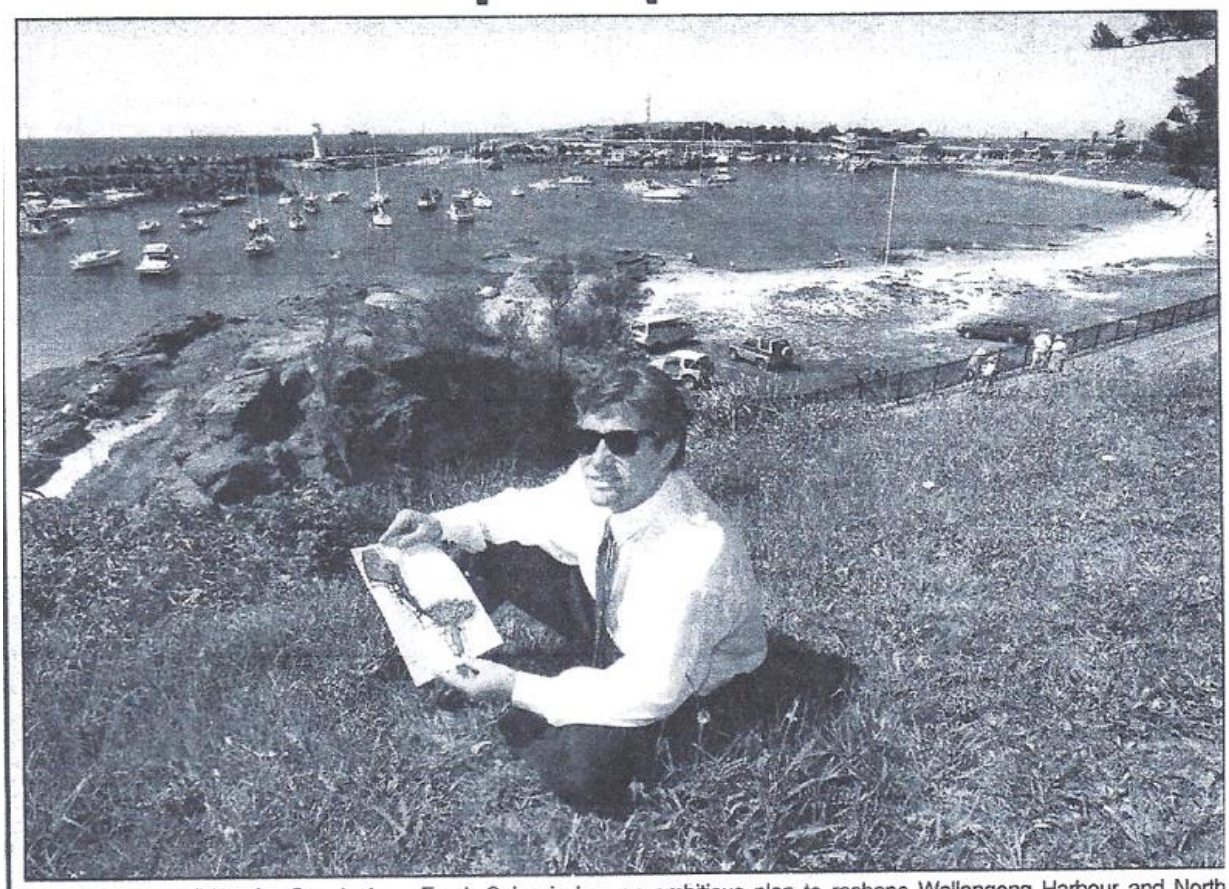
1) Agricultural fertilizers (macro and micro nutrients)
2) Fluoride
3) Food additives (especially pharmaceutical drugs such as antibiotics)
4) Heat
5) Heavy metals
6) Household chemicals (e.g. detergents)
7) Industrial chemicals and wastes
8) Organic wastes (e.g. oils and greases)
9) Polychlorinated biphenols (PCB's) - constitute a class of 209 compounds*
10) Pesticides (organochlorine compounds – from agricultural discharges)*
11) Radioactive contaminants (e.g. from coal-fired power stations)
12) Sewage
13) Toxic waste dumps
14) Waste disposal (household and industrial)

* *Organochlorine pesticides are environmentally stable, bioaccumulative, toxic or carcinogenic. Thus, they should be monitored.*

[75] http://www.naturalstep.org/backcasting, The Natural Step, AEST 18.40, 9/05/2013

APPENDIX-II:

Eco-tourism park plan for harbour



Independent candidate for Cunningham Frank Coluccio has an ambitious plan to reshape Wollongong Harbour and North Wollongong into an eco-tourism area.

Picture: ORLANDO CHIODO

By NALITA FERRAZ

A federal election candidate has developed an ambitious plan to turn Wollongong Harbour into an eco-tourism park.

Independent candidate for Cunningham Frank Coluccio will push to have part of Cliff Rd made into a one-way street with angle parking and a bus bay area at Battery Park.

A privately run marina, forecourts, outdoor eating areas and other traffic changes are all part of Mr Coluccio's plan.

The 36-year-old Wollongong resident said the design would encourage people to park their cars and walk along the harbour foreshore rather than using the area as a thoroughfare.

"This area is too beautiful to be destroyed by through traffic," Mr Coluccio said yesterday, while admiring Wollongong Harbour.

Under the plan:

❑ An eco-tourism education centre complete with cafe and viewing platform would be built at Puckey's Estate.

❑ A Novotel forecourt would link the hotel with the beach and allow for cafes with outdoor eating areas.

❑ Cliff Rd, between Bourke St and Georges Place, would become one-way for traffic and bus bays would be built for tourist transport. The beachside road would be blocked between Osborne Park and Harbour St with turning bays at either end.

❑ A privately operated marina and cafe would be established in Wollongong Harbour.

❑ The old courthouse could be turned into an environmental museum or restaurant with a forecourt and outdoor eating areas, room for markets and art exhibitions.

❑ Endeavour Dr would be one-way traffic with angled parking around Flagstaff Hill.

❑ The slipway area at Wollongong Harbour would be converted back into a jetty and fishermen's wharf-type development to accommodate a ferry service between Sydney and Wollongong.

The plan also includes construction of a tram link between the City Beach development and the Science Centre along Marine Dr, Cliff Rd, George Hanley Dr and Squires Way.

"The plan is very ambitious but we've already got it all here, we just need to use it more efficiently," Mr Coluccio said.

"It wouldn't take much time - maybe a week - to change the traffic around but it will need co-operation from everyone."

Mr Coluccio believes his plan would create jobs for young unemployed people.

Figure 1: Independent candidate for Cunningham, Frank Coluccio, 1998[1]

Businessman Frank Coluccio believes his concept of turning Wollongong into Australia's first eco-city is being thwarted by political differences with Lord Mayor George Harrison. Picture: DAVID TEASE

Eco-city idea stalled by political bunfight

By DAVID ILIFFE

Businessman Frank Coluccio believes he has a viable blueprint to turn Wollongong into Australia's first "eco-city".

But he has despaired of his plans ever being considered, claiming yesterday that Lord Mayor George Harrison refused to see him because of political differences.

Mr Coluccio's vision for the city includes a foreshore plan making part of Cliff Rd into a one-way street to keep through traffic out, a marina at Belmore Basin, an eco-tourism resort at Puckey's Estate and a terminal at Wollongong Harbour to accommodate a fast-ferry service to Sydney - with three large park and ride facilities linked by a light transport network to feed the service.

Tourists would be fed into the foreshore area via a road tunnel from Mt Ousley Rd, under the Northern Distributor, to Squires Way.

Under Mr Coluccio's plan, an environment, technology and business park would be built at Brandon Park.

His ambitious plan was an alternative to the "ad hoc development" currently occurring throughout the city.

He said the environment, technology and business park would create a large number of jobs and give Wollongong prominence on the national and international environmental scene.

"It would make Wollongong a centre for environmental excellence, but at the moment they're just talking about it," he said.

Mr Coluccio said he made an appointment to discuss his vision with Cr Harrison about three weeks ago but was shocked to be turned away.

"When he had agreed to meet with me, it was before the Sandon Point rally," he said.

"But he saw me protesting at the rally and then on the Monday afterwards when I turned up for my appointment he said he didn't want to speak to me."

Cr Harrison said Mr Coluccio had no game plan and could not be taken seriously: "No-one can take him seriously when he turns up protesting against Sandon Point saying 'stop all development'.

"The only thing Frank Coluccio knows how to do is demonstrate."

Figure 2: Frank Coluccio plans to turn Wollongong into Australia's first Eco-City, 2001[3]

Business

Blueprint of the Wollongong into future: transforming nation's first eco-city

Way of life the envy of day visitors

By GREG ELLIS

Frank Coluccio and Paby Sahira have a plan.

The directors of Hi-Tech Consulting, an engineering, management consultancy, have developed a blueprint for a multi-million dollar transformation of Wollongong into Australia's first eco-city.

"We have got the landmass, all we need is the water to bring the harbour and wetlands in time," Mr Coluccio said of Wollongong.

Stripped of the jargon, the idea is to create a "freshwater park" extending from City Beach to Fairy Meadow Beach.

The idea is for the area to eventually be developed as a commercial and residential centre, complete with a marina, dominated by virtually extending Lang Park all the way to Stuart Park.

Mr Coluccio said the subprism of commercial space, stretching along Cliff Rd and open into a number of residential streets, would be the ideal location for tourists and visitors.

"It would make the city more liveable," he said.

Mr Coluccio said the buzzword at first foreshore would be "access", with a new pedestrian and cycleway linking the city centre to the beaches.

He said a fast ferry service would also be established to Sydney, which would be envisaged as a "water taxi" service.

"It complements what Sydney already has," he said.

The plan includes the introduction of cross-way bridges around Flagstaff Hill, the extension of a paved area to a landscaped park between the Illawarra Yacht Club and Belmore Basin, and the creation of a light rail loop along Cliff Rd between the city centre and the beaches.

Mr Coluccio said the blueprint was the result of a year-long study by Hi-Tech Consulting and Professor Robert Stimson of the Queensland University of Technology and Business Park.

It would be a Centre of Environmental Excellence, with the Wollongong Campus and the Science Centre into an Environmental Technology and Business Park.

Stage three would be the creation of a Technology Park, Prickys Reserve, Campus East and the Science Centre into an Environmental Technology and Business Park.

Hi-Tech Consulting would encourage the development of specific "clusters" of activity, such as a Cooperative Research Centre (CRC) project.

It would help to establish a "knowledge corridor" of excellence for sustainability and clean production.

Mr Coluccio said the CRC would be developed together a number of recent studies, including the recommendation in the Illawarra Regional Strategy's health risk assessment and the Government's Beaches Report.

"The whole idea is to pull all that together as an integrated approach to making the Illawarra an exciting region," he said.

"We have a unique environment and need to determine local people's views on environmental issues."

Mr Coluccio said the University of Wollongong was ideally situated to become the "knowledge corridor" because of its unique campus for sustainability and cleaner production.

The objectives of the CRC would be to support scientific and technological research, capture the benefits in centre research concentration could bring, and provide education and training.

The CRC could also attract investment and development to the Illawarra.

"We have to put the right mix of business in place for the new Illawarra, in which the knowledge economy is the main driver in Wollongong," Mr Coluccio said.

The eco-city blueprint also includes a Tourism Marketing and Development Plan that has been developed to help achieve the knowledge city marketing strategies.

And when would Hi-Tech Consulting like to see the plan implemented?

"As soon as it had been presented to Council," Mr Coluccio said.

"It is up to us to put our shoulder to the wheel to get it to the point where it is viable when they realised its economic value to make it happen."

People in Wollongong had to become a city of environmental excellence, A Community Liaison Environmental Action Network is being established and once that happened the blueprint would be deployed publicly.

"The whole concept of an eco-city is here if we want it to happen," he said.

"It is up to us to put our shoulder to the wheel to get it to the point where it is viable when they realised its economic value to make it happen."

FROM PAGE 32

would take tourist traffic away from the City East from Mt Ousley Rd via Squires Way.

The blueprint also includes a suggestion to improve traffic flow in Wollongong's CBD, particularly in the West Crown St area.

Mr Coluccio said it was also important that a bypass be developed with Thirroul Railway Station, where visitors could hire bikes.

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The blueprint of the area including the foreshore park extension from City Beach to Fairy Meadow Beach.

Frank Coluccio has plans for Wollongong to develop a City Foreshore Park which would be the envy of day visitors from Sydney.

PHOTO: WAYNE YEOMANS

Maglev, Port proposals need Govt support: MP

Federal Parliament has been asked to look at proposals for a maglev train and a new container terminal at Port Kembla as projects of enormous importance to the Illawarra.

Kicking Thursday's MP Colin Hollis has urged the Commonwealth Government to financially support Wollongong with the container terminal project, in particular, observed federal assistance.

"This project has so many benefits that I don't see how Parliament can't support it," he said.

Mr Hollis praised the Port Kembla Port Corporation for its leadership in promoting the port and the value of handling large scale freight movements.

He also highlighted the container terminal's potential benefit being next to a major multimodal facility for motor vehicle imports.

The proposed container terminal at Port Kembla would bring in a region not unchallenged, but without a replacement road for Macquarie and Marine Dr, a fishermen's wharf type development adjacent to a fast ferry terminal, a marina at Belmore Basin, and a system of link roads to the Princes Hwy.

"It complements what Sydney already has," he said.

The plan includes the introduction of cross-way bridges around Flagstaff Hill, the extension of a paved area to a landscaped park between the Illawarra Yacht Club and Belmore Basin, and the creation of a light rail loop along Cliff Rd between the city centre and the beaches.

Mr Coluccio said the blueprint was the result of a year-long study by Hi-Tech Consulting and Professor Robert Stimson of the Queensland University of Technology and Business Park.

CONTINUED PAGE 33

CONTINUED FROM PAGE 32

Port, such as Caltex Pass, the Port would not reach its full potential.

"I have always supported this proposal, so I am looking for wider support which I know all regional members will give for a proposal which will create massive employment and infrastructure in the Port of Kembla," he said.

In relation to the maglev train, Mr Hollis said recent media reports revealed several states had become increasingly attracted to the maglev concept.

"I am quietly confident that the current feasibility studies being undertaken by the Federal Government will clearly show a viable link with great economic and investment opportunities for the Illawarra region," he said.

Mr Hollis told Federal Parliament that the experience of the Sydney Olympics proposal clearly showed how the Illawarra was trying to diversify its economy away from a dependency on the still important industries of coal and steel.

MR HOLLIS

Figure 3: Frank Coluccio's *"Blueprint of the Future: transforming Wollongong into nation's first Eco-City"* 2001[4]

I'm hearing

Business Editor GREG ELLIS

Lost in translation: I failed teen-speak

READING about students using SMS-speak in their HSC exams reminded me of a test I took earlier this year, when Drake International organisation specialist and Generation Y expert Stephanie Dinnell came to town to speak about the impact this emerging generation was having on the workforce.

Ms Dinnell spoke at Rydges and tested each table on its knowledge of abbreviations used to add emotion to emails and SMS messages.

Participants in the demographic and parents of teenagers fared best, but I failed dismally.

I don't think anyone got 100 per cent. Here is a list of the SMS language we were tested on and the answers.

Take the test

- Pushing a Buck 10 - doing 110km/h in a car.
- Homeslice - a place that feels like home.
- Fetch - trendy.
- Ruf2t - are you free to talk?
- Cu@Mtg - see you at the meeting.
- :-0 - Wow, surprised.
- Iced out - wear a lot of jewellery.
- Let's book - let's go.
- Pimp - desirable, extremely good.
- Scrub - someone undesirable or to trip and hurt yourself.
- Cul8r - see you later.
- Afaik - as far as I know.
- :-D - laugh, happy, pleased.
- :-II - angry.

Leather Jacket hooks beer award

MITTAGONG'S Fish Rock Brewery has continued to enhance the Illawarra and Southern Highlands' growing reputation for quality beer production by winning Best Australian Lager at the Australian Hotel Beer Awards.

The Fish Rock Leather Jacket Lager held off Boag's St George and Redoak Vienna Lager to cement its place among the Australian premium beer cognoscente. To win the lager category the Leather Jacket Lager was considered to be of high quality and highly drinkable.

Wollongong can become nation's first eco-city: expert

WOLLONGONG Futures Community Advisory Group's Frank Coluccio has renewed calls for Wollongong to become Australia's first eco-city.

Mr Coluccio hopes the Draft Strategic Plan for the city will act as a trigger to pull together an eco-city consortium to make it happen.

By pulling heads together, he believed Wollongong could achieve another national first by using the Draft City Centre Revitalisation Strategy as an opportunity to build on the city's natural beauty and proud industrial heritage.

"This is the opportunity to say let's get in and do it. Why shouldn't Wollongong become Australia's first eco-city?" he said. "We are the city that can do it. Everything's here, we have just go to pull it all together."

Mr Coluccio said this could be done by integrating the city centre strategy with the National Emissions Trading Scheme discussion paper.

He said Wollongong could raise revenue for civic improvement projects, such as an integrated foreshore and transport plan, specifically designed to reduce greenhouse gas emissions. The first steps included improving the public domain and creating jobs that helped sustain the environment, rather than exploit it.

"Since we were the city that pioneered and championed the first (Australian) industrial revolution, we now have the opportunity to reduce our unemployment rate – and reduce the amount of commuters travelling to Sydney by pioneering and championing the second industrial revolution based on resource conservation, values, renewable, zero emission technology and, finally, the transition from a carbon-based economy to a hydrogen-based economy."

Figures 4: Frank Coluccio's plan for Australia's first Eco-City, Wollongong, continues to ring, 2006[6]

What I'm hearing

Business Editor GREG ELLIS

Dongtan gives an eco-friendly lesson

WOLLONGONG'S Frank Coluccio has provided a good case to encourage our city's planners, civic leaders and developers to be careful not to kill the goose that laid the golden egg.

The Wollongong Futures Community Advisory Group member said a new city being built in China would have many of the same desirable characteristics that Wollongong boasted.

But Dongtan will go one step further, and become a true eco-city with environmentally friendly transport and job-generating foreshore activities.

Dongtan is planned for a greenfield site and will essentially become a satellite city of Shanghai.

Like Wollongong, Dongtan will have a golf course on the foreshore and a wetland near an operating port. The major point of difference was its eco-friendly integrated foreshore and transport plan.

Frank believes Wollongong and Dongtan can learn from each other.

He said if Wollongong followed China's lead and addressed its transport issues and generated more eco-friendly industries, it would become a model for more cities to follow.

Carbon trading would make projects, specifically designed to reduce greenhouse gas emissions, possible, Frank says.

But it needs to be done carefully so jobs aren't sacrificed in carbon emitting industries.

Frank says an important first step was to improve the public domain and create jobs that helped sustain the environment.

The goal is to generate enough eco-friendly jobs to reduce Wollongong's unemployment rate and the need for residents to commute to Sydney.

Last week international sustainable transport expert Rod Tolley said Wollongong's location gave it the potential to become one of the world's great sitting, cycling, walking and watching cities.

Eco-city: Frank Coluccio's green future. PICTURE: DAVE TEASE

Miners to test gambling mettle

MEMBERS of the Illawarra's mining community will be letting their hair down tonight at a casino Christmas party.

ATS Mineforce national operations manager Ray McCrimmon said the labour management company's mission was to stage an end-of-year event with a difference.

It will be held at the Novotel Northbeach.

Colliers committed to Illawarra success story

ILLAWARRA'S growing economy convinced Colliers International to include Wollongong in its national expansion plans with the opening of a new office in the city this week.

Chief executive John Kenny was not only impressed with the region's economic performance but its potential for further business and investment opportunities.

"We are committed to accelerating our clients' success in one of Australia's most dynamic regions.

"Colliers International is committed to helping write another chapter in the Wollongong success story.

"We are responding to a specific need in the market from local and non-local investors who have existing investments in the area and want more. They see opportunities in this market, as they are being pushed out of other markets by the institutional investors."

Mr Kenny said Wollongong's residential market should also not be overlooked.

"There is a lot of high value residential opportunities, particularly from a development and project marketing point of view."

Colliers International's Wollongong office is being headed by Simon Kersten, who has 15 years worth of experience in the property market.

