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TECHNOLOGY SYDNEY

INSTITUTE FOR SUSTAINABLE FUTURES

'ECO-INDUSTRIAL TRANSITION'

A vision for economic and socio-ecological renewal at
Swanbank



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ABOUT THE AUTHORS

Australia's flagship sustainability research institute, the Institute for Sustainable Futures (ISF) is part of the University of Technology, Sydney (UTS). ISF was established in 1996 with a mission to create change towards sustainable futures by conducting independent project-based research and consultancy. ISF is known internationally for its uniquely transdisciplinary research that supports cost-effective, sustainable and adaptive solutions, including, but not limited to, the provision of futures research for industries, urban and peri-urban planning, waste and resources, and energy and water efficiency.

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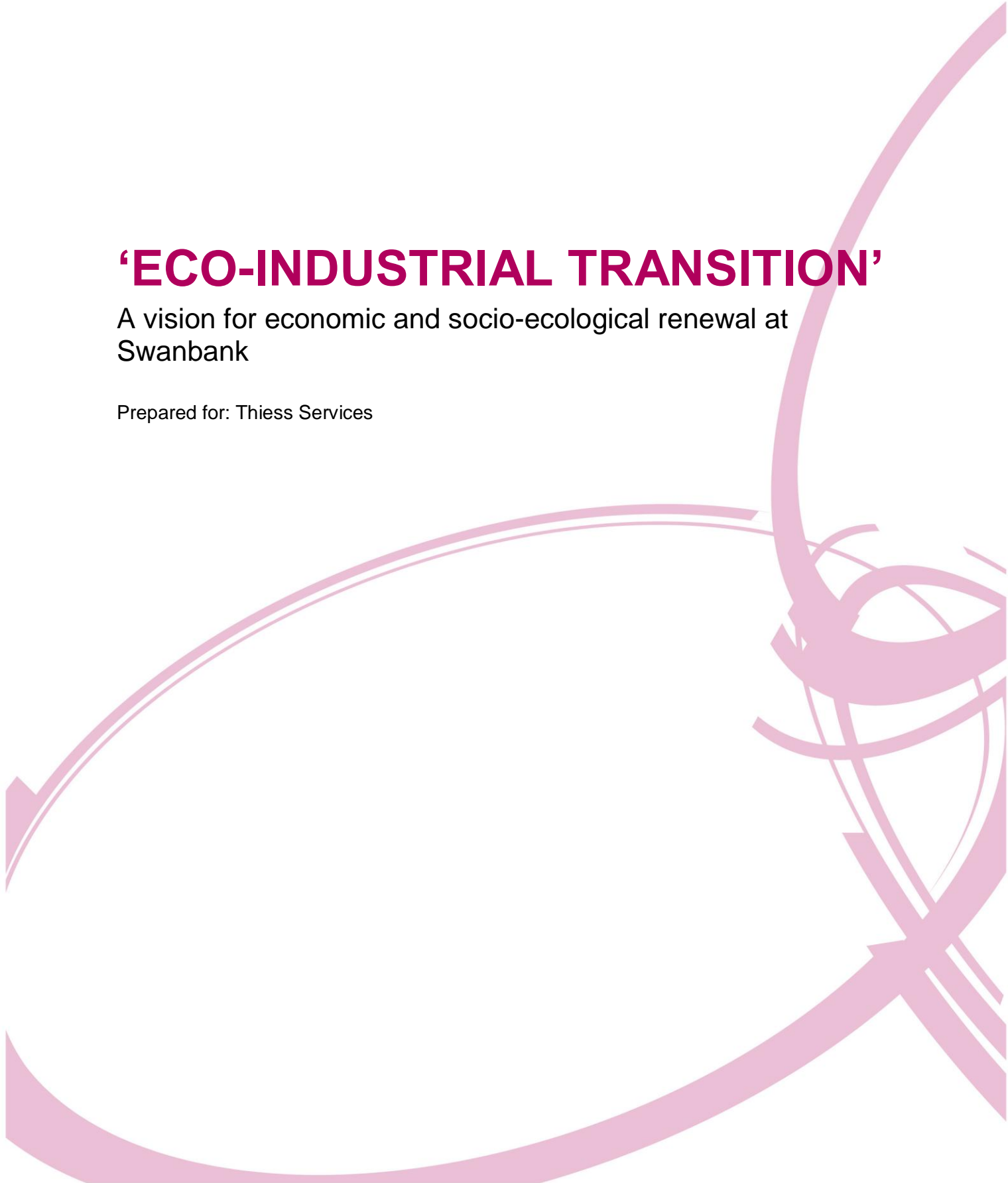


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EXECUTIVE SUMMARY

This report describes a vision for Swanbank as **a world-class eco-industrial cluster that integrates energy, waste and industry opportunities to create benefits to the local community, economy and environment.** The vision is firmly based on and assessed against essential principles for economic renewal.

This eco-industrial vision builds on existing opportunities that the Swanbank region offers:

- a planned state-of-the-art solar hybrid power station;
- a closing landfill at capacity ready for remediation and substitution;
- a new resource recovery park with integrated landfill;
- a developing residential settlement in Redbank Plains; and
- a planned town centre and community in Ripley Valley.

Together these elements provide the basis for a future Eco City. The Eco City encapsulates a future vision of an area that has mixed industrial development where the individual types of industries complement and/or mutually benefit each other. For instance, excess heat from the power station supplies fertiliser or food processing facilities. This integration in turn provides added value to the region via economic renewal and development, low carbon emissions, decentralised energy provision, enhanced employment opportunities, tourism and high quality transport and land use development that ultimately supports more liveable communities.

This report describes the characteristics of this vision for eco-industrial development in more detail, addressing some different areas where the Eco City vision creates opportunities and assets for sustainable development. It assesses and makes projections for possible energy, waste minimisation, water and other potential co-benefits that could ensue from the eco-industrial development. For instance, production of low emissions energy due to proximity between industry and landfill gas and biogas capture, impacts of increased opportunities for waste transfer, diversion and processing and potential impacts for recycled water and associated water efficiencies, implications on distance to markets, economic and employment benefits.

The report recommends that the vision for a world-class eco-industrial development in Swanbank will create a solid foundation for liveable communities, supported by thriving and economic development that is resilient to fluctuations in oil and electricity prices.



INTRODUCTION

This research report describes a vision for an ‘Eco-Industrial Transition’ of the Swanbank area. The transition of Swanbank into a world-class eco-industrial centre has the potential to create considerable benefits to the community, economy and environment of the Ipswich region through integrating energy, waste and industry opportunities based on proven urban renewal principles. To showcase the possibilities presented by Swanbank, the report consists of four chapters:

1. Economic renewal through industrial ecology – a pathway towards sustainable futures

The first chapter outlines current developments that create the need for Swanbank to consider economic renewal in order to ensure sustainable economic, environmental and community development. It introduces key principles for economic renewal and how these are relevant to the Swanbank area.

2. Industrial ecology strengths, constraints and opportunities for Swanbank

The second chapter describes the local context of the Swanbank region as well as projected developments. In doing so it highlights the strengths, constraints and opportunities for an eco-industrial transition.

3. A vision for eco-industrial development

The report then introduces an eco-industrial vision for integrating energy generation, waste management and energy-using industries in a way that creates mutual efficiency increases for these industries. As a second step it describes the potential benefits, added value and opportunities that this transition can create for the community, economy and environment of the Swanbank region. These benefits and developments are illustrated using exemplary international case studies. In addition, to make the vision more tangible to the Swanbank community, decision makers and stakeholders, this chapter provides illustrative graphical examples of the eco-industrial transition.

4. Conclusions and recommendations

The report concludes by discussing how the proposed eco-industrial development can contribute to liveable communities in Swanbank that are supported by thriving and resilient economic development.



1. ECONOMIC RENEWAL THROUGH INDUSTRIAL ECOLOGY – A PATHWAY TOWARDS SUSTAINABLE FUTURES

1.1 WHY ECONOMIC RENEWAL?

Australian landuse planning and industrial development has historically been characterised and driven by the low cost of oil. As the cost of oil increases, new ways of thinking about how we arrange the Australian economy, industry and lifestyles are paramount to harnessing economic competitiveness whilst living in balance with Australia's finite natural resources.

A related challenge for industry and communities is the rising cost of electricity infrastructure combined with a growing demand for energy. These network costs account for 57 per cent of the average residential electricity bills in Australia and about 40 per cent of the scheduled price increases between 2011-12 and 2013-14¹. In order to ensure affordable and reliable energy supply for regional economies and communities on a long-term basis it is important to find new ways to generate and distribute energy locally. Equally important is ensuring ways to reduce overall energy demand by integrating uses that mutually benefit each other.

This report describes a pathway for an 'eco-industrial transition' of the Swanbank area that seeks to harness the new operating environment of a low-carbon future and meet the challenge of balancing economic growth and liveability with the principles espoused by 'sustainability'. The future vision proposed within is built upon existing assets and master planning directions for Swanbank and seeks to integrate them with suggestions for economic renewal that have the potential to catalyse affordable low carbon lifestyles in a thriving local economy.

1.2 PRINCIPLES FOR ECONOMIC RENEWAL

This report builds on principles for economic renewal that have been developed by the Rocky Mountain Institute and have proven their empirical validity in many cases². They are relevant for this study because they provide guidelines on how rapid community and industrial expansion (as planned for the Ipswich area) can be executed in a way that benefits the local community, economy as well as the environment. They question the assumption that expansion is always beneficial and acknowledge the side effects of expansion such as loss of traditional income sources, decline in small local businesses, increasing social stress and weakening of community bonds, higher housing costs and decrease in air quality and liveability. Such side effects often and at times accidentally result in few winners and many losers.

To account for these effects this report assesses the proposed eco-industrial transition in the light of the four economic renewal principles below. It assumes that if suggested developments are consistent with some or all of these four principles, they are likely to

¹ Source: <http://www.smh.com.au/business/high-power-rates-its-a-poles-and-wires-story-20120611-20603.html#ixzz1xj1nsH5Z>, accessed 18.06.2012.

² Kinsley, M. J. 1997, *Economic Renewal Guide. A collaborative process for Sustainable Community Development*, Rocky Mountain Institute, Snowmass, CO.



contribute to development that benefits the community as a whole as well as the economy and the environment.

1.2.1 Principle #1: Plug the leaks in the local economy

Leak-plugging is an important, but all too often overlooked, economic opportunity. When a community plugs an unnecessary leak, it puts money back into the local economy just as surely as if it had earned it through new industry. Likewise, as individual residents spend and re-spend the money they've saved, the local economic benefit multiplies in the same way it does with new income: more money in circulation creates more value, pays more wages, finances more investments, and ultimately creates more jobs. Unlike income, however, savings are inflation-proof-once you've cut out an expense, you no longer need to worry about its price going up. [...]

Leak-plugging-through import substitution, resource efficiency, buy-local programs, and a stronger informal economy-is an important step toward greater self-reliance, and a crucial aspect of any community's development strategy in an increasingly globalized and unpredictable economy. **The more efficiently resources can be used, and the more local purchases (especially necessities) can be produced locally at reasonable prices, the more resilient the local economy will be, and the more able it will be to withstand externally created shocks and changes.**³

This principle describes a crucial strategy for communities to deal with projected increases in oil and energy prices and associated increases in transport costs: to establish infrastructures that make the community more self-sufficient and thus less dependent on external price fluctuations. The aim of this study is to describe how Swanbank can create a long-term supply of electricity at stable prices.

1.2.2 Principle #2: Support existing businesses

The economic heart of a community is its small businesses. **Many development experts are convinced that the fastest way to increase jobs and strengthen a community's economy is to encourage existing businesses to become more efficient and successful.** A 1991 report by the National Conference of State Legislatures notes that smaller businesses--those that are most likely to start up in your community--"while not providing the windfall of jobs promised by a Saturn plant...are the largest source of new job creation and tend to be less mobile and more committed and loyal to the...community over time and more willing to endure economic hard times." Yet, caught up in the dream of high-tech industrial recruitment, many communities overlook local opportunities.⁴

This principle highlights how a vision for industrial development should build on local assets and existing businesses as a core foundation. This is taken into account in this study in that it uses the existing local context as a starting point for developing a future vision rather than imposing a futuristic scenario.

1.2.3 Principle #3: Encourage new local enterprise

In any dynamic economy, businesses are constantly folding and being created. In most communities this process goes largely unnoticed unless business failures outnumber start-ups. However, your community can do a lot to tip the balance toward success by encouraging new local enterprise. Pursuing the previous two steps will lay a firm foundation for this effort. **They create an exciting business climate: a town**

³ Kinsley, M. J. 1997, *Economic Renewal Guide. A collaborative process for Sustainable Community Development*, Rocky Mountain Institute, Snowmass, CO, pp. 18-20.

⁴ Kinsley, M. J. 1997, *Economic Renewal Guide. A collaborative process for Sustainable Community Development*, Rocky Mountain Institute, Snowmass, CO, pp. 20-22.



that's plugging leaks and supporting existing businesses is a great place to start a new one. And plugging leaks will often lead automatically to opportunities for creating new businesses.⁵

This principle emphasises how new business and industrial development can thrive if it is integrated with the existing strengths in the local economy. This report assesses which new types of industries would be most complementary and mutually beneficial with the existing and projected developments.