Figure 5: Frank Coluccio's plan for *"green future"*, 2006[6]

Figure 6: Kim Yeadon (1995-2007)[76]

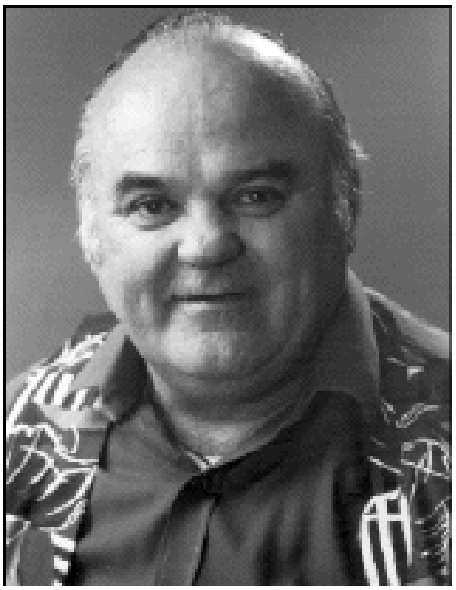


Figure 7: Gavin Hillier (1995), secretary of the NSW/national logging division of the CFMEU[77]

[76] Photo: http://www.hn.cma.nsw.gov.au/infopages/5899.html
[77]http://www.sydneyalternativemedia.com/blog/index.blog/1796143/gavin-hillier-prominent-retired-logging-unionist-on-stateline-footage-as-protester-no5/

7.0 ATTACHEMENT-I

Save Lake Illawarra - *The Jewel of Illawarra*

By Dr. Anton Dominis[78]

(February 2013)

Illawarra District - pre-European settlement

According to Aboriginal history, the region between (now) Stanwell Park and Shoalhaven was called *Dharawal* (*Thurrawal,* meaning *cabbage tree)*[79] – presently it's called Illawarra. There were many Aboriginal clans living within the Illawarra district and the estimated native population, about 3,000. What's more, there was no ownership of land amongst the native inhabitants, but each tribe depended on specific hunting grounds. They had territorial limits and respected each other's clannish laws. All in all, they lived in harmony with the land.

Jubborsay - the *Jewel of Illawarra*

For the *Dharawal* Australians, *"Jubborsay"* (now, called) Lake Illawarra, was a vital catchment including all the watercourses which drain into it. The first Australians depended on the lake's resources, as the place was rich in raw materials and teaming with wildlife.
Prior to the arrival of European settlers (late 18th century), Lake Illawarra had one entrance – the one (now) at Windang. However, to complement it, periodic tidal seawater from the Pacific Ocean, including coastal wetland (or swamp) water, percolated through the low lying *sand spit* area between Port Kembla and Windang, and gradually flowed into (now) Lake Illawarra. It brought in sand filtered water, correct salinity, pH, temperature balance, nutrients and platonic microorganisms.

In combination, the tidal seawater and wetland freshwater mixture functioned as a hydrological buffer zone which helped maintain the lake's water level, including its water circulation and outflow(s). As a result of that, its flora and fauna was more 'unwavering' relative to present. However, during the wet period, freshwater runoff from surrounding hills drained into the lake's basin, overloading it and changing the water chemistry. Thus, the lake became brackish (less saline) and muddy, thus affecting simple marine organisms. For example, simple cell organisms absorbed more fresh water than it could release, thus increasing in volume (swelling) and straining its existence. All in all, some aquatic species adapted well to such seasonal changes (e.g. eels), some died off, and some 'flushed out' to sea via the Windang entrance.

Despite that, for most of the year, the lake's water was *en par* with seawater quality, and its flora and fauna - healthy.
All things considered, intermittent tidal inflows into Griffins Bay brought normality to abrupt hydrological changes within the lake, including the continuance of the lake opening at Windang. So, prior to the late 18th century the lake ecosystem was 'unspoiled.'

The arrival of Europeans

[78] Ante (Anton) Josip Dominis; February 2013, "Save Lake Illawarra - *The Jewel of Illawarra* before it transforms into a *Great Green Lagoon",* Member of *Hi-Tech Consulting (HTC), Community Liaison Environmental Action Network* (*CLEAN*) *and Sustainable Industries Development Institute (SIDI).*
[79] Michael. K. Organ and Carol Speechley, Illawarra Aborigines, 1997, p1; http://ro.uow.edu.au

From the late 18th century, thing started to change in the Illawarra and quickly. That is, in came the Europeans who then ignored the native population (about everything) and straight away took control of their land and went on to exploit it without abate.
In return, the first Australians were given alcoholic beverages, 'white-man' diseases, tobacco and plenty of misery. There is no need to elaborate any further on the subject matter because the overall outcome is well known.

All this said started in 1770 when *Captain Cook* sailed northward along the Illawarra coastline and logged his finding – from offshore.

In 1796, explorers, *George Bass* and *Matthew Flinders*, sailed from Sydney (a colonial settlement) down the Illawarra coast and logged things of interest. In 1815, *George William Evans* did a similar thing. In due course other explorers came to the Illawarra, studied the area and evaluated their findings.

Not only did the early explorers find an abundance of valuable raw materials for Sydney's and Wollongong's colonial growth, but also for the markets of the British Empire. They found such things such as black coal (*anthracite*), high quality cedar, undulating hills laden with rich soils ideal for agriculture and grazing purposes. They found basalt rock for urban development, quality freshwater sources, rich fishing grounds, and so on. What's more, it was all found in a good climatic zone and close to Sydney – the colonial administrative centre of NSW.

Then, legally or illegally (i.e. with or without permission from Governor Macquarie), the leading colonial graziers and merchants from (mostly) Sydney relocated their stock into Illawarra and simply took more Aboriginal land(s), and kept it.

From 1816, the Illawarra region was systematically distributed to its colonials in the form of *'land grants'*, especially to the so-called *'gentlemen'* and *'respectable New Settlers'* of the time.[80] The colonial *land grants* varied in size from tens-to-thousands of acres.[81] The 'distribution formula' was, the higher the social status, the 'larger and better' the land grant.
What's more, the Aboriginal land was divided not only amongst prominent colonial settlers of Illawarra, but also amongst *absent* '*high-flying colonials'* of Sydney. In turn and from a distance, they utilized 'their' newly acquired lands as they saw fit and who subsequently made a handsome profit.

In contrast, for such people (i.e. British commoners) to have so much land back in Britain was just impossible. It was beyond their wildest dreams simply because large land ownership was in the hands of wealthy aristocracy. Even the British *'common land'* was stripped by the upper classes. Thus, for key colonials and pardoned convicts of the time, it was like going from 'rags to riches'.

In brief, Illawarra went on to develop as a grazing and vegetable growing area – European style. Then, as it supplied Sydney's needs it was appropriately dubbed as *"the Garden State of NSW."*[82] As for the native population, well, they got more of the same.

Agricultural Illawarra transforms to industrial Illawarra

[80] Urban Illawarra, Edited by Ross Robinson, T. M. Perry, Exploration and Settlement of the Illawarra, Chapter 3, p62-68, Sorrett Publishing, Melbourne, 1977, ISBN 0 909752 30 3
[81] Michael Organ and A.P. Doyle, Historical Records of the Illawarra Region of NSW, Australia, 1770 - 1855
A Chronological Guide to Sources and Events; http://www.uow.edu.au/~morgan/ilchron1.htm
[82] Michael. K. Organ and Carol Speechley, Illawarra Aborigines, 1997, p2; http://ro.uow.edu.au

"In the 1890s attempts were made to make Lake Illawarra a deep sea port. A jetty was to be built on the western shore of the lake to allow the export of coal from the Ocean View colliery. As part of this scheme, a channel was to be dredged through the entrance of Lake Illawarra to allow ocean-going boats to reach the lake jetty. The channel was to be four and a half miles long and 430 feet wide between the breakwaters at the lake entrance. A railway line was built on Windang Island to carry rock cut from the south-western side of the Island through to the mainland side of the Island. This rock was used to build the breakwaters, the remains of which can be seen today. The project was abandoned in 1902 because of the problem of drifting sand blocking the lake entrance channel."[83]

Because of abundance of high grade coal, water, limestone (from Marulan) and subsequent developments of Wollongong harbour and later Port Kembla harbour, the Illawarra region established a viable heavy industry.

It established the steelworks, several coke ovens, coal export facilities, coal-fired power station at Tallawarra, and so on. Accordingly, the Illawarra region transformed from an agricultural to a coal exporting region and finally to an industrial area. With Illawarra's industrial development, especially between WWI and post-WWII, Australian exporters couldn't keep pace with domestic and international market demands, i.e., iron and steel products, and coal and coke. To meet the criteria, Australia brought in migrants from war-torn Europe and who in turn complemented the Australian society.

Dumping industrial wastes into coastal wetlands

Weathering and subsequent erosion (e.g. water runoff) into Lake Illawarra and its wetlands is a natural thing. It is the reason why, in the Illawarra climatic zone, there are many streams draining into the catchment. However, after the arrival of Europeans and their development schemes such water systems have increasingly become spiked with 'man-made' pollutants, namely

a) *chemicals* (fertilizers, pesticides, herbicides, insecticides, detergents, and so on)
b) *farm feces and urine*
c) *industrial wastes* (slag, coalwash, fly ash, and organic and metallic toxicants)
d) *residential wastes* (sewerage, plastics and so on)
e) *toxins* (road bitumen leachates, vehicle exhaust gases and industrial stack fumes)

At the time such things happened because coastal wetlands were considered *'just swamps.'* Meanwhile, industrial wastes such as *slag, coalwash,* coal-fired power station *fly ash* and *furnace bottom ash* came to be considered as building materials. As a result, such materials were readily put to use; some for road works, some to make additional by-products (e.g. cement and glass) and the rest as landfill.

As heavy industry produced huge quantities of such wastes, it was ever so viable to 'get rid' of them and quickly. So any organisation which wanted them got it virtually for free. All one had to do was pick it up and take it away.

Unfortunately, a lot of industrial wastes ended up in the coastal wetlands, sandy landforms, lowlands, gorges and basins, i.e., environmentally fragile habitats. Next, such landfills were compressed, leveled, divided and sold off. Some such sites were turned into industrial, commercial and residential blocks, parklands, school playgrounds, and so on.

[83] http://www.lia.nsw.gov.au/the_lake/history_of_lake_illawarra

One major landfill area was along the sand spit between Warrawong, Kemblawarra and Primbee (north-to-south) where once tidal inflows periodically infiltrated into Lake Illawarra. In terms of regional growth, it was all good but it was at the expense of nature.

During the 1960's and within the northeastern section of Kully Bay, where now Bunnings Warrawong stands, many fish species (of all sizes) and even octopi would come into the shallows and then due to some unexpected cause(s) die - *en masse*. The lake shallows in question would be strewn with a plethora of dying and decaying fish, including (as said) many octopi.

The 'fish kill' cause(s) could have been due to inadequate water circulation and low dissolved oxygen (DO) content, especially when the water warmed up. Perhaps, surrounding slag and coal leachates added to the 'fish kill'.

At the time, possibly no study was carried out concerning such phenomena and thus the true cause(s) will never be known. That is to say, whether it was purely a natural thing or whether it was acerbated by urban development, i.e., King Street, Warrawong and Kemblawarra. Just for the record, the 'fish kill' phenomena took place during and soon after the so-called developmental stage of the area. [84]

Unfortunately, the 'dumping trend into Kully Bay' is still ongoing. As a consequence, instead of having foreshore wetlands, water and seagrasses within the area in question, the community now has, well, beautiful foreshores, such as a number of club(s), ovals, cycle tracks, picnic grounds, jetty, and so on.

Whatever works were done to the lake foreshores it certainly did not help Lake Illawarra's water nor help preserve the *blue carbon system*. From an environmental perspective, it's ecological vandalism! Such foreshore improvements decimated a lot of endangered seagrass beds, and everything that depended on them. Not good! This all happened as the authorities were, to put it mildly, 'accommodating' - to quick urban growth and to regional waste producing industries.

In short, dumping of coalwash, furnace slag and coal-fired fly ash into coastal wetlands of Illawarra was unquestioned and socially acceptable. Besides, the wetlands were considered as useless stinking swamps. So, if the wetlands impeded progress, well, they were simply filled in. Sadly, many were totally destroyed and others drastically altered (for the worse).

Nowadays, coastal wetlands are known to be important parts of the global *blue carbon* system and need to be preserved and restored, but somehow landfills are still ongoing.
It's also well known that industrial wastes break down, react with groundwater and produce toxic or poisonous leachates (effluents or chemical solutions) and which subsequently affect living things, especially microorganisms – the basis of life.

This text will cover the effects of dumping industrial wastes into Illawarra's coastal wetlands, namely:-

a) *Blast Furnace slag* (BFS) - ongoing
b) *Open Hearth slag* (OHS) - ended
c) *Basic Oxygen Steelmaking slag* (BOSS) - ongoing

[84] Eye witnesses; Rudolf, Anton and Nick Dominis, Nando and Alfredo Tubaro, Dragan and Mario Ban, and many other recreational 'prawners' of Port Kembla, Kemblawarra, Warrawong ,Primbee, Lake Heights and Berkeley, 1960's.

d) *Copper slag* (CS) - ended
e) *Coal-fired power station fly ash* (FA) and *furnace bottom ash* (FBA) - ended

If readers are not interested in the technical aspects of industrial wastes, then skip such sections and resume reading from topic, *'Save Lake Illawarra Crusades'*.

Blast Furnace Slag (BFS)
Slag with an equal amount of basic components (e.g. CaO) over acidic components (e.g. SiO_2 + P_2O_5) has a slag ratio of 1.0, and it's considered *neutral*, i.e., pH 7

If the slag ratio is greater than 1.0, it is *alkaline* (i.e. pH >7), and the higher the value, the greater the alkalinity. This is because solid BFS's have a high percentage of sparingly soluble *calcium oxide* (CaO 30-40%) which can react with water to produce pasty-whitish *calcium hydroxide*, $Ca(OH)_2$ and heat.

In turn, the sparingly soluble calcium hydroxide dissolves (*dissociates*) in water to form calcium (Ca^{2+}) and hydroxide ions ($2OH^-$). The hydroxide ions gives the slag effluent its high alkalinity, i.e., pH>10, and which is especially toxic to microorganisms. This reaction can be expressed by the two chemical equations below.

1) $CaO_{(solid)} + H_2O_{(liquid)} \rightarrow Ca(OH)_{2(solid)}$

2) $Ca(OH)_{2(solid)} \rightarrow Ca^{2+}{}_{(aq)} + 2OH^-{}_{(aq)}$

In the arbitrary case as in Table 1, to determine slag bacisity or alkalinity, the basic component, *calcium oxide*, is divided by the sum of acidic components, *silica and phosphorous oxide*. That is, (CaO/SiO_2 and P_2O_5) or 3.14 or 41.08/11.37 + 1.71 = 3.14

As the slag ratio is much greater than 1, it means that the slag has is highly *alkaline* and will produce highly *alkaline leachates* if reacted with water.

Table 1: Analysis of solid Blast Furnace Slag

Slag composition	Chemical name	Amount (%)
Fe (solid)	Iron (free iron)	0.5-8
FeO	Iron (II) oxide	19.3
Fe_2O_3	Iron (III) oxide	8.70
SiO_2	Silicon oxide	11.37
Al_2O_3	Aluminium oxide	1.60
CaO	Calcium oxide	41.08
MgO	Magnesium oxide	6.28
MnO	Manganese oxide	9.61
P_2O_5	Phosphorus oxide	1.71
S	Sulphur	0.13
Total		**99.78**
Ratio (bacisity)		**3.14**

A typical BFS effluent analysis is shown in Table 2.[85] Depending on the effluent pH and its ionic concentrations, alkaline waters can have detrimental effects on living things, especially on microbial life forms - on which higher life forms depends.

[85] Analysed by Anton Dominis, industrial Chemist (Development Chemist – Water Lab, Central Laboratory, BHP, Port Kembla), effluent sample from a slag dump (sump) prior to neutralization by sulphur reducing bacteria (SRB)* and discharged into Allan's Creek, Cringila 1991.

Table 2: Analysis of BFS effluent

Test	Concentration
pH	12.5 →SRB* → 5-9
Conductivity	7500 μS/cm
Temperature	18°C
Turbidity	<0.05 NTU
Oils and Grease	<0.05 mg/L
Phenols	<0.05 mg/L
Ca^{2+}	480 mg/L
Mg^{2+}	1.0 mg/L
Na^{+}	390 mg/L
K^{+}	30 mg/L
Fe^{3+}	0.2 mg/L
Al^{3+}	0.5 mg/L
Total Alkalinity	490 as $CaCO_3$ mg/L
Cl^{-}	350 mg/L
SO_4^{2-}	28 mg/L

In the case as in Table 1, the slag sopped up its metal constituents from molten steel and on solidification locked them in with oxygen – so they became metal oxides. Even though solid slag resembles hard rock they still break down over time. They react with water, atmospheric gases and subterranean anaerobic microorganisms. That is, they gradually waste away or dissolve producing toxic leachates (alkaline ionic solutions) such as shown in Table 2.

However, other environmental variables increase slag solubility in subterranean anaerobic environment such as; microbial activity, moving moisture, pH, temperature, abrasion, particle size, elemental composition, compaction, porosity, and so on.

From slag dissolution or breakdown, water soluble metallic and non-metallic ions eventually find their way into the environment of which some could be problematic. Blast Furnace slag release metallic constituents, namely *iron* (Fe^{2+}/Fe^{3+}), *aluminium* (Al^{3+}), *calcium* (Ca^{2+}), *magnesium* (Mg^{2+}), *sodium* (Na^{+}), *potassium* (K^{+}) and *manganese* (Mn^{2+}). Some can be detrimental. Nonmetallic slag leachates are *chlorides* (Cl^{-}), *sulphates* (SO_4^{2-}), *phosphoric acid anhydride* (P_2O_5) and elemental *sulphur* (S). Some of them can be toxic.

Figure 1: Remnants of slag dumping at the foreshore of Lake Illawarra, Lake Heights. Note the high iron content in the slag[86]

Luckily, slags are sparingly soluble. That is, they have a low solubility value in water (about 0.0015g/100mL water/20^{o}C) and are quickly quenched, diluted and wash out by groundwater. Despite slag deterioration being slow, but in excess (as in landfills) it releases toxic leachates which are cumulative and thus considered a pollutant. What's more and as said, the slag-water reaction produces heat and which can be high enough to crack the substance and open it up to further deterioration or reaction.

Slag dump effluents can become extremely hazardous. For example, during dry periods of the year some particular spot within a BFS dump at Primbee oozes highly alkaline water which can pickle human skin.[87] Such a thing is a rarity, but it happens.

As a general rule, BFS's produce highly alkaline effluents (pH >10) and where life forms struggle to survive, especially if the slag dumps are inadequately 'cleansed/flushed' by rainfall and/or underground water.

Open Hearth Slag (OHS)

Open Hearth slag is made under different chemical processes relative to Blast Furnace slag and thus it has different properties (e.g. Table 3).

Table 3: Analysis of Open Hearth slag

Slag composition	Chemical name	Amount (%)
Fe (s)	Free Iron	8-10
FeO	Iron (II) oxide	6-15

[86] Photo: Anton Dominis, Thursday, 7 March 2013, 3.00pm, Lake Heights, Lake Illawarra
[87] Sharralyn Robertson, president of the *Illawarra Local Aboriginal Land Council, 2012*

Fe_2O_3	Iron (III) oxide	1.5-5.0
SiO_2	Silicon oxide	28-35
CaO	Calcium oxide	30-45
MnO	Manganese oxide	1-4
P_2O_5	Phosphorus oxide	2-4
MgO	Magnesium oxide	3-8
Al_2O_3	Aluminium oxide	2-8
Ratio ($\%CaO/\%SiO_2 + \%P_2O_5$)		**Variable**

Relative to grayish colored BFS's; OHS's can have various colors because of their high iron oxide (FeO) content. They can be *black*, *grey*, *light brown* and *dark brown*. The slag colour also roughly indicates its bacisity ratio ($CaO/SiO_2 + P_2O_5$). From experience, *black slags* have low bacisity ratios (< 1) and thus are acidic while the *dark brown slags* have high bacisity ratios (> 1) and are alkaline. Thus, OHS's can be acidic, neutral and alkaline.

Acidic and alkaline slag leachates have similar detrimental effects on microorganisms, as both release harmful constituents when reacted with water. In basic terms, acidic and alkaline leachates can be environmentally toxic.