1.2.4 Principle #4: Recruit compatible new business

Having pursued the first three steps, your town will be in a much better position to recruit new business. **A community that's plugging leaks, supporting existing business, and encouraging new local enterprises won't be desperate for any economic activity, regardless of the harm it may cause.** Businesses looking to relocate will be more attracted to a community with vibrant local enterprise and a high quality of life. Government agencies and foundations will also be more likely to direct their resources toward a community that's working hard to improve itself.⁶

This principle finally highlights how following the first three principles can create a virtuous cycle that competitively attracts innovative new business to a region rather than forcing a community to accept development that doesn't fit the local context. This report investigates how such a virtuous cycle can be created for the Swanbank region.

⁵ Kinsley, M. J. 1997, *Economic Renewal Guide. A collaborative process for Sustainable Community Development*, Rocky Mountain Institute, Snowmass, CO, pp. 22-24.

⁶ Kinsley, M. J. 1997, *Economic Renewal Guide. A collaborative process for Sustainable Community Development*, Rocky Mountain Institute, Snowmass, CO, pp. 24-25.



2. INDUSTRIAL ECOLOGY STRENGTHS, CONSTRAINTS AND OPPORTUNITIES FOR SWANBANK

This section outlines the industrial ecology strengths, constraints and opportunities for Swanbank. In doing so it establishes a framework of the local context from which we develop a realistic vision for an eco-industrial transition or cluster in Section 3.

2.1 STRENGTHS AND OPPORTUNITIES

- Power station to fuel eco-industrial transition: planned state-of-the-art solar hybrid power station as core for economic renewal.
- Integrated waste treatment and energy generation: substituting landfill airspace with waste treatment and production of processed fuels provides the opportunity for integration and efficiency increase with neighbouring power station.
- Greenfield area for Eco City development: greenfield area in close proximity to power station gives manufacturing and engineering firms access to low-cost electricity by being able to locate and cluster close by.
- Industry support: predicted growth in future focussed industries to support existing industries, proximity to Brisbane.
- Community development: Planned town centre in Ripley Valley and emerging community in Redbank Plains as the base for a future Eco City.
- Existing labour pool: existing pool of labour with expertise and experience in the manufacturing, energy and construction sectors. This may enable the transfer of skills and knowledge across an integrated business cluster.
- Government support: a local government that is open to innovative ideas.
- Proximity to Brisbane transport infrastructure: Brisbane-Ipswich rail line as connector, potential for extension of rail lines into regional areas, e.g. Lockyer Valley.

2.2 CONSTRAINTS

- Comparatively narrow industry base: this could lead to a reliance on one organisation or industry which reduces the flexibility and adaptiveness of the cluster and increases the susceptibility to adverse changes to that particular cluster element.
- Historically, clustering has not been encouraged in the region. By contrast, Kwinana Industrial Cluster (KIC) in Western Australia which is widely acknowledged as successful (see Section 3.4) has evolved as an eco-park over time..
- Need for co-ordinating body (such as the KIC) to oversee development, foster relationships, create networks and build partnerships. This may make it difficult to bring together industries and organisations that have evolved independently/in isolation over time. The cluster development process revolves around a set of dedicated leaders and such a body could provide this leadership
- Required innovation: implementing the industrial ecology concept will require a series of breakthrough innovations in management to link several key activities.



3. A VISION FOR ECO-INDUSTRIAL DEVELOPMENT

This section describes how an integration of energy generation, waste treatment and related mixed industries generates mutually supportive benefits and opportunities for the economic renewal of the Swanbank area. This vision is based on an assessment of a consortium of five senior ISF trans-disciplinary researchers who hold expertise across; industrial ecology, urban and industrial planning, transport planning, energy and water modelling, environmental economics, waste and resource management, and social research. The assessment has taken into account potential developments and assets for the following areas (see Figure 1):

- Energy generation
- Waste
- Mixed industries (cleantech/greentech)
- Employment
- Transport and land use
- Tourism
- Community
- Water
- Food/agriculture

The vision identifies and suggests possible industry types that may benefit from, and/ or be attracted to locating themselves in the area, for example, industries that may harness and leverage off lower energy costs and associated low cost heat (thermal energy from co-generation). It also describes how this co-generation of energy, waste and industry builds a backbone for thriving communities by creating jobs, secure energy sources and high quality residential development.

To make the vision tangible to the community, decision makers and stakeholders of the region the appendix of the report provides illustrative graphic examples of the Swanbank eco-industrial transition and the integration of community, commercial and industrial development.



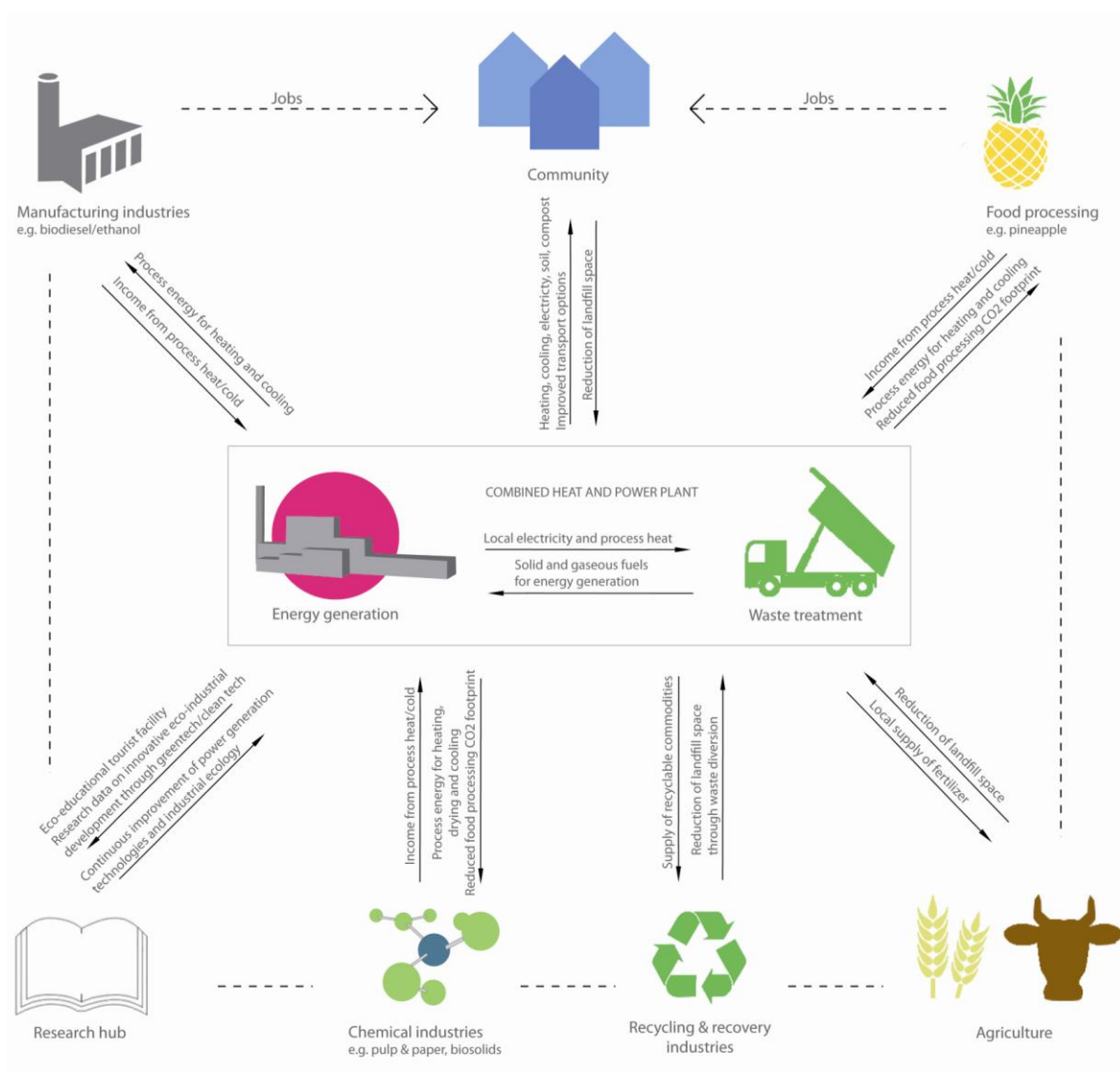


Figure 1: Mutual efficiency increase of energy generation, waste treatment and related mixed industries



3.1 CO-GENERATION OF ENERGY AND WASTE TREATMENT

The proposed EfW / CSP hybrid power plant has the peak net capacity of 35.5MWe including concentrated solar power (CSP) contribution and a 30.7MWe without CSP. Fuel consumption and power generation is given in Table 1.

Fuel requirements	Annual quantity
Wood waste	100,000t
RDF	50,000t
Landfill gas	16,800t
Biogas	1,600t
Net power generation	
Total annual power output	252,800MWh
Power output wood waste and RDF system	245,600MWh
Power output concentrated solar power system	7,200MWh

Table 1: Fuel quantities and net electricity generation

In addition to pure electricity generation the station can provide up to 40MWth of process heat as steam or hot water to adjacent industries. This is equivalent to a maximum annual process heat potential of 320GWh. Combined heat and power generation is a promising option to increase the overall plant efficiency from 36.1% up to 80% and strengthen the commercial case for the new power station. Several reference plants operating on such fuels in combined heat and power operation exist, e.g. 23MWe & 37MWth Simmering plant in Vienna, Austria.⁷

The electric efficiency of the proposed power station is maximised by jointly using solid materials, wood waste and RDF, and gaseous fuels, landfill- and biogas. The gaseous fuels allow external steam superheating to 530°C without encountering high-temperature corrosion problems inside the boiler. The only other EfW plant operating since 1993 with a similar concept, natural gas instead of landfill- and biogas, is in Måbjerg, Denmark.⁸

- EfW well established for CHP operation
- District heating, e.g. Måbjerg, Denmark⁹
- Process steam at Coolaroo , VIC and Tumut, NSW¹⁰

⁷ LAHODA, J., ARNDT, O. & HANSTEIN, W. 2006. Biomass lookig for efficient utilisation - the reheat concept. *Power Gen Europe*. Cologne, Germany: Siemens Power Generation.

⁸ BABCOCK & WILCOX VØLUND A/S 2008. Multifuel-fired Combined Heat and Power Plant Måbjergværket Måbjerg, Denmark. Esbjerg, Denmark.

⁹ DONG ENERGY A/S. 2012. *Måbjerg CHP Plant*. Source:

www.dongenergy.com/en/business%20activities/generation/electricity%20generation/waste_to_energy_plants/pages/maabjerg%20chp%20plant.aspx [Accessed 31/05/2012].

¹⁰ VISY INDUSTRIES AUSTRALIA PTY LTD. 2012. Clean Energy, Melbourne. Source:

www.visy.com.au/sustainability/clean-energy [Accessed 31/05/2012].



3.2 SUPPORTING MIXED INDUSTRIES THAT MUTUALLY BENEFIT WITH POWER STATION AND LANDFILL

Taking the local context of Swanbank into account, the Eco City vision sees mixed use developments with the following characteristics as relevant:

- Cleantech/greentech industries that support low environmental impact development
- Industries that integrate well/mutually benefit the energy and waste co-generation, e.g. industry types that benefit from low cost energy and heat
- Industries that benefit from short transport routes
- Industries that fit well into existing development
- Industries that are of world-class standard in their field to make the eco-industrial transition an inspirational case study

The types of industries that could meet these requirements are described in the following sections. Their added value to community, economy and environment is summarised in Table 2 in Section 3.3.

3.2.1 Industries that require heat

- Food processing facilities (proximity to Lockyer Valley): 40MW process heat for food processing available
- Biosolids and green waste for drying
- Fertiliser production: a 20.000t/a fertiliser plant that used to produce organic fertilisers recently closed down as it was not economical, however , 150.000t/a of biosolids could be dried using heat from the co-generation plant (dried biosolids use less energy for transport and can be manufactured into organic fertilisers)
- Chemical industries
- Pulp and paper industries
- Manufacturing industries: for example, biodiesel and bioethanol could be manufactured. If a pyrolysis plant were added in future, biochar could be manufactured and used both to sequester carbon and improve soil quality in the region.
- District heating systems

3.2.2 Industries that require chilling

- Food processing
- Ice making
- District cooling systems

3.3 ADDED VALUE AND OPPORTUNITIES FOR COMMUNITY AND ECONOMY

Table 2 synthesises the proposed developments for an eco-industrial transition in Swanbank. In doing so it outlines in what way these developments create assets for the local community, economy and environment, and in what way they mutually benefit each other. Section 3.4 then provides illustrative international case studies that have already realised and benefitted from such developments.