During the steelmaking process sometimes OHS's sop up additional components from molten ferroalloys and deoxidizers. Thus, they can be rich with such things such as phosphorus, vanadium, titanium, lead, nickel, cobalt, copper, chromium, aluminium, molybdenum, manganese, and so on. As a result, they can become quite toxic when reacted in water, especially as said, if infused with *heavy metals*, such as copper, chromium, lead, and so on.

In general and environmentally wise, OHS's decomposition in water is considered to be more hazardous relative to BFS's.

Copper slag

Copper works slag is different to steel industry slag as it contain heavy metals, such as *copper (Cu), arsenic (As), cadmium (Cd), lead (Pb)* and *vanadium (V).* Heavy metals are extremely harmful to living things, especially to lower life forms. For added information, refer to other texts.

As copper slag has different physical and chemical properties relative to steelmaking slag the two were not dumped on the same site. They were dumped in separate areas, for example, the copper slags were dumped in the wetlands of Kurrongulla Primbee and at north Windang - to fill in sand mining holes and to construct residential blocks, respectively. What's more, the local council readily gave the license to Port Kembla copper smelter, and again dismissed community concerns, including Aboriginal Koori concerns.

Copper slag also breaks down and releases its components including heavy metals, such as *copper, lead, vanadium, cadmium, arsenic,* and so on.

Slag impact(s) on underground and aquatic microbial activity is difficult to measure or evaluate. The levels could be in *parts per billion* (ppb), *parts per trillion* (ppt) or even less. As far as the lake's dynamic biosystem is concerned, amounts and biological consequences are extremely difficult to evaluate.

Coalwash

Illawarra coals are 'washed' by *'coal washeries'* to remove inorganic components from coal – from carbon. To be precise, to 'wash away' unwanted materials from coal. Because treated coalwash use is limited, it was mostly dumped, especially as it is somewhat acidic in nature.

Coalwash materials can reduce alkalinity as they contain a clay mineral called *kaolinite*, and the alkalinity removal is by the *cation exchange* principle. However, in this text it won't be necessary to explain the process. Thus, soil and water chemistry of wetlands can be changed by coalwash dumping, and do affect microscopic life forms. In short, a lot of coalwash was dumped into the coastal wetlands of Illawarra and which had an impact.

Coal-fired Power Station Fly Ash (FA) and Furnace Bottom Ash (FBA)

Tallawarra coal-fired power station used Illawarra coals to generate electricity and from the combustion produced fly ash and furnace bottom ash.

Large quantities of such materials were produced and subsequently dumped into nearby wetlands, and which (at the time) were appropriately hemmed in and controlled. However, dump leachates 'leaked' out via underground means and subsequently entered Lake Illawarra. AINSE Progress Report for ALNGRA 11116 shows that during the lifespan of the power station (1960's-1989), the heavy metals increased within the Lake Illawarra's sediment.

When the plant closed down such elements decreased.[88] The heavy metals in question are isotopic *lead* ($^{210}_{82}$Pb) and isotopic *cesium* ($^{137}_{58}$Cs), including a non-isotopic nonmetal, *selenium* (Se). [89]

'Normal' elemental lead is represented as $^{207}_{82}$Pb. In simple terms, it has 82 electrons, 82 protons and 125 neutrons. Protons and neutrons are the heavy components of the atom.
On the other hand, the unstable isotopic lead is represented as $^{210}_{82}$Pb. It has 82 electrons, 82 protons and 128 neutrons. In other words, it has 3 extra neutrons relative to 'normal' lead.
Because it has 3 extra neutrons, the isotopic lead is heavier and thus unstable. Because of its instability the atom wants to be stable as his 'normal' cousin, $^{207}_{82}$Pb. To do it, the element becomes *radioactive* and gradually *decays*. That is, it gives off (or emits) energy, and thus matter – as it wants to be lighter and stable.
In a nutshell, the two above leads (Pb's) or the same element, have similar chemical properties but slightly different physical properties or atomic masses. The half-life of $^{210}_{82}$Pb is 22 years. It means that every 22 years it loses half of its mass. For example, it would take about 100 years for 1.0g of radioactive lead to decay to 0.10g. It would take about 250 years to decay to 0.001g (1.0 mg).
Thus, for trace amount of radioactive lead to decay to 0.05 parts per million (ppm) or 5,000parts per billion (ppb), it would take about 24,000 years, and so on. The concentration of total lead in marine water should not exceed 5μg/L.[90]
A similar thing applies to 'normal' cesium, $^{133}_{58}$Cs versus isotopic cesium $^{137}_{58}$Cs. Isotopic and radioactive cesium has 4 extra neutrons. Thus, it's heavier and radioactive. Its half-life is about 30 years.
On the other hand, selenium, Se, is a nonmetal and non radioactive, but it has certain metallic properties. It can bind to many things it can be toxic. The concentration of total selenium in marine water should not exceed 70μg/L.[91]

[88] Bill Maher (Chief Investigator), Janie Potts and Larissa Schneider Guilhon, Henk Heijnis: AINSE Progress Report for ALNGRA 11116. Mrs Larissa Schneider Guilhon, University of Canberra, Thesis Title; Selinium Cycling in Esturine Ecosystems Receiving Inputs From Coal-Fired Power Stations, July 2012.
[89] Bill Maher (Chief Investigator), Janie Potts and Larissa Schneider Guilhon, Henk Heijnis: AINSE Progress Report for ALNGRA 11116. Mrs Larissa Schneider Guilhon, University of Canberra, Thesis Title; Selinium Cycling in Esturine Ecosystems Receiving Inputs From Coal-Fired Power Stations, July 2012.
[90] National Water Quality Criteria (1992), Chapter 2: Protection of Aquatic Ecosystems, Lead, 2-22. Australian and New Zealand Environment and Conservation Council, GPO Box 787 Canberra, ACT, 2601
[91] National Water Quality Criteria (1992), Chapter 2: Protection of Aquatic Ecosystems, Lead, 2-24. Australian and New Zealand Environment and Conservation Council, GPO Box 787 Canberra, ACT, 2601

To sum up, coal-fired power station wastes somehow got into Lake Illawarra's sediment and which could have had an impact on microorganisms.

Other detriments to Lake Illawarra

Other detriments to Lake Illawarra are namely;

a) atmospheric toxicants
    a. industrial
    b. vehicle exhausts
b) increasing rural areas
    a. deforestation (clearing)
    b. fertilizers
    c. fires
c) increasing urbanization
    a. sewerage leakages
    b. stormwater drains
    c. silting (mud and soil runoff)
    d. road materials
    e. oils
    f. tars/bituminous products

Except for road bitumen leachates, such as *polycyclic aromatic hydrocarbons* (PAH's, by-products of petroleum processing and combustion) the above points will not be covered as it's beyond the scope of this text.

Concerning Lake Illawarra, no quantitative data was sighted regarding PAH's. However, it's something which should have been addressed because bituminous products (e.g. tars and oils), petrol and diesel exhaust gases, industrial atmospheric toxicants from furnaces (e.g. coke ovens and coal-fired power plants) do produce PAH's and are released into the environment.

On the other hand, transformer oil leakages/accidents are sources of *polychlorinated biphenols* (PCB's). In the past, such leakages happened. Once again, no quantitative data was sighted about PCB's, regarding Lake Illawarra.
In short, regional man-made activities had an impact on the lake's ecosystem, as protection of aquatic ecosystems was low on the agenda.

'Save Lake Illawarra Crusades'

In the name of regional development, Lake Illawarra's ecosystem has been put under enormous strain over the years. Either intentionally or unintentionally, man-made activities had and still do have detrimental effects on the catchment.

To help combat its stresses a number of community groups and organisations sprung up, and each trying to do their bit to help save the lake. The *Lake Illawarra Authority* (LIA) is one such an organisation which strives to impede further deterioration of the lake. Over the last two decades, it utilized lots of (grant) money and subsequently did some wonderful things, like – improving the foreshores.

In conjunction with the State government(s), Wollongong and Shellharbour Councils, Wollongong University, CSIRO, EPA, Save Lake Illawarra Action Group, Illawarra Local Aboriginal Land Council, and a plethora of public volunteers, have and are also doing noble things. Yes, many (costly) studies have been carried out relating to water quality, hydrology,

geomorphology, sediments, nutrient inflows and its consumption, flora and fauna, seaweed harvesting, bank stabilization, and commercial and recreational usage. You name it, and it has been studied.

A lot of foreshore rubbish was cleared on *'Clean Up Australia Day'*, picnic grounds were established as were cycle ways, jetties, litter traps, and so on. Appropriate public signs were put up, including penalty notices, and many volunteers helped keep the lake entrance open. Aboriginal groups planted native vegetation along the lake's foreshores, and so on. To top things off, specific lake areas were filled in and then partitioned off.

Most recently, LIA announced that it will spend more money on foreshore improvements.[92] However, it's all a *'band aid job'*. Lake Illawarra itself (i.e. its water) is still 'sick' and little is being done to address it, but to say *"Yes, it's sick!"*

It is known that the lake entrance periodically blocks up and which subsequently causes the lake water get 'really sick,' especially during droughts when the water level drops up to about half a meter, and which significantly devastates the (now endangered) seagrasses – the *blue carbon sinks*.

In 2002, the state of affairs became so critical that in desperation Save Lake Illawarra Action Group organized a plethora of public volunteers, ranging from young kids to the elderly, to turn up at the 'lake entrance' with their own picks and shovels in an attempt to open up the lake 'entrance'. Figures 2-3

[92] Argon Latifi, The Advertiser, Wednesday, March 6, 2013-3

Figure 2: *'Lake entrance'* at Windang, Lake Illawarra [93]

Figure 3: *"The Big Dig"* (16th November, 2002) [94]
More than 1000 people pitched in to help open up the 'lake entrance'

[93] www.lia.nsw.gov.au
[94] Courtesy of Save Lake Illawarra Action Group: http://www.savelakeillawarra.org.au/gallery5.html

A new proposal to save Lake Illawarra

With all the time and effort put into saving Lake Illawarra (and about $14.5 million)[95], well, it simply didn't happen. Whatever was and is being done it's not working! So what's next? Are there any other options? All things considered, the lake (especially its water) must and can be re-established by giving Mother Nature a 'bit of a nudge'.

According to an inspiration by the author (Dr. Anton Dominis) and an ides later disclosed to Hi-Tech Consultancy (HTC), Community Liaison Environmental Action Network (CLEAN), Illawarra Eco Tourism Association (IETA), Marine Rescue Port Kembla (MRPK, Regional Commander, Bruce Mitchell[96] and Peter Purnell[97]), Illawarra Local Aboriginal Land Council (ILALC)[98] and Sandon Point Aboriginal Tent Embassy (SPATE)[99], what the lake really needs is a second opening, and perhaps some underground complementary tunnel or piping system. If this happens, Mother Nature will take its course and restore the lake's marine flora and fauna – and *for free.*

In view of that, the most liable place to establish such a project would be across the sand spit spanning between Perkins Beach, Port Kembla (34º.31.542'S/150º55.941'E) and Griffins Bay, Warrawong (34º.32.444'S/150º55.660'E) - a distance of about 1 km. Figure 4.

Figure 4: A second lake opening at Griffins Bay, Lake Illawarra? [100]

[95]NSW Government Natural Resources, Estuaries in NSW, Estuary management program, 25/02/2013-1; http://test.dnr.nsw.gov.au/estuaries/estmgt.shtml

[96] bruce.mitchell@marinerescuensw.com.au

[97] peter.purnell@bigpond.com

[98] Sharralyn Robinson and Roy (Dootch) Kennedy

[99] Roy (Dootch) Kennedy, Aboriginal Elder, Chairman of the Illawarra Local Aboriginal Land Council and Lead Activist for Aboriginal Rights at Sandon Point, 'head' of Sandon Point Aboriginal Tent Embassy (SPATE)

[100] www.lia.nsw.gov.au

With the lake's water improvement or restoration the region would attract investments, business and tourists. For example, a viable marina and an assortment of businesses could be established along the 'non-smelling' foreshores of Griffins Bay and elsewhere, especially if it was proficiently developed and (if need be) strategically dredged.

Strategic dredging to help seagrass beds

Most of all, seawater inflows/outflows and strategic dredging will benefit the lake' *phytoplanktons* and *seagrasses*, particularly the dominant *Zostera capricorni*, (Figures 5-7).

Figure 5: *Zostera capriconi* is commonly known as 'ribbonweed' and 'eelgrass.'[101]

Figure 6: Marine mollusks feeding on *Zostera capriconi* during low tide[102]

[101] Photo: Anton Dominis, Thursday, 7 March 2013, 3.00pm, Lake Heights, Lake Illawarra
[102] Photo: Anton Dominis, Thursday, 7 March 2013, 3.00pm, Lake Heights, Lake Illawarra

Figure 7: Dry and decaying 'ribbonweed' does not stink[103]

That is, the incoming fresh seawater would improve/restore the lake's water quality and clarify its seagrass habitats. Yes, the seagrasses would grow in better quality water (i.e. correct seawater chemistry) and in depths of proper sunlight intensity. Hence, seagrass beds would eventually re-establish.

Lake Illawarra's other two seagrass species are *Halophila ovalis* and *Halophilia decipiens*. They are broad leaf seagrasses which are also vital within the marine habitat, but to a lesser degree relative to *Zostera capriconi*, simply because their beds are smaller in size.

Seagrasses are closely related to terrestrial plants as they have roots and vascular tissues.

Strategic dredging to reduce seaweed

Lake Illawarra also nurtures *macroalgae* which are multi-celled algae or *seaweeds*, and which are not to be confused with seagrasses. *Macroalgae* or *seaweeds* do not have roots to acquire nutrients from the sediment. Instead, they have a 'holdfast', i.e., a shoot to physically anchor themselves to materials, such as rocks, wood, seabed, coral, and so on. Seaweed 'holdfasts' do not absorb nutrients and water. Seaweeds get it (by diffusion) from the water via their tissues. What's more, relative to seagrasses, *macroalgae* longevity is short, i.e., days to several months – longevity is seasonal.

Lake Illawarra's most problematic seaweed is green *chaetomorpha linum*, an estuarine pollution alga.[104] Figure 8-10[105]

[104] 19th Edition 1995, Standard Methods for the Examination of Water and Wastewater, Plate 35
[105] http://blog.sandbaraquatics.com/?paged=5, Posted on May 19, 2012 by Amanda

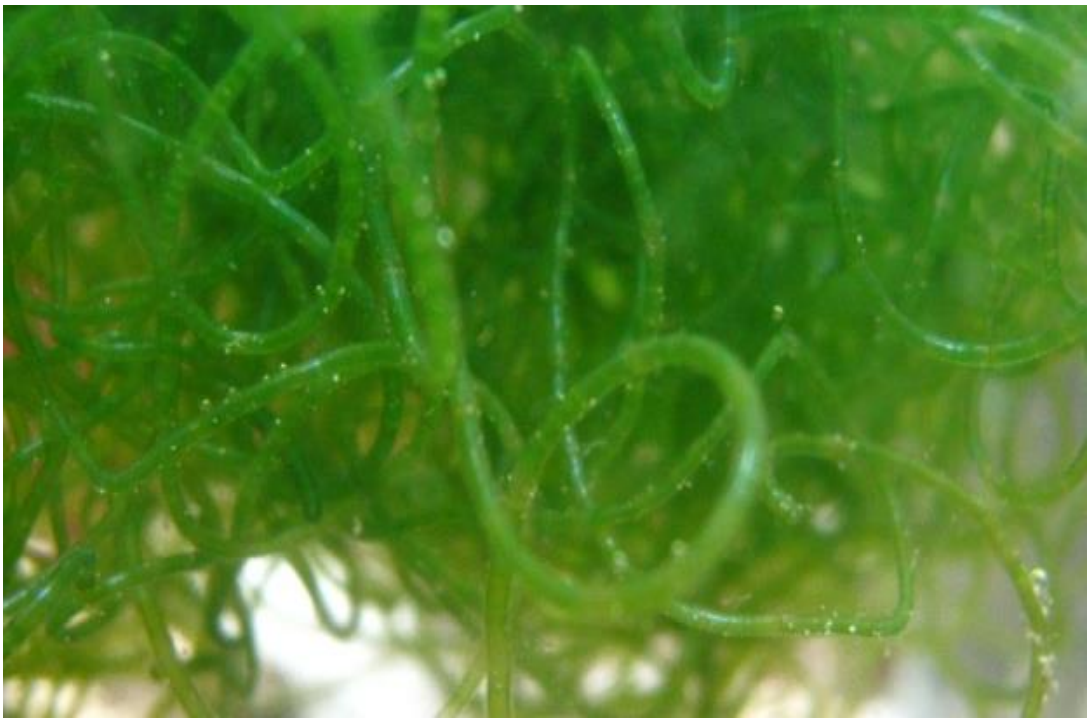


Figure 8: *Chaetomorpha linum* can cause 'floating sheets'[23]

Figure 9: Juvenile brown *Chaetomorpha linum* at Lake Heights, Lake Illawarra[106]

[106] Photo: Anton Dominis, Thursday, 7 March 2013, 3.00pm, Lake Heights, Lake Illawarra

During the drought period and on hot sunny days, Lake Illawarra's water level drops almost to half a meter. It's also the time of year when the seaweed, *chaetomorpha linum,* 'blooms'. It 'blooms' because the catchment attained a spike in nutrients, particularly nitrogen (in the form of *nitrites, nitrates* and *amines**.

Lake Illawarra catchment gets most of its nitrates (NO_3^-) from terrestrial sources such as rural fertilizers. In turn, the seaweed utilizes it and grows profusely. When it dies off (*en masse* and seasonally), decomposing bacteria sets in and breaks down the seaweed mass, and subsequently releasing the nutrients and carbon dioxide back into the habitat. Seaweed decomposition typically happens under aerobic conditions and at near neutral pH values.
Fortunately, nitrates do not have a direct effect on aquatic animals. However, certain marine species have gut microorganisms which can convert nitrates (NO_3^-) to nitrites (NO_2^-) and which can be dangerous, especially to species on the lower side of the food chain.

What happens is that 'nitrate reducing bacteria' converts *nitrates* (NO_3^-) to *nitrites* (NO_2^-) which then react with hemoglobin in the blood (of animals) and converts the ferrous iron to ferric iron ($Fe_{II} \rightarrow Fe_{III}$). Once this happens the blood cannot carry oxygen within the animals' circulatory system. That is, the blood is unable to oxygenate itself (in the lungs or gills) and remains mostly deoxygenated (oxygen deficient blood) and which leads to animal's immobility, and even death.

Nitrate reducing bacteria in anoxic sediments can convert nitrates to nitrites, and depending on the concentration, it can affect certain animal species living within the habitat. Within the lake, microbial decomposition of proteins (e.g. animal flesh) also takes place. What happens is that microbes release amines (and its nitrogen) back into the habitat and which can be toxic, especially to certain marine species.

Macroalgae consume and sequester nitrogen from its habitat, and which came in the form of inorganic compounds such as nitrates and nitrites, including from nitrogen containing materials such as proteins from decaying plants and animals. However, during the decay process, all the nitrogen is released back into the system, causing euthophication of the habitat. Thus, one way of controlling it is to mechanically harvest the alga before its dies off and deposits on the seabed, and decays. Another way is to prevent nutrients getting into the habitat.

During the period of algal uncontrollable growth, the seaweed sometimes grows to such an extent that it breaks away from its holdfast and floats to the surface. As the seaweed mass grows it forms thick floating 'green sheets' which subsequently drift off with the winds, tides and currents, and eventually mostly settle in the warm shallows along the foreshores – alongside the seagrasses.

As a matter of fact, such 'floating sheets of seaweed' do not form in the middle of the lake but around the foreshore peripheries and in depths of about 1.5m. Within a season (3-4 months), they die *en masse*, sink to the bottom, decompose and subsequently produce unpleasant odours. If bacterial decomposition follows the natural course, the rotting mass produces a concoction of carbon dioxide, carbon monoxide and a sulphide gas (H_2S gas) - commonly known as rotten egg gas. Because of communal complaints dealing with such a malodorous odour(s), such seaweed has been mechanically harvested and then dumped at landfills, Figure 10.

mercury news 9

Blooming weed a choker

ALEX ARNOLD

JOE Spiteri "can't knock" the permanent opening of Lake Illawarra.

However the Primbee resident says the consequences of the entrance opening are starting to hit home, especially in an area described as the lake's most productive.

"Primbee is supposed to be the breeding ground for fish and prawns, but the algae here now is so thick nothing can get through it," Mr Spiteri said.

A visitor to the lake for 40 years and a resident of Primbee for 16 years, Mr Spiteri said there had been similar problems with the algae before, but usually in times of drought.

"Ever since the permanent opening the lake has dropped ... it used to be a foot higher than the ocean," Mr Spiteri said.

"The last two years we have had a lot of rainfall and it is still here.

"It is so thick it is like a net, nothing gets through it.

"When the tide comes up and covers the weeds, the prawns come over the top, but as the tide recedes the prawns are getting trapped ... the seagulls, pelicans and ducks are having a feast."

Mr Spiteri says that dredging along the western side of the lake is an option that needs to be pursued.

"They says this a breeding ground, but it can't be if there is no water – and they can't breed in this sort of crap. Dredging has to be done."

Lake Illawarra Authority Chairman Doug Prosser said there was no "silver bullet".

He said traditionally this time of year saw a build up of seagrass wrack on the western side of the lake as a result of the prevailing westerly winds over winter.

"We are doing work in the Primbee area right now, but we have to be careful when we clean we don't do more damage than we do good," Mr Prosser said.

"That is an area that Fisheries tells us is the most productive area for fish and prawns in the whole lake because of the sea grasses that grow there."

Mr Prosser said the problem with dredging is the cost of disposing of the material and finding somewhere to put it.

He said prior to construction of the new entrance, people were warned that the tidal effect would be much greater than before.

"We also warned it would have the effect of lowering the lake levels and that is exactly what has happened, a lot more of the foreshore shallows are exposed."

"It is not just in Primbee or Windang, people in Oak Flats are commenting on how the shallows are exposed more now and that is because we have intervened with mother nature by putting in the large entrance," Mr Prosser said.

Exposed: Joe Spiteri of Primbee with some vegetation cleared from Lake Illawarra which affects fish and prawn breeding. Picture: DAVE TEASE

Figure 10: A resident of Primbee holding up seaweed – green *Chaetomorpha linum* [107]

By physically removing the seaweed, a quantity of nutrients was also removed from the catchment, and which is a good thing - as the lake's euthrophication process (to a degree) was temporarily impeded. However, such a process could be ongoing and costly.

To be brief, Lake Illawarra's *phytoplanktons*, *macroalgae* (seaweeds) and *seagrasses* are all aquatic plants and vital *blue carbon sinks* which sequester carbon dioxide and produce oxygen. According to scientists[108], planetary marine algae produce somewhere between 50% and 75% of global oxygen and sequester about 25% carbon dioxide. Thus, such marine plants are environmentally very important.

So, if seaweed 'blooms' absorb carbon dioxide and aquatic nutrients, and produce oxygen, then why are they considered detrimental? The answer is, because at night the seaweed mass depletes the water's dissolved oxygen (DO), which results in such low levels that aquatic animal species (e.g. fish) living within the habitat cannot breathe and thus die.

When the seaweed mass (and fish) dies and microbial decay sets in. What happens is that decomposers also consume a lot of DO (to 'burn' its food in order to function) and which acerbates the problem, i.e., further lowering the DO in the water. Additionally, DO depletion is further acerbated by elevated water temperatures, i.e. the warmer the water the less DO it holds.

[107] Photo by Dale Tease, Illawarra Mercury, Friday, October 26, 2012.
[108] Dr. Allan Millar, Principal Research Scientist, Royal Botanic Gardens, Sydney, 'Macroalgae', June 2009. NSW Department of Primary Industries

As Lake Illawarra is gradually becoming muddier (silting up) and as a consequence shallower, and darker in colour (mud brown and absorbing more solar energy). Such parameters mean that the lake is becoming warmer and holds less DO, and from the perspective of the lake's flora and fauna - it's not good.
What's more, in the recent past, warm water from the former power station flowed freely into Lake Illawarra. Yes, the lake was truly a 'dump site.'

To have more seagrass beds (and not seaweed) within Lake Illawarra is beneficial, because such marine plants are food sources, sanctuaries and nurseries for a myriad of living things. In other words, seagrass beds would provide healthy marine flora and fauna – it's also a habitat indicator. For that reason, it is imperative that seagrass beds exist and are maintained in pristine condition. Unfortunately, due to poor water quality it appears that the seagrass beds are waning year by year, and with their loss everything else that depends on them.[109] What's more, man/organisations are acerbating the problem by simply filling in affected seagrass beds. Well, it's certainly happening within Griffins Bay (see Figure 13).

The benefit of marine plants – algae and seagrasses
Lets' also consider the role of marine *phytoplanktons* (microscopic aquatic plants). It's known that seawater is rich in *phytoplanktons*. They function similar to terrestrial plants, i.e., utilize sunlight, atmospheric gases and aquatic nutrients. Thus, their abundance and distribution depends on sunlight availability, nutrient loadings and water quality.

Ecologically speaking, *phytopklanktons* are extremely important as they are the basis of the food chain on which higher life forms depend. They support *diatoms, porifera* (sponges), *annelids* (worms), *coelenterates* (anemones, jellyfish), *crustaceans* (prawns, crabs), *mollusks* (snails, seashells), *fish, waterbirds,* including - *mankind*. A similar thing applies to the phytopklanktons within Lake Illawarra.

If the lake had a second opening (complemented by some tunneling/piping system), the incoming seawater would bring in fresh seawater and quickly equilibrate the lake's water level with the ocean tides. It would bring in many ecological benefits, e.g., vital seagrass beds would re-establish and perhaps even increase. Then, fish and crustaceans stocks (prawns) would follow. What's more, if the second opening was to be established its water inflow/outflow will also help keep the Windang's lake entrance permanently open. This in turn would avoid regular dredging, algal harvesting and lower associated costs. In a nutshell, no matter how the incoming seawater dissipates throughout the lake system and what it does, it would bring more good than harm.

With the use of modern technology, heavy machinery and expertise, the proposed second opening shouldn't be too difficult to construct (perhaps 150x1000m by about 5-10m deep), especially as the excavation would be into mud, sand and slag material, and particularly while the area is still underdeveloped. Apart from that, a road bridge will have to be built across such a would-be channel - where it cuts King Street. The only intricacy would be to maintain the channel opening at the beach/ocean end. However, marine engineers can solve the problem as similar works have been carried out elsewhere, such as at Ballina and Yamba, northeastern NSW, Figures 11-12.

[109] Rudolf, Nick and Anton Dominis; visual observations over the years (1960's-2013), as we live close to Griffins Bay and periodically fish at Lake Illawarra. What's more, it's an interest.

Figure 11: The entrance to Richmond River at Ballina, NE NSW (1999)[110]

Figure 12: Camden Haven estuary, NE NSW[111]

[110] http://test.dnr.nsw.gov.au/estuaries/inventory/pictures/richmond-01.shtml
[111]http://www.google.com.au/imgres?q=Estuaries+of+NSW&hl=en&biw=1440&bih=695&tbm=isch&tbnid=S03j1oiLf0peWM:&imgrefurl=http://test.dnr.nsw.gov.au/estuaries/inventory/pictures/camden-00.

So, let's re-establish Lake Illawarra once and for all, instead of 'stealthfully' filling it in as it's done at present (Figure 13). Filling it in is an easy option. It's simple and anyone can do it. One doesn't need experts to do that.

Figure 13: The easy option is simply to fill in Griffins Bay, as is the current trend[112]

So, whatever organisation(s) are managing the Griffins Bay and filling it in, well, they are not doing the right thing. Instead of restoring the lake (i.e. its water and which is the principal task) they are fundamentally killing it and quickly. Then to appease the so-called 'local community', the foreshores are being 'beautified' with ovals, cycle ways, picnic facilities, jetties and sporting clubs. Yes, foreshore improvements are great and do help (to a degree), but the main task is to improve the lake's water quality and keep its entrance permanently open. If Mother Nature cannot keep it open than mankind must.

[112] www.lia.nsw.gov.au

As of yet, the suggestion of having a second opening spanning from Port Kembla beach to Griffins Bay was never sighted in any publication. In essence, the idea wasn't considered by any group in the Illawarra. So, why don't we, as a concerned community, have a go and make it happen. It could work! Besides, as of yet, nothing else seems to work.

Conclusion

If Lake Illawarra water is to be restored it needs to be continuously 'flushed out' by incoming fresh seawater and be in balance with the outlying sea tides. This can only be achieved by building a second lake entrance – an efficient seawater-lakewater exchange system spanning from say Perkins Beach, Port Kembla to Griffins Bay/Joes Bay, as shown in Figure 4.

To complement such a scheme, perhaps some underground water system should also be considered.

If such a crucial project did come to fruition the odds are that Mother Nature will not only help restore Lake Illawarra, but it will do it *for free*. Subsequently, lake management costs will be vastly reduced.

In addition to that, many sustainable benefits will 'flow' to local councils, regional businesses, tourism, and to the general community.

It will also benefit our future generations. Yes, our future generations should also enjoy the Jewel of Illawarra and not some stinking (sorry, eutrophic) *Giant Green Lagoon.*

8.0 ATTACHEMENT-II

C.L.E.A.N

A BLUEPRINT FOR THE ESTABLISHMENT OF AUSTRALIA'S FIRST

"ECO-CITY"

WOLLONGONG

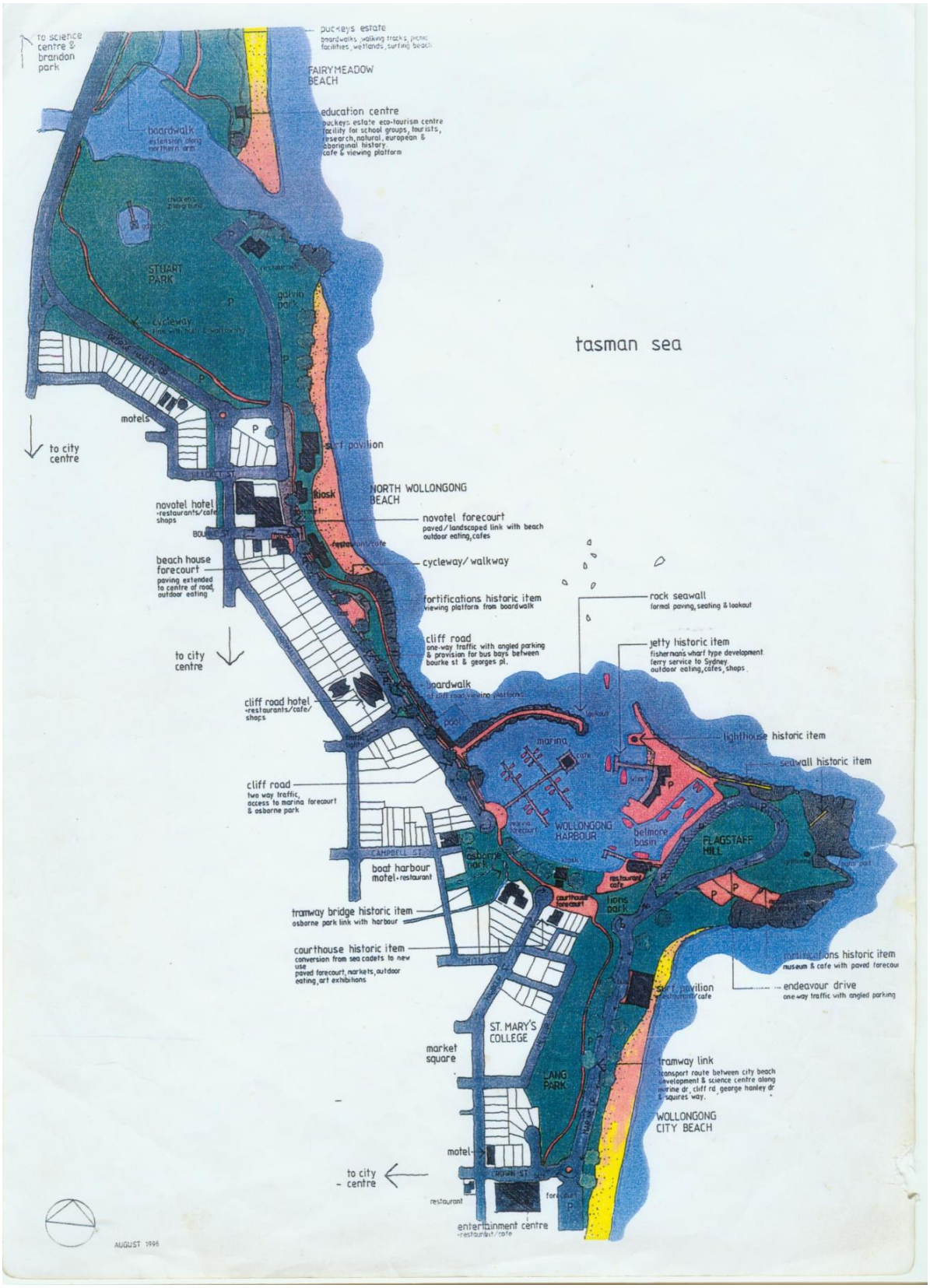
"CITY OF INNOVATION"

A SUSTAINABILITY PLAN

STEP 1 The establishment of a city foreshore park

Cleverly utilizing the tranquility and beauty of Belmore Basin and North Beach by innovatively adopting a few minor road changes along Cliff Rd will help create a world-class city foreshore park. This open minded planning will create a meeting place for the people of this city to breed a sense of tolerance, awareness, identity and mutual respect, which has been sacrificed in the past due to planning that only meet inexorable patterns of private demand (appendix1) Extract "Cities For a Small Planet"

The foreshore park will complement our magnificent escarpment and complete the first step in transforming Wollongong into Australia's first "Eco-City".


to science centre & brandon park
puckeys estate
boardwalks, walking tracks, picnic facilities, wetlands, surfing beach
FAIRYMEADOW BEACH
education centre
puckeys estate eco-tourism centre facility for school groups, tourists, research, natural, european & aboriginal history. cafe & viewing platform
boardwalk
extension along northern arm
STUART PARK
galvin park
cycleway
tasman sea
motels
to city centre
surf pavilion
NORTH WOLLONGONG BEACH
novatel hotel
restaurants/cafe
shops
novatel forecourt
paved/landscaped link with beach
outdoor eating, cafes
beach house forecourt
paving extended to centre of road, outdoor eating
cycleway/walkway
fortifications historic item
viewing platform from boardwalk
rock seawall
formal paving, seating & lookout
cliff road
one-way traffic with angled parking & provision for bus bays between bourke st & georges pl.
jetty historic item
fishermans wharf type development
ferry service to Sydney
outdoor eating, cafes, shops
boardwalk
to city centre
cliff road hotel
restaurants/cafe/shops
pool
marina
lighthouse historic item
seawall historic item
cliff road
two way traffic, access to marina forecourt & osborne park
WOLLONGONG HARBOUR
belmore basin
FLAGSTAFF HILL
CAMPBELL ST
osborne park
boat harbour
motel-restaurant
tramway bridge historic item
osborne park link with harbour
courthouse historic item
conversion from sea cadets to new use
paved forecourt, markets, outdoor eating, art exhibitions
lions park
fortifications historic item
museum & cafe with paved forecour
endeavour drive
one-way traffic with angled parking
surf pavilion
restaurant/cafe
ST. MARY'S COLLEGE
market square
LANG PARK
tramway link
transport route between city beach development & science centre along marine dr, cliff rd, george hanley dr & squires way.
WOLLONGONG CITY BEACH
motel
to city centre
restaurant
entertainment centre
restaurant/cafe
AUGUST 1998

STEP 2 A fully integrated transport strategy and city plan

Establishing a completely integrated transport strategy for the city will further develop the concept of Australia's first "Eco-City"- Wollongong City of Innovation.

Incorporating

Inner City By-Pass
City Circuit for dedicated city traffic
Eco-friendly city bus
Sea Transport to Sydney
Three Park and Ride Stations
Tourist Loop Road
Wollongong Environment, Technology and Business Park


dedicated busway to northern suburbs and Sydney
LOCAL TRAFFIC ZONE (Towradgi precinct)
redirect drainage channel (flush northern arm of creek)
FAIRYMEADOW BEACH
WOLLONGONG ENVIRONMENT, TECHNOLOGY & BUSINESS PARK
• hotel + business park
• science centre + planetarium
• close off section of Squires Way to link science centre with Puckeys wetland
new station
tunnel road
Mt Ousley Rd boulevard (avenue of trees)
dedicated busway to western Sydney
multi storey park + ride carpark adjacent stadium (gas driven city bus service)
TUNNEL ACCESS ROAD to take tourist traffic movement to city east from Mt Ousley Rd via Squires Way
SECONDARY + TERTIARY INSTITUTIONS
avenue of trees
STUART PARK
tasman sea
freeway
cycleway
dedicated busway to southern suburbs and Nowra
Bourke / st. link
NORTH WOLLONGONG BEACH
LOCAL TRAFFIC ZONE – WOLLONGONG (city east precinct)
FORESHORE PARK
Flinders St boulevard (avenue of trees)
BEATON PARK SPORTS COMPLEX
Campbell / st. link
WOLLONGONG HARBOUR
Wollongong heritage precinct
school
city east precinct
CITY CIRCUIT
one way flow for city circuit traffic (delete need for traffic lights provide angle parking wide footpaths)
court house
MALL
CITY CENTRE
Burelli st
route for gas driven buses to city centre + city east from multi storey carpark
rejuvinate surf pavilion
WOLLONGONG CITY BEACH
dedicated busway to freeway and southern suburbs
mall
tourist/backpacker accommodation
M'cabe Park central park
WIN STADIUM
Wollongong Sports Club – brewery and boutique (close off section of Harbour St.)
escalators from station to Crown st.
Gladstone Ave boulevard (avenue of trees)
multi storey park + ride carpark adjacent showground (gas driven city bus service)
multi storey park + ride carpark adjacent railway station (gas driven city bus service)
integrated commercial/residential development along Corrimal st.
Auburn st
Keira st
Corrimal st
Gladstone ave
Swan st link
Keira St boulevard (avenue of trees)
J.J KELLY PARK
GOLF LINKS
Bridge st link
GREENHOUSE PARK
• wetlands
• bush regeneration + experimental plantations
• eco-tourist centre
• lookouts + walking tracks
• picnic facilities
• carparking
dedicated busway to freeway and southern suburbs
Corrimal St boulevard (avenue of trees)
BORST architects
RE INVENTING WOLLONGONG FOR THE 21st CENTURY .
ILLAWARRA BUS-WAYS PTY. LTD.
ILLAWARRA ECO-TOURISM ASSOCIATION
CITY OF ENVIROMENTAL EXCELLENCE

STEP 3 The establishment of a Wollongong Environment Technology and Business Park

The Final Stage of Transformation

By transferring Illawarra Soccer to Lysaghts Oval and converting Brandon Park, Puckeys Reserve, Campus East and the Science Centre into a Centre of Environmental Excellence with the addition of an Eco-Resort, Innovation Campus, Film Studio and Re-Engineering Wollongong University to a Centre of Excellence in Sustainability and Cleaner Production.

Wollongong and the Illawarra has an ideal opportunity to reduce its unemployment rate and utilise its natural and manmade advantage to become Australia's first "Eco-City".

From a report "Multi-Partner Campuses The Future of Australian Higher Education?" by the Queensland University of Technology (appendix 2). Wollongong University is ideally situated to become the world's first multi-partner campus for sustainability and cleaner production similar to the University of Maastricht in the Netherlands, one of the finest international examples of a learning region.

The only obstacles holding back this regional vision is mediocrity by bureaucracy (appendix 3).

This is highlighted by a conference which was conducted by Healthy Cities Illawarra Inc in June 1998 "Partnerships for Illawarra's Environment Opportunities for an Integrated Approach", which was attended by the majority of bureaucrats in this region.

The concluding comments from that conference are attached (appendix 4).

APPENDIX 1

In 1957 the satellite was launched into orbit. It gave us a vantage point from which we could look at ourselves and signalled a new global consciousness, a dramatic change in our relationship with the planet. Seen from space, the beauty of the Earth's biosphere is striking – but so to its fragility. The plumes of pollution, the wounds of deforestation, the scars of industrialisation and the sprawl of our cities are evidence that, in our quest for wealth, we are systematically plundering every aspect of our life support system.