Table 2: Summary of opportunities and added value of eco-industrial transition

Development area	Potential developments	Potential assets	Adds value to other areas
Energy	<ul style="list-style-type: none"> -supply local electricity and process heat to eco-industrial cluster -provide research data on innovative eco-industrial development through greentech/cleantech to research hub 	<ul style="list-style-type: none"> -income from process heat/cold 	<p>Jobs, Tourism, Community, Water, Food/Agriculture</p>
Waste	<ul style="list-style-type: none"> -supply of solid and gaseous fuels for energy generation -supply of recyclable commodities -local supply of fertilizers to agriculture 	<ul style="list-style-type: none"> -reduction of landfill load through waste diversion -recovery of commodities 	<p>Jobs, Tourism, Community, Water, Food/Agriculture</p>
Industry	<ul style="list-style-type: none"> -cleantech/greentech industrial park co-located with recycling and recovery industries -light commercial/ residential development in existing buffer zone -mixed industry types that may benefit from low cost energy -exchange excess heat from powerstation for local industries: (HEAT: food, chemical, pulp&paper, manufacturing; CHILLING: food, icemaking) -fertiliser production -biodiesel and bioethanol manufacturing. If a pyrolysis plant were added in future, biochar could be manufactured and used both to sequester carbon and improve soil quality in the region. 	<ul style="list-style-type: none"> -integrated industrial development that fits into regional context -cost and energy savings 	<p>Jobs, Tourism, Community, Water, Food/Agriculture</p>
Food/ agriculture	<ul style="list-style-type: none"> -green vegetation, amenities -associated industries (biosolids) -CO2 to grow tomatoes / hothouses, Eden project style biodome on old mine site (sust. Food) -vertical food farms 	<ul style="list-style-type: none"> -cost savings -reduce food processing CO2 footprint 	



	<ul style="list-style-type: none"> -solar farm on side of hill - Greenhouses using CO2 supply to enhance plant growth 		
Jobs	<ul style="list-style-type: none"> -creating job options through industrial development (Ca 20 employees required to operate the power station over 25 years) -establishing a research precinct for industrial ecology 	<ul style="list-style-type: none"> -long-term employment opportunities - ongoing improvement of technologies 	Community, Industry
Transport/land use	<ul style="list-style-type: none"> -bike/ pedestrian friendly residential development -local public transport shuttles -link to Brisbane rail line -links between residential development and buffer zones 	<ul style="list-style-type: none"> -improved access/ distance to jobs and markets -improved accessibility on regional level 	Industry, Tourism, Jobs, Community
Water	<ul style="list-style-type: none"> -water heating/cooling options through power station -development of recycled water systems -increasing wetland amenity -water to be used in power station for cooling; supply from lake -sewerage treatment plant using high pressure water pipeline 	<ul style="list-style-type: none"> -improved local water quality -community education -cost savings -effluent water provision to other industries 	Industry, Community
Tourism	<ul style="list-style-type: none"> -eco-educational projects about industrial transition 	<ul style="list-style-type: none"> -showcasing the area as world-class development 	Jobs, Industry
Community	<ul style="list-style-type: none"> -local energy generation and distribution -district heating and cooling -waste minimisation in residential areas through integration with Thiess facilities -artificial hill from landfill site and ponds to be used for social integration (e.g. bike trails, skate park, camping, climbing) 	<ul style="list-style-type: none"> -cost saving -social integration/ community building -community education on waste and energy use 	



3.4 INTERNATIONAL CASE STUDIES

The following case studies illustrate how the industrial, commercial and residential elements of the eco-industrial vision for Swanbank have already been successfully realised in other international projects.

- Kalundborg provides an example of a successful business cluster which grew around a power station in Denmark.¹¹
In Kalundborg Symbiosis, public and private enterprises buy and sell waste products from industrial production in a closed cycle. The residual products traded can include steam, dust, gases, heat, slurry or any other waste product that can be physically transported from one enterprise to another. A residual product originating from one enterprise becomes the raw material of another enterprise, benefiting both the economy and the environment.

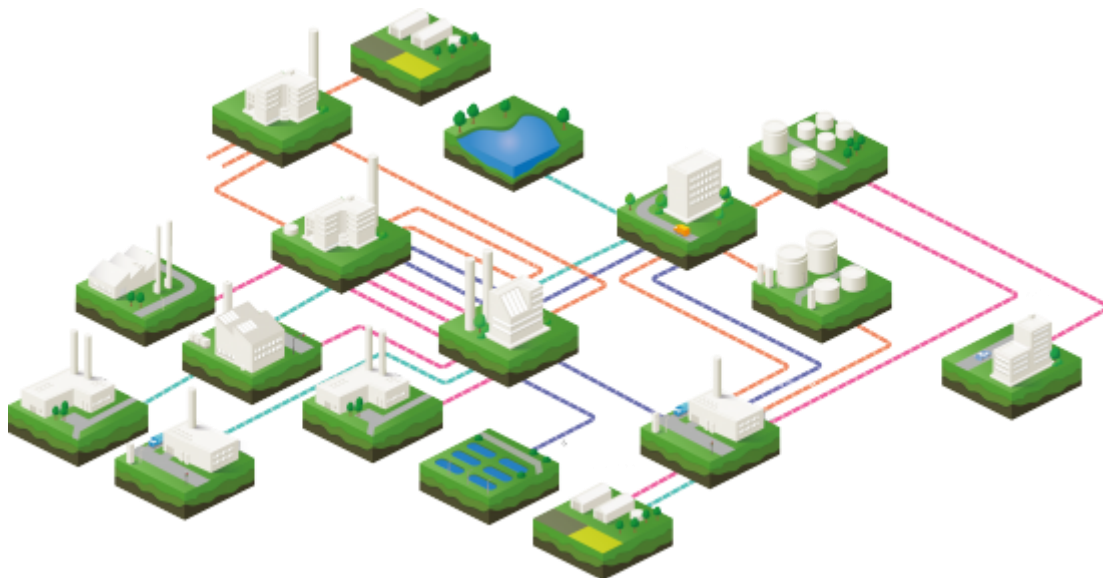


Figure 2: Kalundborg Symbiosis

- Kwinana Industry Council provides an example of a highly diverse range of industries from smaller service industries, such as fabrication and construction facilities, through to very large heavy process industries, such as alumina, nickel and oil refineries.¹²
The Kwinana Industrial Area (KIA) was established in the early 1950s when the Western Australian Government negotiated an agreement with the Anglo Iranian Oil company, now BP Refinery (Kwinana) Pty Ltd, to construct an oil refinery. The agreement was formalized with the signing of the Oil Refinery Act 1952, and the rezoning of about 2,400 ha of coastal land for industrial purposes. This agreement fulfilled a major objective of the Western Australian Government, which was to establish an industrial base for the State's economy.

¹¹Description and image source: <http://www.symbiosis.dk/en>, accessed 18.06.2012

¹² Description and image source: <http://www.kic.org.au/kia.asp>, accessed 18.06.2012



Over the following years the KIA became the State's primary area of industrial development, with major drivers being its proximity to the sheltered waters of Cockburn Sound, a ready supply of labour from Perth and Fremantle, and a willingness by the Government to develop, a dedicated heavy industrial area. The 2007 Kwinana Industrial Area Integrated Assessment has demonstrated that the KIA provides a wide range of economic, environmental and social benefits to the local community, wider Western Australia and Australia.