The survival of society has always depended on safeguarding the equilibrium between the variables of population, resources and environment. The neglect of this principle had disastrous and fatal consequences for past civilizations. We, too, are subject to the controlling laws of survival, but we are the first to be a global civilisation and therefore the first to face a simultaneous and worldwide expansion of population, depletion of natural resources and erosion of the environment.

Above us, 400 or so satellites, equipped with weather instruments, study coastal, ocean and polar processes, constantly beaming back scans of vegetation and atmosphere, plotting effects of pollution and erosion. Their data provides insights into changing geological patterns, global warming and the depletion of the ozone layer. They are witnessing the creation of an environmental catastrophe of a magnitude never before faced by humankind. The exact long-term results of current levels of consumption are not yet clear, but given the scientific uncertainty concerning their precise effects, my contention is that we must apply the "precautionary principle" and ensure that action is taken to safeguard the survival of our species on the planet.

It is a shocking revelation that it is our cities that are driving this environmental crisis. In 1900 only one-tenth of the world's population lived in cities. Today, for the first time in history, half the population lives in cities- and in 30 years time it may rise to as much as three-quarters. The urban population is increasing at a rate of a quarter of a million people per day- the equivalent of a new London every month. The worldwide growths of urban populations, and grossly inefficient patterns of living, are accelerating the rate of increase of pollution and erosion.

In the United States, pollution from cities has already reduced crop production by almost 10 per cent. In Japan, waste dumped by Tokyo city amounts to 20 million tonnes every year; waste that has already saturated the entire Tokyo Bay. Mexico City is literally drinking its two rivers dry, why London's massive traffic congestion causes greater air pollution today than the burning of coal in the pre- 1956 Clean Air Act period. Cities generate the majority of greenhouse gases, and respected establishment figures such as Sir John Houghton, chair of the United Nations advisory panel on Climate, now warn of the disastrous likely effects of current levels of greenhouse gas production.

While the need for cities and the inevitability of their growth will not diminish, city living need not lead to civilisation's self- destruction. I passionately believe that the arts of architecture and city planning could provide crucial tools for safeguarding our future. Creating cities that provide sustainable and civilising environments.

My cause for optimism is derived from three factors the spread of ecological awareness, of communications technology and automated production. Throughout the world, scientists, philosophers, economists, politicians, planners, artists and citizens are increasingly demanding

that the global perspective be integrated into strategies for the future. A United Nations report. Our Common Future, proposed the concept of "sustainable development" as the backbone of global economic policy: we should aim to meet our present needs without compromising future generations, and we should actively direct our development in favour of the world's majority, the poor.

The core of this concept of sustainability is the redefining of wealth to include natural capital: clean air, fresh water, an effective ozone layer, a clean sea, fertile land and the abundant diversity of species. The means proposed to ensure the protection of this natural capital are regulation and most importantly, the appropriate pricing of the market's use of natural capital. The ultimate aim of sustainable economic development is to leave to future generations a stock of natural capital that equals or ideally exceeds our own inheritance.

Nowhere is the implementation of "sustainability" more potent and more beneficial than in the city. In fact, the benefits to be derived are potentially so great that environmental sustainability should become the guiding principle of modern urban design.

In both the developed and developing worlds, the "carrying" capacity of cities is being stretched to the limit. Cities are increasing in size and at such a rate that conventional patterns of accommodating urban growth have become obsolete. In the developed world the migration of people and activities from the city centre to the dream world of suburbia has led to massive suburban development, wide spread road building, increased car use, congestion and pollution best exemplified in the cities of the western US like Phoenix and Las Vegas.

Meanwhile in the fast-growing economies of the developing world, new cities are being built at a phenomenal rate and density with little thought for future environmental or social impact. Cities are producing disastrous social instability that is further driving environmental decline. Poverty, unemployment, ill health, poor education and conflict undermine a city's capacity to be environmentally sustainable. Cities that have experienced civil war, such as Beirut, that suffer from severe poverty, such as Bombay; that have alienated large sections of their population from mainstream life, such as Los Angeles; or that pursue profit as their only motive, such as Sao Paulo in Brazil; damaging the environment to the detriment of all. There can be no urban harmony or real environmental improvements without basic human rights and peace.

Cities throughout the developed world contain communities that are experience intense social deprivation, but it is in the rapidly expanding cities of the developing world that the crisis of the poor is expanding all the faster. If unchecked, the ecological and social problems of these cities will soon dominate the human scene. The idea that the rich few can continue to turn their backs on the pollution and poverty of these cities and operate in comfortable isolation from these seats of desolation is short-sighted in the extreme.

Political and commercial expediency has shifted the emphasis of urban development from meeting the broad social needs of the community to meeting the circumscribed needs of the individuals. The pursuit of this narrow objective has sapped the city of its vitality. The complexity of "community" has been untangled and public life has been dissected into individual components. Paradoxically, in this global age of rising democracy, cities are increasingly polarising society into segregated communities. The result of this trend is the decline of the vitality of our urban spaces. The political theorist Michael Walter has classified urban space into two distinct groups "single- minded" and "open- minded" spaces.

“Single-minded” describes a concept of urban space that fulfils a single function and is generally the consequences of decisions by old guard planners or developers. “Open-minded” is conceived as multi-functional and has evolved or being designed for a variety of uses in which everyone can participate. The residential suburb, the housing estate, the business district, the industrial zone, the car park, underpass, ring-road, shopping mall, even the car itself, provide single-minded spaces.

But the busy square, the lively street, the market, the park and the pavement café are open-minded. When we are in the first type of spaces we are generally in a hurry, but in the open-minded places we are readier to meet people’s gaze and to participate.

Both categories have a role to play in the city. Single-minded spaces cater for our very modern craving for private consumption and autonomy. They are very efficient, in those terms. In contrast, open-minded places give us something in common; they bring diverse sections of society together and breed a sense of tolerance, awareness, identity and mutual respect. In the process of designing cities to meet the inexorable patterns of private demand,

We have seen the former category eclipsing the latter. In its wake we are witnessing the destruction of the very idea of the inclusive city.

The emphasis is now on selfishness and separation rather than contact and community. In the new kinds of urban development, the activities that traditionally overlapped are organised for the purpose of maximising profit for developers or retailers. Businesses are isolated and grouped into business parks; shops are grouped in shopping centres with theatre-set “streets” built into them; homes are grouped into residential suburbs and housing estates. Inevitably, the streets and squares of this counterfeit public domain lack the diversity, vitality and humanity of everyday city life. Worse still, the existing streets of the city are drained of commercial life and become little more than a no-man’s land for scurrying pedestrians or sealed private cars. People today do value convenience but they also long for genuine public life, and the crowds that pack city centres on weekends testify to this.

The disappearance of open-minded public space is not simply a cause for regret: it can generate dire social consequences launching a spiral of decline. As the vibrancy of the public spaces diminishes we lose the habit of participating in street life. The natural policing of streets that come from the presence of people needs to be replaced by “security” and the city itself becomes less hospitable and more alienating. Soon our public spaces are perceived as downright dangerous, and fear enters the scene.

In response, activities become ever more territorial. The street market becomes less attractive than the secured shopping mall, the university district becomes the closed campus; and as this process spreads through the city the open-minded public domain retreats. People with wealth bar them-selves in or move out of the city. In these closed, privatised spaces, the poor are forbidden to enter, guards stand at the gate. Those without money are equivalent to those without a passport, a class to be banished. Citizenship- the notion of shared responsibility of one’s environment- disappears, and city life becomes a two tier structure, with the rich in protected enclaves and the poor trapped in inner-city ghettos or, as in the developing world, squalid shanty towns. We created cities to celebrate what we have in common. Now they are designed to keep us apart.

The sprawling cities of the US with their inner-city ghettos, heavily policed middle-class dormitories, shopping centres and business parks, show the divisive tendency most clearly. Los Angeles starts at the outskirts where there is the Toxic Rim, a circle of giant garbage landfill, radioactive waste dumps and polluting industries. Moving inwards you pass so-called gated or privately patrolled residential suburbs and a zone of self-policing lower-middle class homes, until you reach a free-fire downtown area of ghettos and gangs. Here, the Ramparts Division of Los Angeles police regularly investigate more murders than any other local police department in the US. Finally, beyond the no go area lies the business district itself. In part of this area, TV cameras and security devices screen almost every passing pedestrian.

At the touch of a button, access is blocked; bulletproof screens are activated, bombproof shutters roll down. The appearance of the "wrong sort of person" triggers a quiet panic. Video cameras turn on their mounts.

In LA the car has become the mobile fortress. Tinted windows disguise the identity of the passengers, bullet proof glass protects from armed attack, doors can in an instant be centrally locked from within, creating ever greater alienation of the individual from the city.

Although British, European or Australian cities have not yet gone this far, many display similar tendencies writ small. We to have seen a retreat to the suburbs, as an increasing reliance on private security and private transport, the proliferation of single-minded spaces. Any attempt to redress the situation must depend on mobilising individuals and their sense of belonging to the city. It is the individual's commitment to the city, which is so absolutely central to achieving sustainability.

Strolling through Europe's great public spaces- the covered Galleria in Milan, Ramblas in Barcelona, the parks of London or the everyday public spaces of market and local neighbourhoods- I feel part of the community of the city. The Italians even have a word which describes the way men, women and children interact with the public space of the city as they stroll on their streets and squares in the evening: they call it la passeggiata.

When Parisian authorities agreed to give half the site they had set aside for the Pompidou Centre to a public piazza, they were encouraging exactly this type of citizenship.

The idea of integrating a bustling public square into the Pompidou Centre project had come from our experience of historic public spaces, such as Jamaa El Afna in Marrakech, Piazza San Marco in Venice and the Campo at the heart of Siena, scene of the Palio horse race. Active citizenship and vibrant urban life are essential components of a good city and of civic identity.

Cities can only reflect the values, commitments and resolve of the societies, which they contain. The success of a city therefore depends on its inhabitants, their government and the priority both give to maintaining a humane urban environment. The Athenians of ancient Greece recognised the importance of their city and the role it played in encouraging the moral and intellectual democracy of their times. The agora, the temples, the stadium, the theatre and the public spaces between them were both the magnificent artistic expression of Hellenic culture and the catalyst for its rich humanist development. The commitment to the interdependence of built form and ideals was captured in the oath pledged by new citizens; "We will leave this city not less but greater, better and more beautiful than it was left to us." Quality of urban environment defines quality of lie for citizens.

Vitruvius, Leonardo da Vinci, Thomas Jefferson, Ebenezer Howard, Le Corbusier, Frank Llyod Wright, Buckminster Fuller and others proposed ideal societies; cities that would better citizenship and enable society to overcome its traumas. While such single-minded visions of cities no longer relevant to the diversity and complexity of modern society, these architectural attempts at Utopia should remind us that, in a democratic age, contemporary architecture and planning might be expected to express our common philosophical and social values. But, in fact, most recent transformations of cities reflect society's commitment to the pursuit of personal wealth.

The construction of our habitat continues to be dominated by market forces and short-term financial imperatives. Not surprisingly. This has produced spectacularly chaotic results. It astounds me that the built environment in so many places remains an incidental political issue. Cities are the cradles of civilization, the engines of our culture development. Putting the culture of cities back on the political agenda is critical, for a while they might be places where life is at its most precarious, cities can also fundamentally inspire. This is the dichotomy of the city: its potential to brutalise and its potential to civilise.

A new form of citizenship must be evolved that responds to the needs of a modern city. Greater emphasis on citizen participation and better leadership are vital. Involving communities in decision-making requires that the built environment becomes a standard part of the education. Teaching children about their everyday urban environment equips them to participate in the process of respecting and improving the city. Cities themselves can be a greater tool, a live laboratory for education. Environmental sustainability should be at the core of subjects taught, a theme linking physics, biology, art and history. Much of our future quality of life depends on getting this right.

Should people be demoralised by the apparently insurmountable task of gaining democratic control of their cities, there are encouraging examples from around the world. In many places, the city, in its many aspects from ecology to architecture, is an established issue of public debate and electioneering.

The late president Francois Mitterand stated that "culture", and in particular architecture, was the fourth most important voting issue in France. Major initiatives such as the Grand Projects of Paris are just the tip of the iceberg. In France there is a competition for each and every government building, be it a public housing project, a school, a post office, a local square, a park or an entire new town. Contrast this with the situation in Britain, where taxpayers spend 4 billion pounds annually on their public buildings and yet central government has had no architectural policy. In 1992 just 10 public design competitions were held to France's 2000. It is maddening to watch real talent being squandered today and a mediocre architectural heritage left for tomorrow.

Curitiba, a rapidly expanding city in Brazil, has succeeded- thanks to farsighted leadership and public participation- in tackling its problem of growth and consolidation. They have pursued policies aimed at increasing environmental and social awareness, covering everything from education to commerce, transport to planning. As a result, citizens feel they own their city and are responsible for its future.

Rotterdam provides an example of concerted government-sponsored, but community-orientated, development. A strategic plan for the entire city defines the principle directions in which the community wishes to see it grow.

The conversion of their docklands is the subject of continuos study, debate and collaboration. The majority of land in and around the city is publicly owned and can be given to the community if the need arises, rather than when someone can afford to buy a site. The city aims to grow like a cell structure, splitting and replicating into mixed neighbourhoods of three to five thousand people with workplaces, schools, shops and housing. At least a third of each new community consists of overflow from neighbouring communities, which ensures the social coherence of the whole. In this way, Rotterdam avoids dividing itself into segregated zones and isolated communities.

In Spain the end of Franco's rule in 1975 was followed by the election of city mayors, and in Barcelona strong mayoral leadership backed by popular support totally transformed the city. The mayor Pascal Maragal and his Minister of culture, the architect Oriel Bohigas used the hosting of the Olympics as a catalyst for visionary reform that went much further than the provision of Olympic facilities

Beyond specific projects Maragal has created an atmosphere of which the private sector is willing to conform to poular public leadership, because developer can both see the overall benefit of the long-term improvement of the city and recognise the importance of public interest. by these democratic processes Barcelona has been transformed into a world-class city, a place where people long to visit, work and live.

The cities of San Francisco, Seattle and Portland have integrated public participation in urban planning into their electoral system. In local elections, you just don't choose a candidate, you have the opportunity to make decisions about your own surroundings: How much office space should be allowed? Which regeneration plan is best? What transportation strategy should we adopt?

These approaches illustrate how urban societies are evolving strategies tailored to their specific culture and needs. In each of these cities there is a fundamental assumption that citizens have a say in the shaping of their cities. They emphatically prove that public participation and genuine government commitment can transform the physical and social fabric of our cities.

In parallel we must pursue ever more decisively the development of technologies and innovations that protect our ecology and humanise our cities.

Humankind's capacity to transmit accumulated knowledge from generation to generation, to anticipate and to solve problems, has been its greatest asset. I find it amazing and tremendously inspiring that only a hundred typical lifespan separate our present age, which can build a city in space, from the age which saw the first cities built along the Euphrates and the Tigris.

Nowadays technology develops ever faster and offers even greater opportunities. There were only two lifespan between the invention of the bicycle and that of space travel; and less than half a lifespan between the first electronic computer and the development of the information superhighway.

In his compelling analysis of modernity in the 19th and 20th centuries, Marshall Berman reminds us of the challenge to traditional social, economic and religious values that accompanies this technological evolution. He quotes from Marx's vivid description of the modern condition: "All fixed, fast-frozen relations, with their train of ancient and venerable prejudices and

opinions, are swept away, all new-formed ones become antiquated before they can ossify. All that is solid melts into air, all that is holy is profaned, and men at last are forced to face the real conditions of their lives and relations with their fellow men."

Embracing change always carries uncertainty and risk. The power to transform and change both the world and our-selves defines our modern condition. The thirst for what we can achieve is balanced by our ability to destroy. To be modern, therefore, is to live this life of paradox- this is the Faustian bargain Berman exposes.

In his maelstrom, the laws of the market have taken hold. But the "invisible hand" of the market is a force of neither nature nor man. Society, in the form of its governments and other institutions, has the responsibility to focus the dynamic of modern life, to direct the application of new technology, to confront old values with new.

The city is the embodiment of society: its form must be continuously viewed against our social objectives. The problems of today's cities are not the result of rampant technology, but of its rampant misapplication.

The speed of technological change and, above all, the speed and breath of its dissemination, provides modern society with its greatest potential power. The United Nations Development Agency estimates that in the next 30 years, as many people will be seeking a formal education qualification, as have done so in total since the beginning of civilisation. For the first time since the Industrial Revolution, work is taken up less of our lives. Robotics, education, medicine, global communications-all manifestations of our technological development- provide the conditions for the development of a new form of creative citizenship that generates wealth for society without breaching the limits of our environment's sustainability.

The challenge we face is to move from a system that exploits technological development for pure profit to one that has sustainable objectives. Making cities sustainable demands fundamental changes in human behaviour, in the practice of governments, commerce, architecture and city planning. The developer, who builds for purely commercial returns, with no commitment to the city's environment nor to the quality of life of its citizens, is misusing technology. So too is the planner who drives a motorway through the middle of a city without regard for the broader environmental or social issues.

I am wild about technology but not about technology run wild. The citizen for the benefit of the citizen must focus technology; it should seek to secure universal human rights and provide

shelter, water, food, health, education, hope and freedom for all. It is my belief that the sustainable city could provide the framework for the fulfilment of basic human rights. That ideal underpins my approach to sustainability: mobilising creative thinking and technology to secure humanity's future on this small planet of finite resources. It is innovation that would have an impact on the city of the 21st century as radical as that of the industrial revolution on the city of the 19th century.

This is an edited extract from "Cities For A Small Planet", by British architect Richard Rogers,

APPENDIX 2

BLUEPRINT FOR A BETTER COMMUNITY

JOINT-VENTURE campuses have a bright future in Australia and can play a crucial role in transforming regional communities into vibrant centres of learning, a new report says.

These campuses present some of the most exciting responses to the demand for educational innovation, with collaboration across education sectors, it says.

The report Multi-Partner Campuses. The future of Australian Higher Education? Gives a snap shot of Australian and international practice. It looks at possible future arrangements and, for the first time, creates a template for measuring their success.

The Queensland University of Technology report- by Adam Shoemaker, Janelle Allison, Kingsley Gum, Rose Harmony, Mike Lindfield, Marguerite Nolan and Lawrence Stedman- was funded under the federal Government's Evaluation and Investigation Program.

"From our research…. It has become clear that the changing nature of knowledge and education in the 21st century requires new kinds of learning environments." The report says.

"Such environments must foster partnerships between different education sectors, as well as between those various sectors, local government and local communities. This is particularly true of those areas defined as regional."

It says the most successful regional campuses are those that are totally enmeshed with, and reflect, their surrounding communities.

Multi-partner campuses can mean those with secondary, vocational and higher education on one site.

In a more innovative context they can also mean co-location with local and state governments and industry.

In teaching and learning, the spectrum can range from simple articulation between TAFE and university to a fully-fledged, cross-sectoral amalgamation of all the services, equipment and capital infrastructure as well as academic programs.

The report concludes there is no single institution or multi-partner campus in Australia or overseas whose performance is ideal.

The University of Maastricht in The Netherlands is one of the finest international examples of a learning region.

"Here, Coffs Harbour (NSW) is a stand out in terms of seamless co-operation across three educational sectors; Rockingham (Western Australia) has one of the most successful multi-partner libraries in the country; the University of Ballarat has an exemplary strategy for marrying IT infrastructure with the development of its region.

“The challenge now is to draw together these disparate strands of success into a coherent whole-both as these projects develop and as new multi-partner campuses are conceived.”

The report recommends adopting clear measures and standards for these types of campuses and advocates a 12-point viability index to assess them.

The index comprises whether the campus has a central, serviced location; an icon building; local authority support; independent governance; champions for the joint venture among all its constituents; physical and symbolic co-location; involvement of all three educational sectors; a small business enrichment strategy; the best IT infrastructure; a point of difference that reflects its community; and valid demand.

APPENDIX 3

MEDIOCRITY BY BUREAUCRACY

"Have we still got it wrong on encouraging science and technology?" "Yes, writes Barry Ninham"

It looks as if the Prime Minister's Science Engineering and Innovation Council may have put the cart before the horse, as have all its predecessors during the past 40 years.

Several years ago, as national chairman of Chemical Engineering of Sweden. I chaired a review of basic engineering sciences research in the country.