- The Australian Technology Park in Redfern, Sydney a unique integration of heritage architecture, premium commercial space and state-of-the-art conferencing facilities. It hosts leading Australian and global IT, communication and science companies.¹³



Figure 3: Australian Technology Park

- The Ruhr Museum in Germany provides an example of how old industrial sites can be transformed into modern cultural centres for the community.¹⁴ The decades of the 70's and 80's were rough as the economy shifted to service and technology markets, thus leaving Ruhr at a bit of a dark stage in their history. Over the last few decades, the government and its people have worked hard to push a new kind of renaissance and re-design Ruhr into the culture capital of Germany. With a vast architectural landscape of churches, old factories and industrial parks, the area needed a re-design embracing what was currently there as an instrument to tell the story of its people into this new era.

¹³ Description and image source: <http://www.atp.com.au/About/Profile>, accessed 19.06.2012

¹⁴ Description and image source: <http://www.yatzer.com/the-ruhr-museum-hg-merz>, accessed 19.06.2012





Figure 4: Ruhr Museum

- Again in the Ruhr Area, Emscher Park demonstrates how polluted industrial sites have been transformed into scenic landscapes.¹⁵ One of the most polluted and environmentally devastated regions of the world, the Ruhr district has been reborn. With the “International Building Exhibition (IBA) at Emscher Park” initiated in 1989, the run-down industrial landmarks of the region have been transformed to serve new recreational uses while still preserving the area’s rich history. The redevelopment has given the region a greener image, created a more cohesive community and maintained the area’s identity.

¹⁵ Description and image source: <http://sustainablecities.dk/en/city-projects/cases/emscher-park-from-dereliction-to-scenic-landscapes>, accessed 19.06.2012





Figure 5: Emscher Park

- The Victorian Eco Innovation Lab has presented an innovative vision for a sustainable suburb in 2032 for Broadmeadows. It is based on the idea of ‘eco-acupuncture’; the enabling of local design interventions.¹⁶
 The project presents design answers to the following questions: How would a suburb like Broadmeadows cope if petrol, water electricity and food prices increased dramatically? What changes could take place locally to help Broadmeadows meet their future daily needs? How could the community turn around these 2010 pressures and develop 2032 local assets? What new businesses could be developed? What new types of housing could be created?



Figure 6: Vision Broadmeadows 2032

¹⁶ Description and image source: <http://www.ecoinnovationlab.com/exhibitions/354-exhibition-vision-broadmeadows-2032>, accessed 19.06.2012



- Fitzgibbon Chase is an exemplary suburb development in Brisbane that has been designed as a vibrant inclusive community, providing residents with a diverse range of high quality, smartly designed and well priced homes and living options.¹⁷ Set amidst natural bushland on a 122 hectare sites, Fitzgibbon Chase offers an idyllic lifestyle with public transport, shopping and a range of amenities already on your doorstep. All homes will be within metres of a park.



Figure 7: Fitzgibbon Chase

¹⁷ Description and image source: <http://fitzgibbonchase.com.au/>, accessed 19.06.2012



4. RECOMMENDATIONS

To conclude we highlight how the proposed vision for eco-industrial development in Swanbank contributes to all four principles for economic renewal. We therefore recommend that this transition can create a backbone for liveable communities in the Swanbank region that are supported by thriving and resilient economic development.

- **Principle #1: Plug the leaks in the local economy**
The vision in this report describes how Swanbank can create a long-term supply of electricity at stable prices, reduce the transport distances and access to markets and improve waste management and recycling/recovery. It so makes the community more resilient to increases in energy and commodity prices and costs for waste-related services.
- **Principle #2: Support existing businesses**
The vision uses the need for a waste treatment facility and new power station to serve new residential development in Swanbank as an asset for the eco-industrial transition. In doing so it integrates community, commercial and industrial development by building on existing strengths and needs.
- **Principle #3: Encourage new local enterprise**
This report assesses which new types of industries would be most complementary and mutually beneficial with the existing and projected developments in Swanbank. In doing so it proposes a structure that integrates the required inputs for different types of industry with the excess outputs of complementary industry types on a local level.
- **Principle #4: Recruit compatible new business**
The proposed eco-industrial development attracts businesses with a secure long-term supply of decentralised electricity and process heat at stable prices, as well as an process efficiency increase due to the integration of complementary industry types. This makes the Swanbank region attractive for the integration of new businesses that enhance this development in a virtuous cycle.