We sought advice from the top research managers of eight Swedish multinationals, on which the economy is critically dependent.

Swedish policy until then had followed much the same path as ours, dominated by a massive bureaucracy called NUTEK, pushing co-operative research centre, university- industry collaborations and commercialisation of research.

We expected the standard bleat about government support for industry. Not so. The opening statement from the leadoff guy was: "Stop this f…ing academic prostitution."

Then these normally conservative businessmen went berserk for four hours. Stop these ridiculous CRC's, they said. Their message, which thy all passionately agreed, was "We know applied research, we know product development, we know marketing and the market."

"What we desperately need and cannot get enough of is top-quality PhDs. It does not matter which field only that the discipline is intellectually rigorous."

Several years before, Sweden industry did go along with the analogue of CRCs, called competence centres, whose main function is training PhDs, funded by a one-off pool of money for research acquired by a tax on industry. They did so reluctantly- to get their money back and with little expectation of outcomes.

Fortunately for that country, the bureaucracy of NUTEK has since been severely truncated. There are no tax incentives in Sweden.

A multinational such as Proctor and Gamble has something like 8000 PhDs. They spend about $5.2 billion a year on research and development. The same is true for many other companies. And they rigorously protect their intellectual property.

Most of them- chemists, biologists, and engineers- have far more freedom to do research than any Australian academic, and infinite resources. Commercialisation of known science is not a competitive goer in such a climate. So we are looking at new, unanticipated science.

The difficulties for university technology transfer companies, with or without tax incentives, are several. Since their salaries (very low) are paid independently of outcome, they are not

really in business but parasitic. All power in those who make a buck. But success depends on risk capital, their bucks, not mine.

And by and large, their levels of technical competence are such that they do not even know the words of science and engineering let alone have the capacity to recognise a key advance.

Consequently, they are susceptible to snake-oil scientists, as are CRC committees. People not in science or who left the cutting edge of research years ago dominate committees that write papers on the commercialization of science.

The shortage of venture capital ($1.50 per head Vs $33 in the US) is laughable and an almost insuperable inhibition to commercialisation of ideas.

Present policy-makers still assume that the university scientist or engineer is a white coated, inarticulate idiot devoid of entrepreneurial skills, to be locked up, over loaded with lectures, grant applications and accountability statements, underpaid, without tenure, yet expected to feed out ideas on demand at the base of a giant pyramid of planners, entrepreneurs, economists, stakeholders, environmentalists, bureaucrats and boards that magically produce commercialisation.

They have got it wrong and will continue to do so. Our Swedish businessmen research managers identified the key problem. Produce top quality PhD's and leave them in a good environment to do basic science. It is only by getting that side of the mix right that we will stumble across and identify paradigm shifts that matter.

Any really good new science will automatically be commercialised. It is only mediocre stuff, and lack of top researchers that is the difficulty. Our present policies are designed to foster mediocrity.

Putting the horse in front of the cart does require government investment in universities for the knowledge society. Barry Jones knows it, the Swedes know it, so do the Americans, Canadians, Germans, Singaporeans, the Swiss and even the French- but few Australians.

Barry Ninham is foundation professor and head of applied mathematics in the Institute of Advanced Studies at the Australian National University.

APPENDIX 4

Summary of concluding remarks

PROFESSOR DAVID FARRIER

PLANNING

While there is a need for strategic planning, there seems to be an overload of plans and documents without a lot of consideration for how the plans fit together. Some plans probable cease to be meaningful by the time it comes to implement them; further, little attempt seems to be made to see whether or not plans are really being implemented.

INTEGRATION AND COORDINATION

Integration and coordination are critical at every level: strategic planning should be integrated into existing plans; educational initiatives and public participation should be coordinated. However, the system is extremely complex. Can we really expect people to participate in such a complex system and know what's going on?

PERFORMANCE STANDARDS AND ACCOUNTABILITY

We hear very little about whether plans are implemented, whether performance standards are met and about what has succeeded and what has failed; particularly when dealing with non-statutory plans. There seems to be no real attempt to see the extent to which those plans fit together. While it may be done within agencies, it is not done across agencies. It would also be useful for agencies to adopt common procedures and terminology and that they coordinate before developing strategic plans rather than afterwards.

AN ENVIRONMENT CENTRE

A "one-stop-shop" community-based environment centre would pool together a range of environmental information which the public can access, including responsibilities of different agencies, what is being done and how people can get involved. Such a centre may also take on an advocacy role. However, it is unknown how such a centre may be funded. There is also momentum for the formation of a community based environmental health group- this has emanated from the recommendations of the Leukaemia Cluster Report. Such a group would fit well with the formation of an environmental centre.

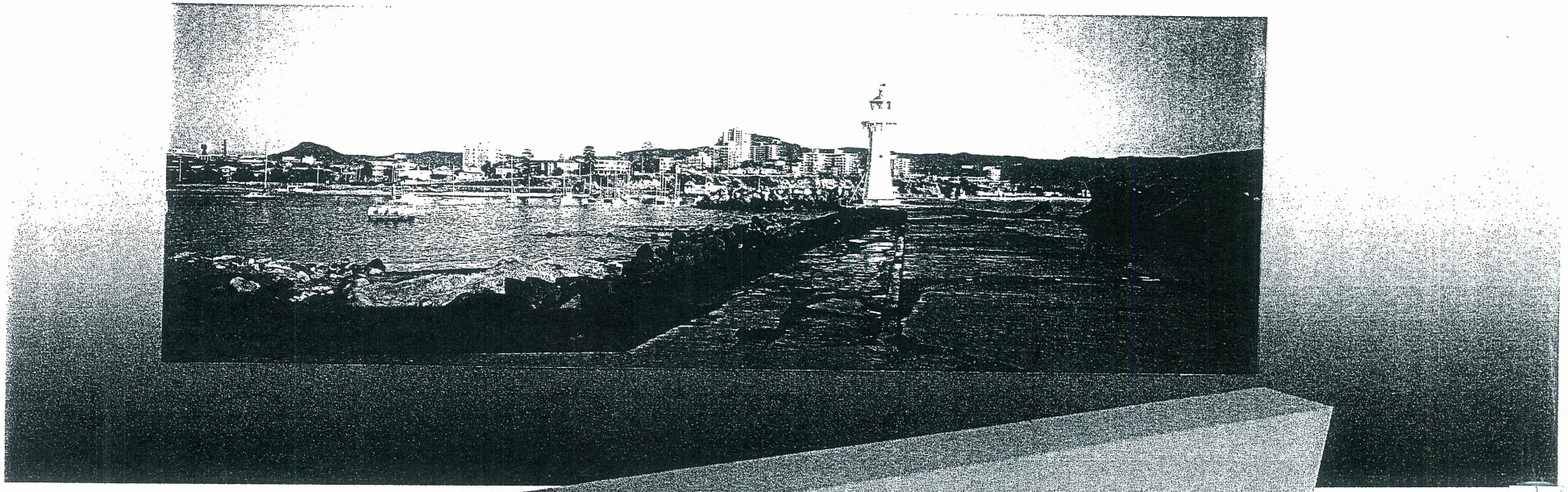
A REGIONAL VISION

There is a need for some type of regional vision and it seems clear that this is where we are headed. This may come from a non-statutory organization with funding power and based on the catchment management model. While this may present some problems in trying to work across historical boundaries, it is important that regional coordination begins to happen.

9.0 ATTACHEMENT-III

"What to do with Charming Wollongong" **- VISION 20 / 20**
An Integrated Approach Draft Central Wollongong Urban Design Strategy
Wollongong City Council - Planning Division 1998

(PDF file)



What To Do With Charming Wollongong

Vision 20 / 20

An Integrated Approach
Draft Central Wollongong Urban Design Strategy

WOLLONGONG
City of Diversity

Planning Division
September 1998

Cover photo is after "Walk Up Australia" ; Wollongong Council document- Keep Australia Beautiful

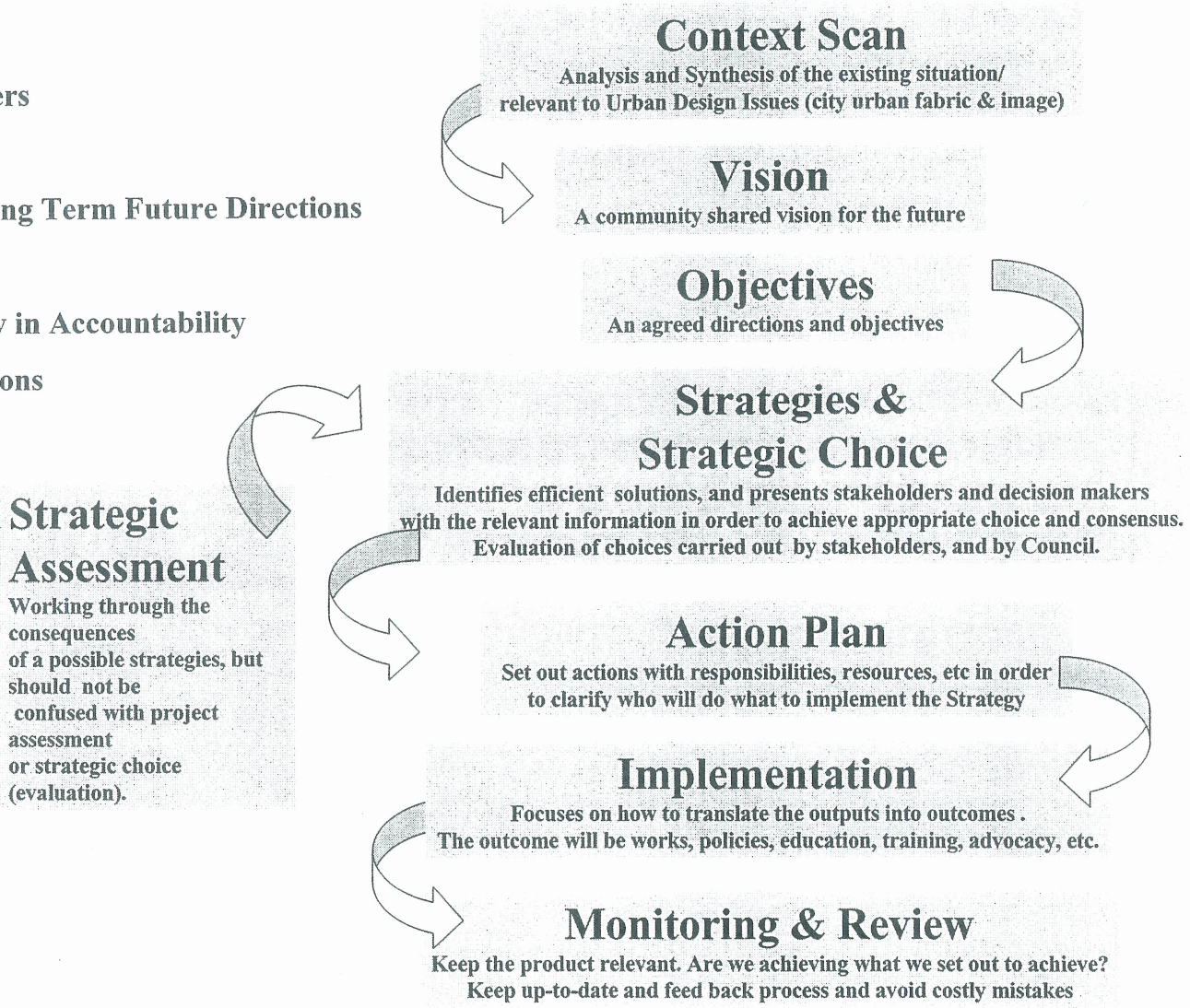
06

1.5 Process of the Strategy

This Process is based on "Principles for Strategic Planning", AUSTROADS, 1998.
(see also Acknowledgment & Methodology - pages 62 & 63).

Strategic Planning Principles:

- Focus on Outcome
- Flexibility in Process
- Consider Relevant Stakeholders
- Comprehensive Approach
- Generate Possible Short & Long Term Future Directions
- Feedback
- Commitment & Transparency in Accountability
- Monitor the Strategies & Actions



Acknowledgment

This Urban Design Strategy was prepared in-house by the Planning Division, Wollongong City Council

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Project Principal:
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Planning Review Team:
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Glenys McLaine - Assistant Manager Planning (till April 1999)
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Phil Tolhurst- Traffic and Safety Management (till April 2000)
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Michael Manti- Planner (since May 2000)
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Working Party:

The following is a list of participants who were invited to the workshop held in 4 & 5 June 1999, and they represent the Working Party:

- Lord Mayor, Cr. David Campbell (Cr. George Harrison since Oct 2000)
- Cr. Alex Darling
- Cr. Pat Franks;
- Mr. Rod Oxley, The General Manager, Wollongong City;
- Mr. Tony Roach, Assistant General Manager;
- Mr. Carl Wulff, Assistant General Manager;
- 5 members from the Illawarra Business Chamber and Future Directions group(Terry Wetherall, Sheryl Miller,John Roach, Malcolm Heard, Mark McDonald- represented by Michael Corban);
- 5 residents from Neighbourhood Committee 6 (P.Calabro,Patricia Kean, Jack Doyle, Frank Coluccio, D.J.Primmer);
- 4 residents from Neigbourhood Committee 5(Irene Tognetti, Carolyn Griffiths/currently a Councillor, Trevor Mott/ currently a councillor, Ron Knowles);
- Mr. David Winterbottom, Consultant Planner – RAPI ;
- Mr. Andrew Conacher, Consultant Architect – RAIA, ;
- Mr. Ken Rootsey, K.F. Williams- UDIA, Illawarra Branch;
- Mr. Neville Fredricks, Miltonbrook Pty, Ltd;
- Mr. David Gilmour, Property Manager, Lend Lease;
- Anna Chubb, Department of Urban Affairs and Planning ;
- Mr.Ken Collis ,Regional Manager, Road and Traffic Authority ;
- Mr. Les Dion, Wollongong Bus and Coach Association;
- Mr. Frank Wallner, Healthy Cities Illawarra;
- Mr.Justin Horan, Wollongong Tourism;
- Ian McClintock, Manager Community Development & Services, WCC.
- Amanda Buckland, Cultural Coordinator , WCC
- Paul Fanning , Mall Manager
- Louise Thom, Heritage Officer, WCC;
- Emma Thorburn, Landscape Architect, WCC;
- Kerry Hunt, Wollongong Youth Centre;
- The Planning Review Team of the Strategy.

Workshops Facilitator:

Mr. John Mant, Phillips Fox Lawyers

The following documents and studies were consulted by Council's Urban Designer but not necessarily considered or used in the preparation and production of this Strategy:

- Cities for the 21st Century, Department of Urban Affairs and Planning, 1995.
- Towards a 20/20 Vision, Illawarra Region of Councils, 1997.
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- Newcastle Urban Design Guidelines, Development Control Plan No. 30, 1993.

Document Production:

Format and Layout Design, Photographs (except where provided), Graphics, Text, Context , and electronic production – Roxy Binno

Base maps support - Jenny Lewis and Howard Jones

Secretarial Support – Shelly Symons, Maria Plezer, Leonie Voller

PART - 3

Vision & Objectives

Vision Statement

In the 21st Century, Central Wollongong as the regional centre of the south coast and the southern highlands should be attractive, lively, and vibrant city to attract appropriate developments and competitive functions. This should consider the past and the present contexts , and be responsive to the local geographic setting and cater for the need of all age and cultural groups.

The vision may be achieved by setting objectives and the desired outcomes that are relevant to the city urban fabric and image.

City Fabric Is about efficiency and liveability and covers issues relevant to land use, activity spatial pattern, accessibility, and civic places. A good urban fabric should promote convenient and efficient access, and safe and livable environments.

City Image Is about city appearance, attractiveness; and covers issues relevant to city form and image such as: building height, street profile, heritage image, building character and edges, outdoor advertising signs, night lighting and public art. A good city image should be memorable, legible, attractive, and diverse (but compatible and coherent); and leave a pleasant impression on users and visitors. Lifestyle, geographical setting, technological innovations, and the socio-political and economic trends, and changing community values and attitudes are the factors that influence the city image and vice versa.

Preparing a long term urban design strategy (three dimensional) requires close co-ordination and consideration for issues relevant to city fabric and image, such as:

- where people access the city;
- the means by which they move through it ;
- how convenient this is;
- what they see and how they feel ;
- whether their experience in the city is enjoyable;
- how convenient to live in the city; and
- how business functions are stimulated.

Promoting a good city fabric and image will enhance the quality of life for residents and visitors by making the City an enjoyable place to be in.

Desired Outcomes & Objectives

The desired outcomes (listed below) for the Study Area have been derived from consultation with the community through the public exhibition process and workshop during 1999. These outcomes are broad statements of intent from which more defined objectives and strategic actions pertaining to specific functional categories and precincts have been identified (see Part 4 of this document).

- The Central Wollongong Area engender City Pride by developing into a liveable, attractive and safe urban environment to live and work within.
- The Central Wollongong Area be accessible to Sydney and the Illawarra Region.
- The Central Wollongong Area retain its primacy as the regional commercial centre for the Illawarra Region.
- The Central Wollongong Area provide a good visual and physical link between the the Illawarra Escarpment and the Pacific Ocean.
- The Central Wollongong Area enhance employment opportunities for the residents of Wollongong.
- The escarpment, which forms the backdrop of Central Wollongong Area be protected.
- Heritage environments within the Central Wollongong Area be protected from degradation.
- The Central Wollongong Area provide opportunities for the provision of housing choice and diversity.
- The quality of public domain and open spaces in Central Wollongong be enhanced.

It should be highlighted that the abovementioned desired outcomes relevant to the protection of the Escarpment, employment, etc are not within the ambit of this Urban Design Strategy (see Council Strategic Plan " Focus on the Future"). However, promoting good urban design for Central Wollongong Area will contribute to the economic development of the Area and may indirectly increase employment opportunities, and reduce the pressure of urbanisation on the Escarpment.

Generally the Objectives of the Vision encompasses the following categories:

Economic Objectives:
To promote responsive land use and improve accessibility and the urban realms in order to stimulate private sector investment to revitalise existing private properties and businesses; and to attract new businesses and tourist activities.

Socio-Cultural Objectives:
To facilitate better city living , compatible land use, and safe and lively environments to all users.

Environmental Objectives:
To enhance the attractiveness of city image, the quality and efficiency of the city fabric, and minimise any adverse environmental impacts .

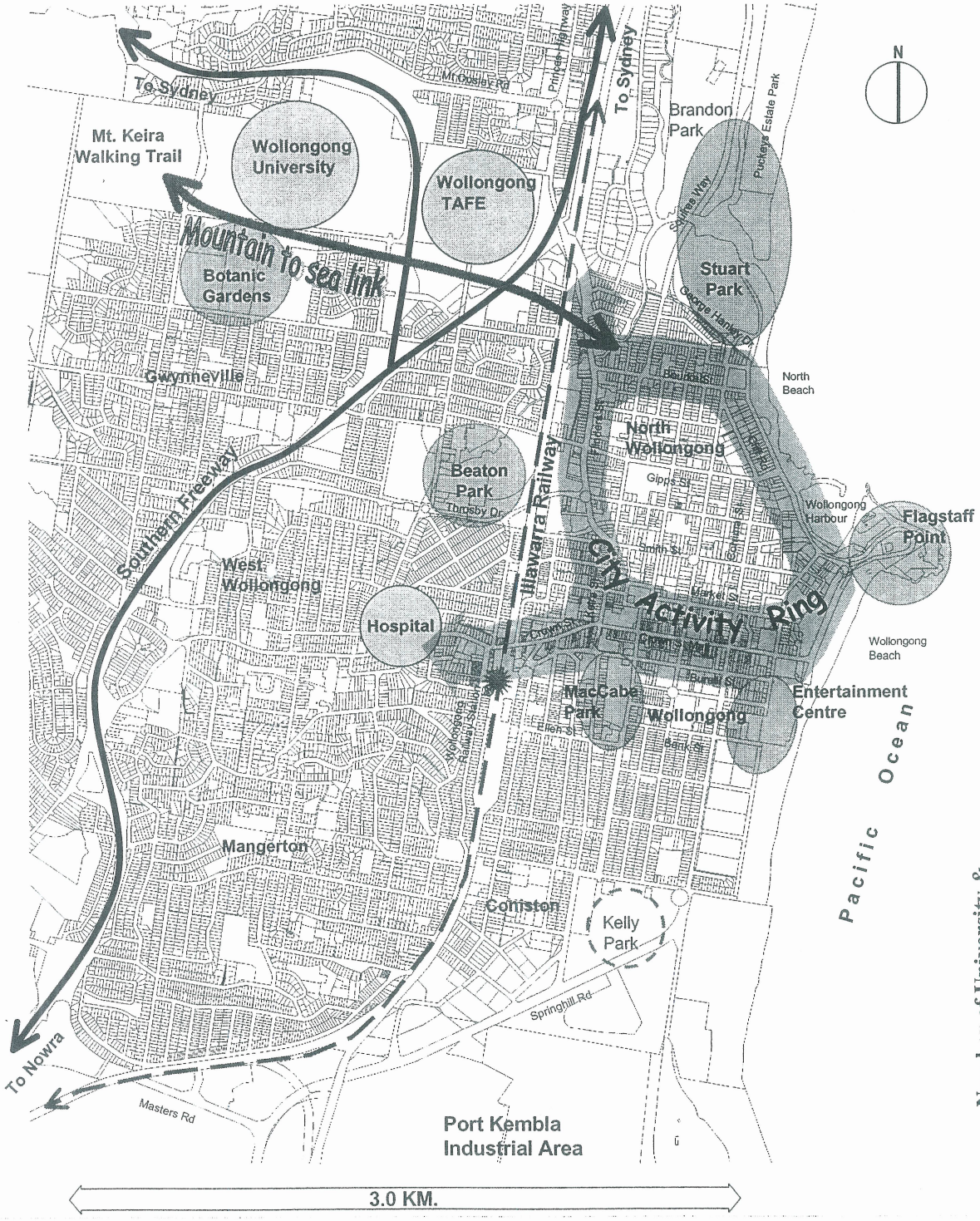
PART - 4
Strategies & Actions

This chapter set out strategies and actions at global and precinct scale levels. These strategies and actions are the tools that will facilitate the Vision and promote the desired character within the city specific areas.

The sub chapters are:

"....there is a need to create a core, a heart for the city."
"Without a strong and inclusive heart, a city tends to become a collection of interests isolated from one another, it falters at producing something greater, socially, culturally, and economically, than the sum of its separate parts"

Jane Jacobs, 1961



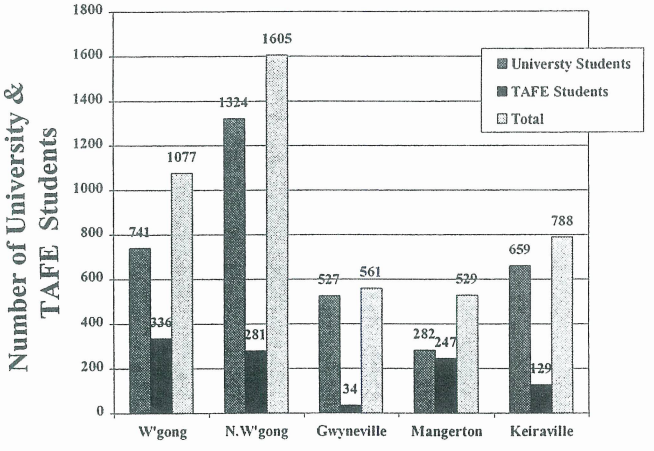
4.1 Synthesis/ Anticipated Future Urban Structure

Currently, the Crown Street corridor is the most active part of Central Wollongong. It is anticipated that activities along the other major movement corridors will grow during the next decade. the future activities fabric will change from its current linear form along the spines of Crown and Keira Streets to a circular corridor " City Activity Ring" . The latter will link the diverse activities along Crown Street, The Foreshore Area, Bourke Street, and Flinders and North Keira Streets. At the periphery of this activity ring there will be also secondary links to the major peripheral activities such as The University Precinct, Flagstaff point, Stuart Park, etc.

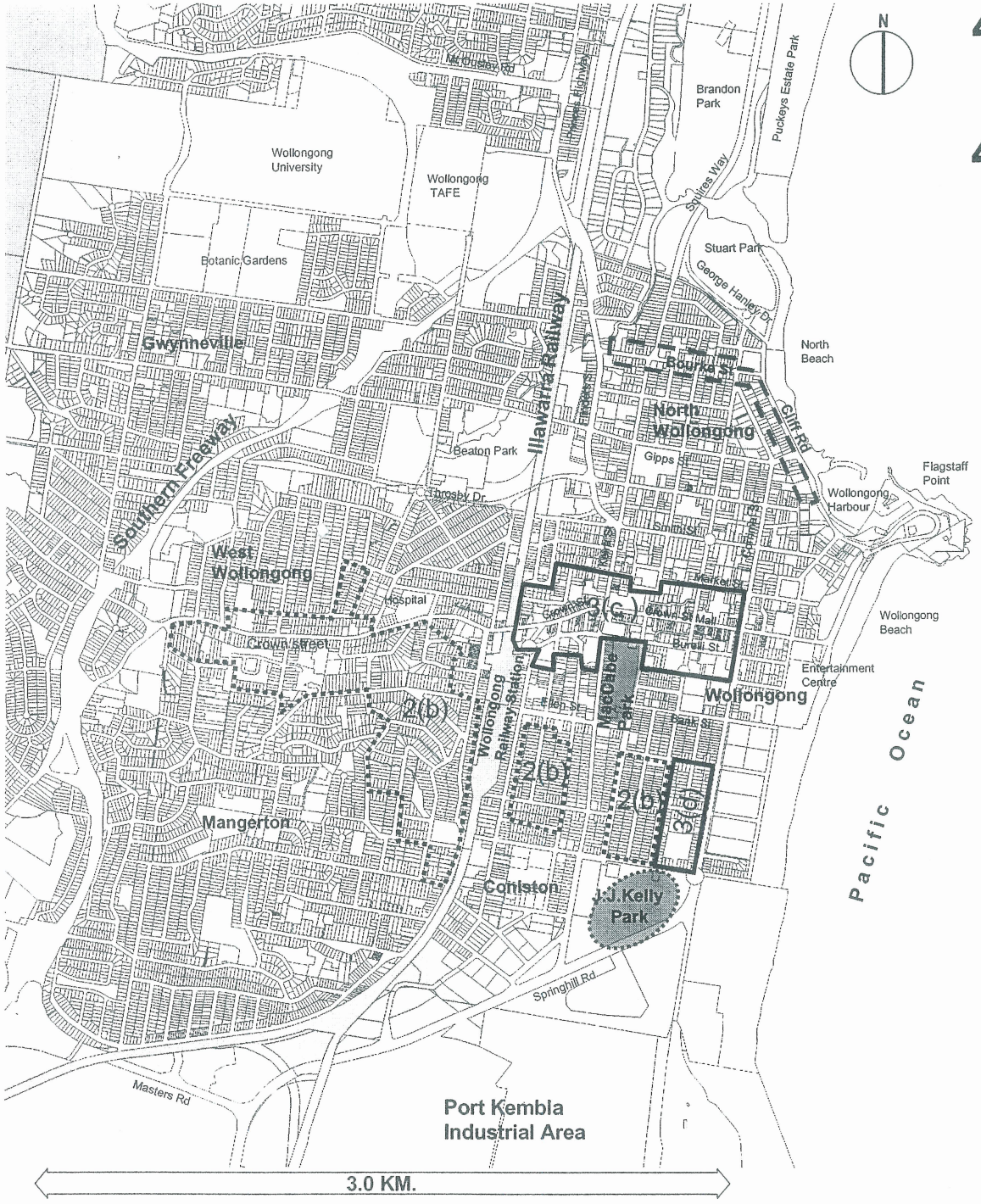
A Mountain to Sea link (pedestrian and cycleway) could be a substantial secondary link. National trends indicate that Wollongong University will play greater role in the local cultural and economic contexts, and consequently will have greater impact on the urban fabric of the City. In 1996 there were 3533 university students living in the study area of whom 60% live in Wollongong and North Wollongong Districts (Australian bureau of Statistic 1996 Census). Given the number of students and visitors moving between the City and the University, the latter deserves a more convenient and attractive pedestrian and cycleway link in the long term. Such a link will also strengthen the pedestrian movement between the Foreshore (marine tourist facilities) and the Botanic Gardens and Mt Keira natural resorts (bush trails and recreation areas) . In other words this will generate better tourism activities.

The central part of the the City Ring will contain the high density residential zone which will occupy the elevated land and slopes at Smith Hill.

It anticipated that identifying, upgrading and improving connectivity between the diverse activities within central Wollongong will stimulate the revitalisation of both private and public property.



Note: Mangerton in the chart includes Coniston & Mt St Thomas Districts



4.2 Possible General Strategies & Actions

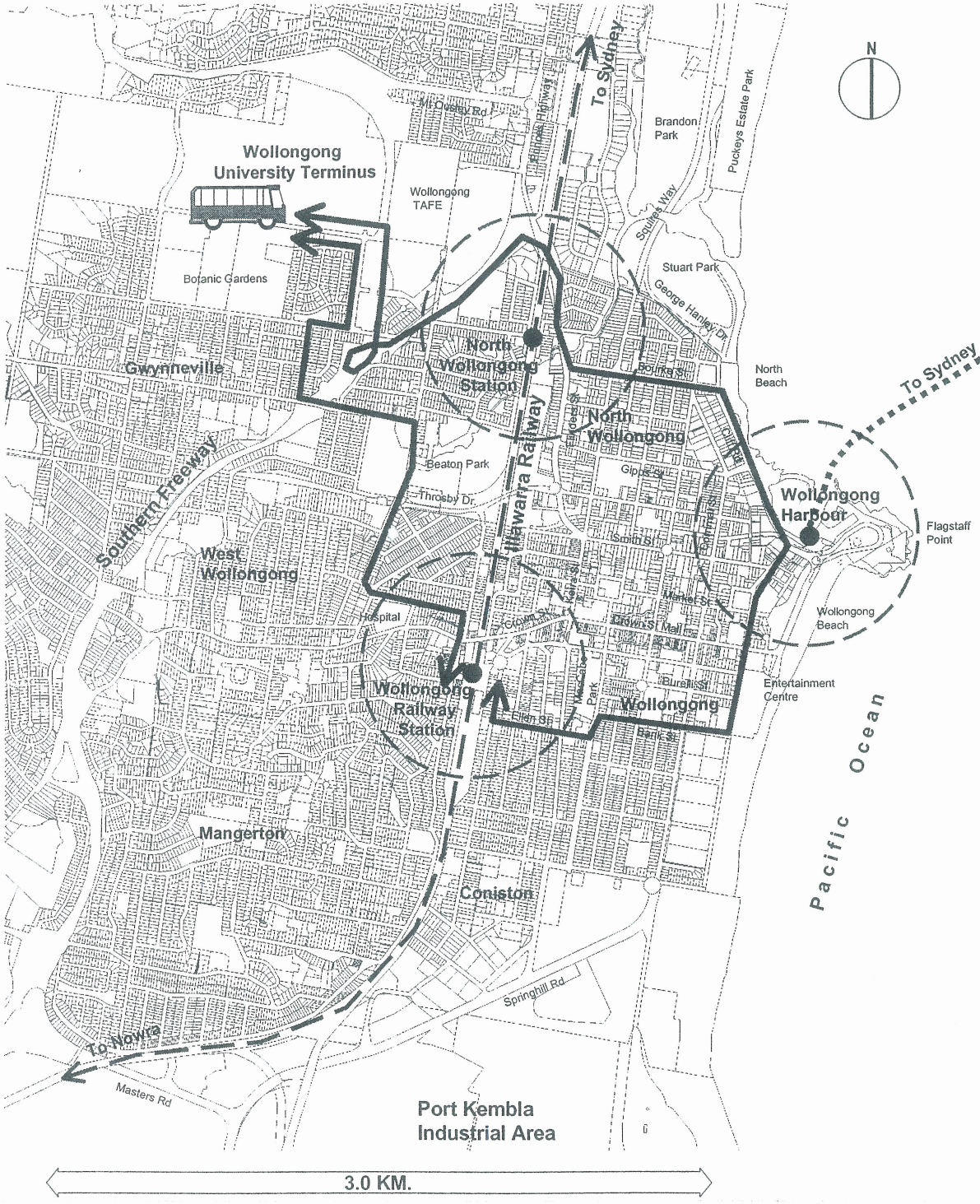
4.2.1 Land Use Strategy

OBJECTIVES:

- Facilitate flexible and appropriate land use patterns ;
- Encourage urban housing consolidation and housing diversity; and
- promote lively and safe environments day and night at specific precincts.

STRATEGIC ACTIONS:

- Prepare development control plan to encourage residential flat developments in the CBD (action achieved – Technical Policy No. 97/25- need for monitoring).
- Investigate opportunities to encourage small shops , restaurants, and cafe development at ground level along Bourke Road and west side of Cliff Road .
- Investigate opportunities to facilitate mixed use development containing residential flats in the 3(d) Commercial Services Zones south of the CBD .
- Investigate the possibility of increasing the density in the 2(b) zones located east and west of Wollongong Railway Station.
- Prepare a management plan for MacCabe Park Precinct and consider a mixed use development containing residential flats along the west and south edges of the Park (study in progress).
- Investigate opportunities to provide a site for stunt motor sport within J.J.Kelly Park Precinct along Springhill Road .
- Evaluate compensation measures such as transfer of development rights for owners of heritage properties.



4.2.3 Public Transport

OBJECTIVES:

Promote public transport that is :

- convenient and responsive to the current and long term urban activity fabric; and
- consider the ecologically sustainable principles.

STRATEGIC ACTIONS:

Prepare a short and long term public transport strategy for Central Wollongong that considers:

- the long term directions mentioned under this Urban Design Strategy, especially the future activity pattern and link corridors , when developing future public transport network.

- a friendly and innovative public transport system for the future to enhance existing bus services such as two electrical shuttle services running between Wollongong Railway station and the University . One via the Foreshore Area , and the second via Wollongong Hospital.

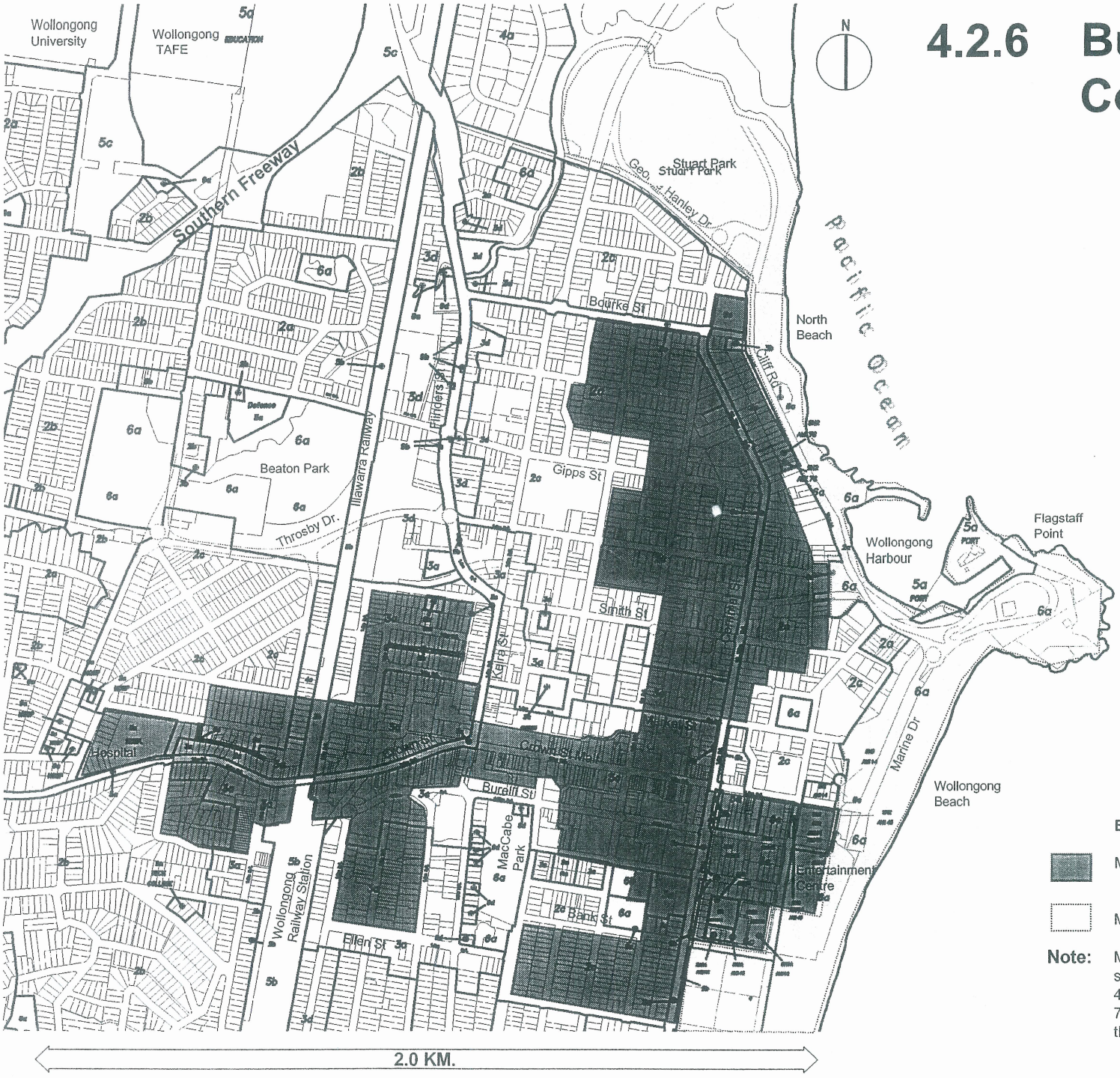
- the use of mini bus services between peak hour services.

Possible electrical shuttle transport

proposed fast ferry- IROC Vision 2020

catchment area - 0.5 km radius

4.2.6 Building Height Control Precincts



OBJECTIVES:

Promote building height precincts that are responsive to the geographic setting, cultural context, and market trends and contribute to the desired character across the various city precincts.

STRATEGIC ACTION:

- Amend Wollongong Local Environmental Plan 1990 in order to facilitate a height limit for each precinct as shown on this page.

Permissible building heights will be also subject to the street profiles shown on pages 47, 53 & 54; and the requirements of the Illawarra Regional Environmental Plan No.1 and relevant Wollongong Development Control Plans.

It should be noted that the following criteria were considered in defining building height control precincts as shown on this page (the criteria is based on Part 1, Context Scan):

- current zoning;
- prevailing building heights;
- current building height control provisions;
- relevant provisions of Building Code of Australia;
- landmarks, scenic views, and vistas;
- local geographic setting;
- the curtilage of existing heritage environments;
- overshading of prominent places and public open spaces; and
- development trends and rationale.