APPENDIX

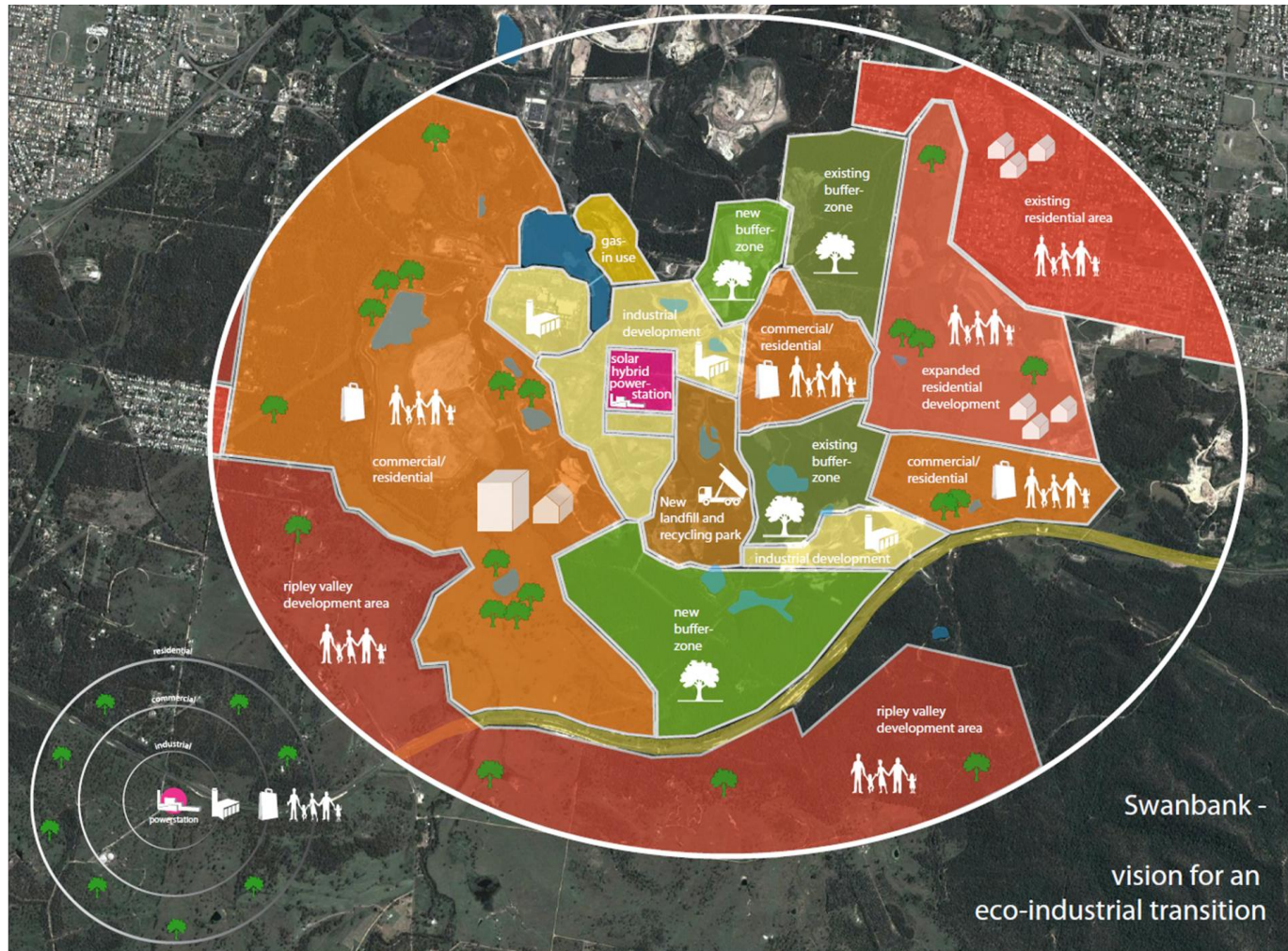


Figure 8: Vision for an eco-industrial transition – map and concept (Version 1)



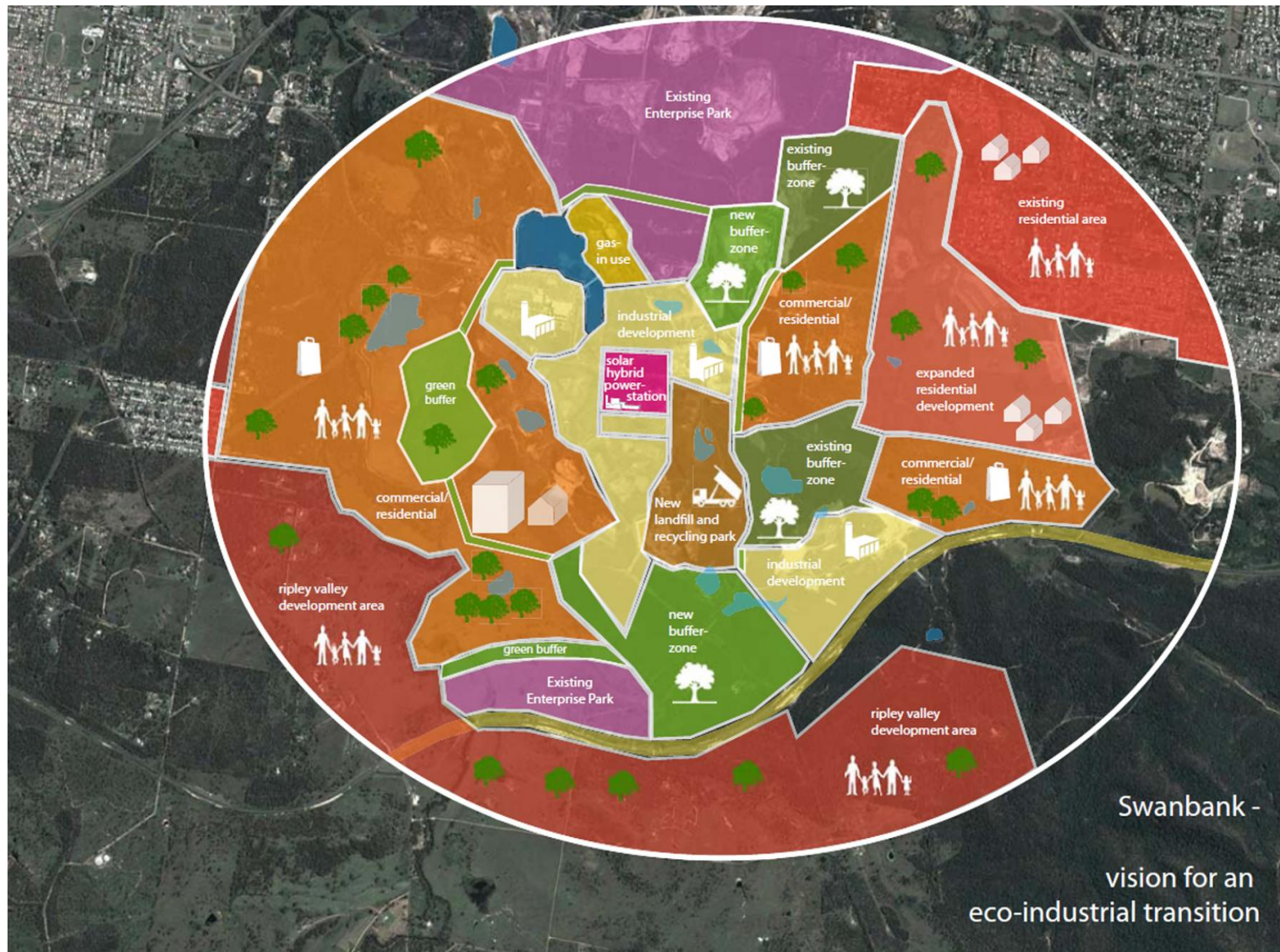


Figure 9: Vision for an eco-industrial transition – map and concept (Version 2)



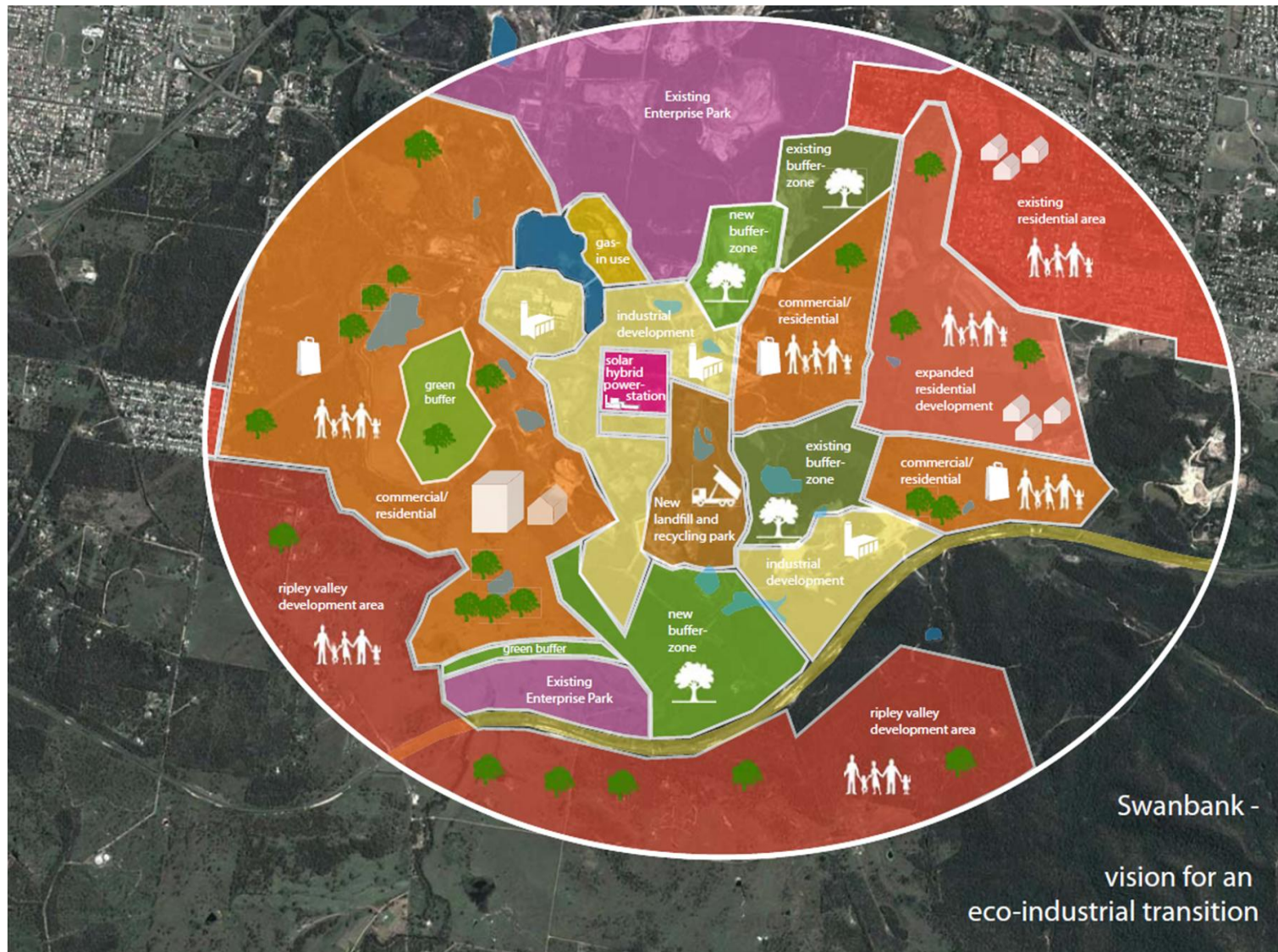


Figure 10: Vision for an eco-industrial transition – map and concept (Version 3)





residential



Figure 11: Residential vision



Mutual efficiency increase of energy generation, waste treatment and related mixed industries

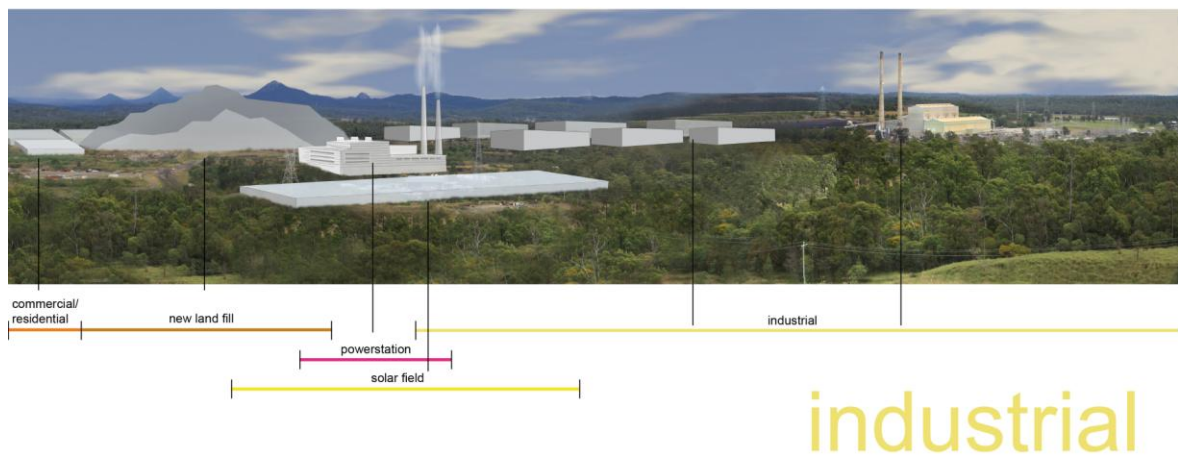
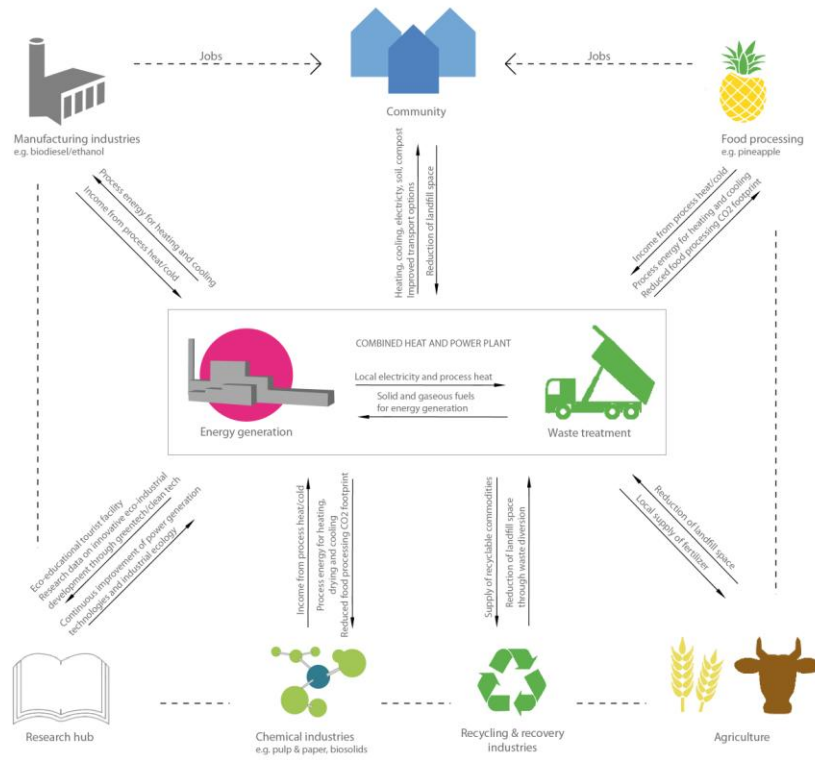


Figure 12: Industrial vision





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