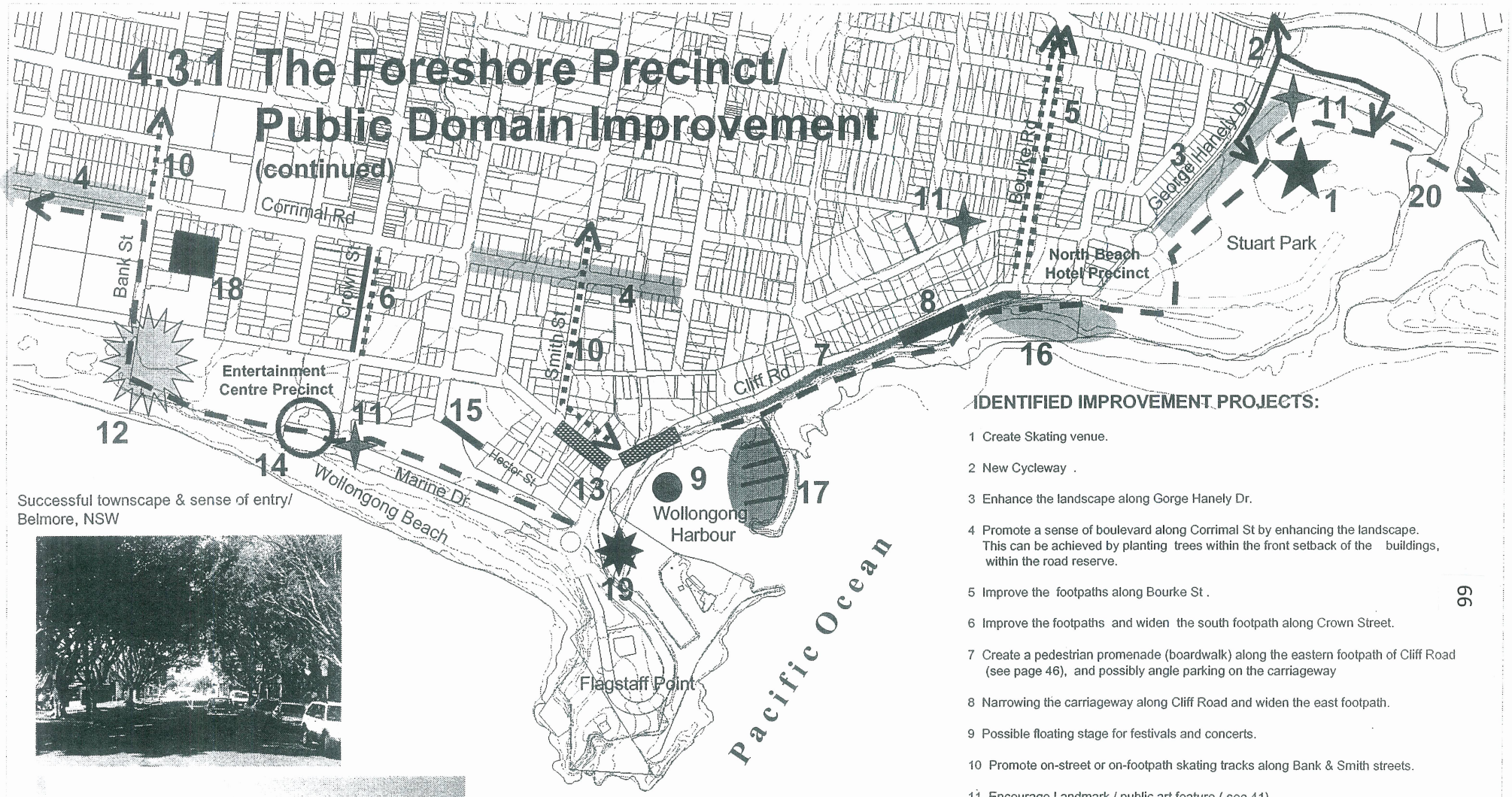
Building Height Control Precincts:

Maximum height is 28 m. or 9 storeys .

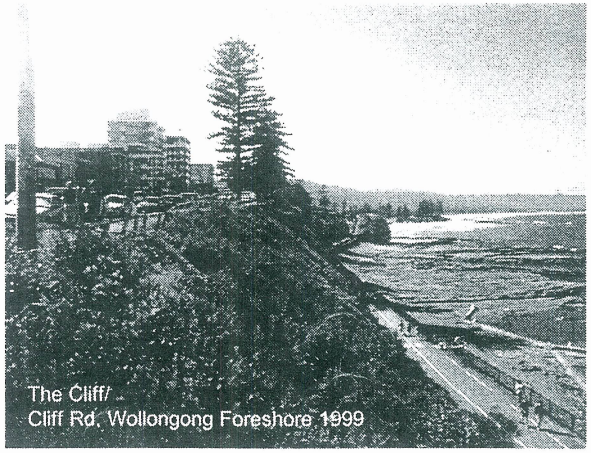
Maximum height is 7 m. or 2 storeys.

Note: Maximum height within the remainder of the secondary and primary study areas is 12 m. or 4 storeys; but maximum height is 2 storeys or 7 m. in the 2(a) Zone, and 3 storeys or 9 m. in the 2(b) Zone.

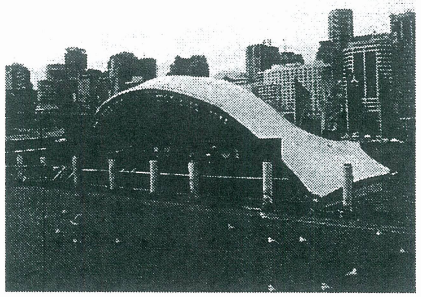
4.3.1 The Foreshore Precinct/ Public Domain Improvement (continued)



Successful townscape & sense of entry/
Belmore, NSW



The Cliff/
Cliff Rd, Wollongong Foreshore 1999



Floating theatre/
Example from Darling harbour, Sydney

IDENTIFIED IMPROVEMENT PROJECTS:

1 Create Skating venue.

2 New Cycleway .

3 Enhance the landscape along Gorge Hanely Dr.

4 Promote a sense of boulevard along Corrimal St by enhancing the landscape. This can be achieved by planting trees within the front setback of the buildings, within the road reserve.

5 Improve the footpaths along Bourke St .

6 Improve the footpaths and widen the south footpath along Crown Street.

7 Create a pedestrian promenade (boardwalk) along the eastern footpath of Cliff Road (see page 46), and possibly angle parking on the carriageway

8 Narrowing the carriageway along Cliff Road and widen the east footpath.

9 Possible floating stage for festivals and concerts.

10 Promote on-street or on-footpath skating tracks along Bank & Smith streets.

11 Encourage Landmark / public art feature (see 41)

12 Encourage beach and market place facilities at the east end of Bank Street.

13 Create prolonged pedestrian refuge along Cliff Rd & Harbour St (see concept examples on page 36)

14 Promote people place (Foreshore Plaza- project in progress).

15 Extend Hector St along Lang Park.

16 Improve the built aspects.

17 Possible small marina along the north side of Wollongong Harbour.

18 Proposed garage parking station.

19 Fast ferry terminus.

20 Existing Cycleway.

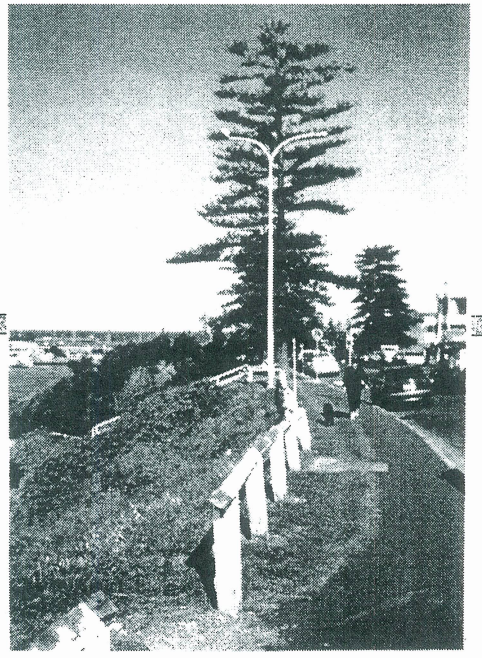
4.3.2 The Foreshore Precinct/ Possible Cliff Road Promenade

Cliff Road enjoys a unique elevated cliff setting. It offers significant and charming views toward Belmore Basin and the ocean, especially when walking along the eastern footpath of the road. However , the eastern footpath is too narrow for heavy pedestrian traffic and will need widening . The latter will require special concept and construction technique due to the sensitive environmental aspects of the cliff.

Developing an elevated promenade along the eastern footpath of Cliff Road would create a unique, attractive and sociable environment , conveniently accessed by both : local residents and visitors. A weekly or daily afternoon "corso" organised by local residents would add to the socio-cultural aspects of the area.
Promoting a promenade along the existing lower cycle way is not as desirable as it is too remote at night and less accessed by the local residents , and has environmental constraints/ sea erosion.

Constructing an on-pole boardwalk along the eastern footpath of Cliff Road would preserve the two way traffic and on street parking along Cliff Road ; add to the attractiveness and sociability of the city; and would minimise environmental damage to the cliff.

Sketch Design: Roxy Binno



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4.4.1 Wollongong CBD /
Public Domain Improvement (Continued)

Inner city skate venue/ example from Melbourne

IDENTIFIED IMPROVEMENT PROJECTS:

1 Create Skating venue(possibly on the existing land mound - MacCabe Park).

2 Facilitate skating track along Smith, Burelli Church and Bank Sts

3 Improve existing cycle access under the railway line (between Smith and Denison Streets).

4 Improve footpaths along Crown, Keira and Burelli Streets.

5 Widen and improve the south footpath along Crown Street between Keira and Station Streets (facing north & sheltered from south wind).

6 Improve road intersections (Crown St with Railway, Denison Streets; and Smith and Keira Sts) to facilitate appropriate traffic movement.

7 Improve the Intersection of Crown and Keira Sts and remove the Mall Gate (see page 51) to facilitate pedestrian movement between the Mall and west Crown Street.

8 Create pedestrian easement or internal arcade to link between Rawson and Crown Street and facilitate access to parking station and west Crown Street.

9 Develop direct access facility between Crown Street and Wollongong Railway Station (see page 52) to encourage efficient, attractive and safe pedestrian movement between the CBD and the Station (sustainable development input).

10 Develop the airspace over the railway line (north of Crown Street) incorporating parking station and residential flats on top floors.

11 Adopt and create an extended pedestrian refuge to facilitate random pedestrian crossing along Burelli Street at MacCabe Park and the Civic Plaza precincts.

12 Retain the mall concept and refurbish and improve the mall furniture, including the kiosks and lighting; provide attractive and durable paving ; and add a flair of art with symbolic meaning to the steel arches and skeleton (use fairy lights).

13. Possible southern railway vehicle crossing bridge.

14 Improve the liveability of Burelli Civic Plaza.

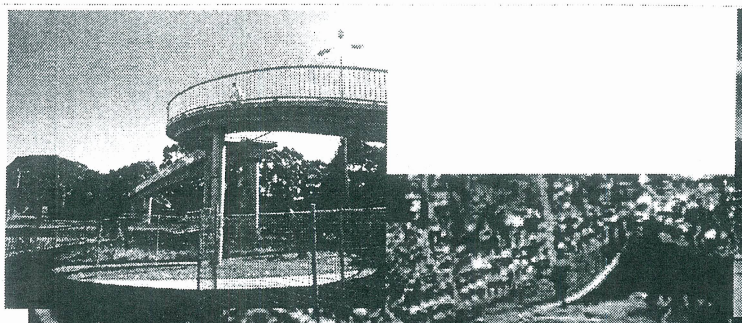
15 Redevelop MacCabe Park. Promote a lively and sustainable Precinct and park incorporating mixed use developments , youth facilities and skating venue (Vision in progress).

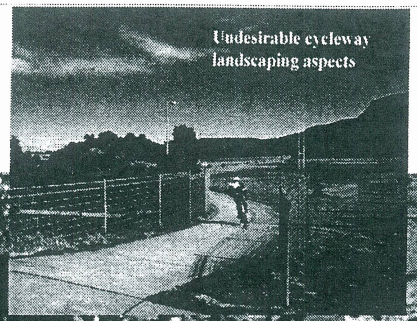
16 Revitalise St Michael Cathedral precinct into lively and attractive place.

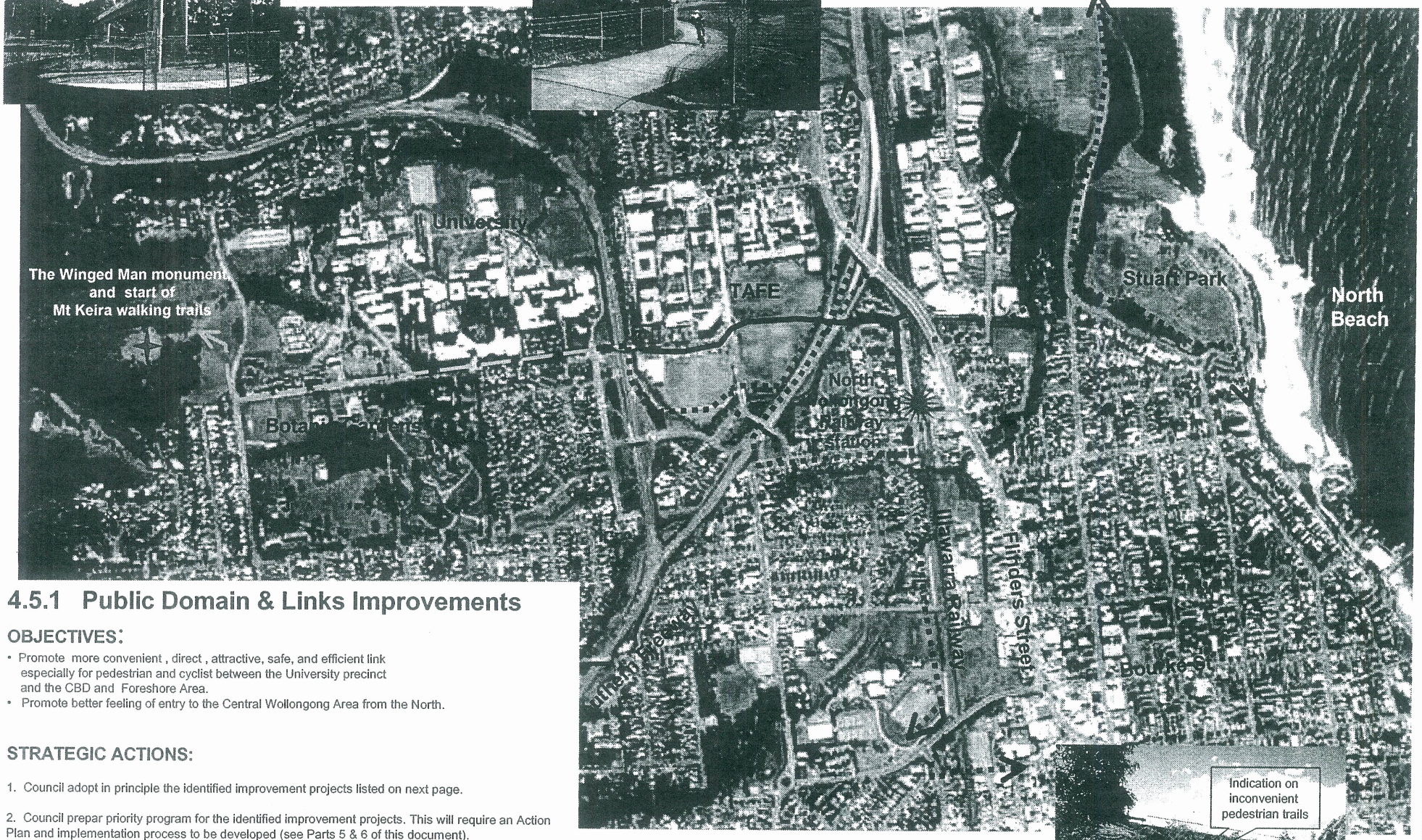
17 Develop multi level garage parking stations at Rawson Street, and Tomas Street.

18 Art feature/ landmark at the intersection of Smith & Flinders Sts.

4.5 City - University Link/ Strategy & Actions







4.5.1 Public Domain & Links Improvements

OBJECTIVES:

- Promote more convenient , direct , attractive, safe, and efficient link especially for pedestrian and cyclist between the University precinct and the CBD and Foreshore Area.
- Promote better feeling of entry to the Central Wollongong Area from the North.

STRATEGIC ACTIONS:

1. Council adopt in principle the identified improvement projects listed on next page.

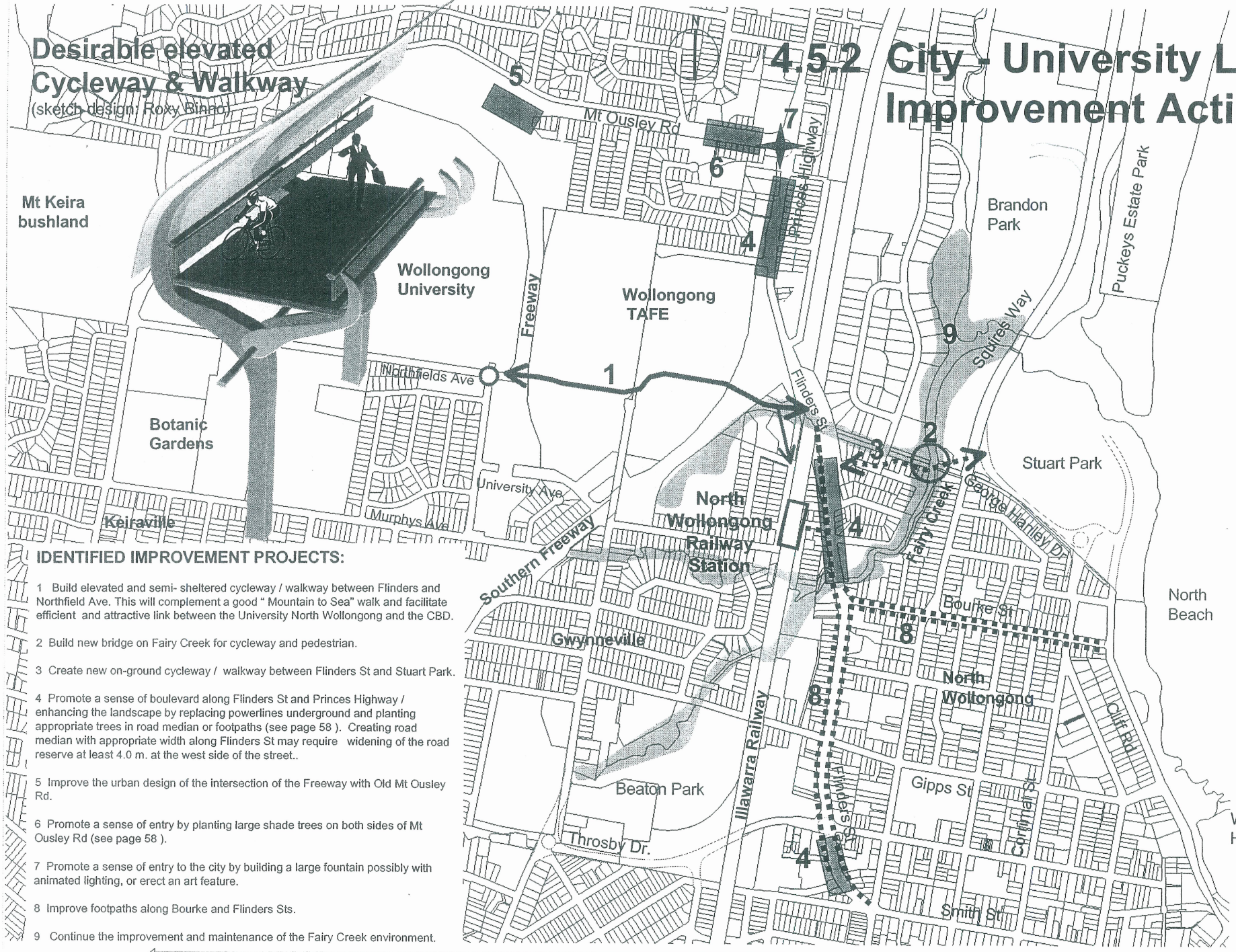
2. Council prepar priority program for the identified improvement projects. This will require an Action Plan and implementation process to be developed (see Parts 5 & 6 of this document).

3. Prepare Development Control Plans and Local Environmental Plans to facilitate the improvement projects where required.

(see next page)

Existing cycleway.
Existing link(Northfields Ave) to Mt Keira walking trail.
Desirable elevated cycleway and walkway (see actions, page 57).
Desirable on-ground cycleway and walkway (see actions, page 57).

4.5.2 City - University Link/ Improvement Actions



IDENTIFIED IMPROVEMENT PROJECTS:

1 Build elevated and semi- sheltered cycleway / walkway between Flinders and Northfield Ave. This will complement a good " Mountain to Sea" walk and facilitate efficient and attractive link between the University North Wollongong and the CBD.

2 Build new bridge on Fairy Creek for cycleway and pedestrian.

3 Create new on-ground cycleway / walkway between Flinders St and Stuart Park.

4 Promote a sense of boulevard along Flinders St and Princes Highway / enhancing the landscape by replacing powerlines underground and planting appropriate trees in road median or footpaths (see page 58). Creating road median with appropriate width along Flinders St may require widening of the road reserve at least 4.0 m. at the west side of the street..

5 Improve the urban design of the intersection of the Freeway with Old Mt Ousley Rd.

6 Promote a sense of entry by planting large shade trees on both sides of Mt Ousley Rd (see page 58).

7 Promote a sense of entry to the city by building a large fountain possibly with animated lighting, or erect an art feature.

8 Improve footpaths along Bourke and Flinders Sts.

9 Continue the improvement and maintenance of the Fairy Creek environment.