This paper proposes a framework to improve Australia’s urban, rural and regional livelihood development. Australia’s urban settlement of 84 percent of its 22.5 million population in one percent of the continent’s landmass has resulted in increasing poverty and livelihood stress for approximately one million Australian citizens and permanent residents currently suffering an almost similar fate to over one billion people of ‘the third world’.

In the same way, many developing countries follow this western lead. Australia has promised under the Millennium Declaration to make an effort to alleviate poverty and food insecurity for these people before 2015.

Transient national governments continue to struggle with the complexity of Australia’s regional development, migration and population policy through separate portfolios seemingly divorced, not only from each other but also from the complex reality of Australia’s place within the Asia-Pacific region.

Systems thinking methodology bridges the divide between urban and rural development and can play an important role in Australia’s scientific and social contribution for rural development and poverty alleviation both within Australia and in the Asia-Pacific region.

**Background and introduction**

When Prime Minister Julia Gillard deposed former Prime Minister Kevin Rudd, she did so announcing ‘the government has lost its way’.

The current opposition leader, Tony Abbott, quotes this government revelation whenever he perceives lack of direction in government policy.

This paper outlines an alternative ‘nation building’ process that produces a systems map supported by an integrative National Planning Framework (NPF). This framework aims to help national leaders and decision makers to see the causal interrelationships between their networks of interconnected socioeconomic, environmental, business and livelihood development responsibilities.

The study uses systems thinking to understand the global forces that shape Australia’s decision making behaviours and identifies key variables that affect Australia’s natural resources and socioeconomic development systems.

From these understandings, leverage points are identified as key points in the systems where decision makers can take effective actions and systemic interventions to remove systems blockages and allow the energy of economic and livelihood development to flow freely through the economic veins of both Australia and Asia-Pacific trading partners.

Daily media reports focus on current events and are sometimes shallow in reporting linkages to underlying problems. Some of these recent events include: stopping boat people; population and migration; migrant settlement; overpopulation in urban areas; education of overseas students; exploitation of overseas workers;
skills shortages; trading off water between agriculture, family livelihood and environmental preservation within the Murray-Darling basin; lack of rural infrastructure; drought and water shortages; carbon trading establishment; strengthening of the Australian dollar; rising interest rates; the perceived robustness of the Australian economy with one million Australians living in poverty and another 100,000 homeless; calls to increase the mental health budget from $5 to $15 billion; and the list goes on.

A closer look at these reported events reveals patterns of interconnected symptoms resulting from ‘yesterday’s decisions’ that can be traced back to inadequate integrated national planning. Australia is losing real opportunity to capitalise on its immense national resource endowment (people, land, water, minerals, energy and environment).

Today’s key global challenge is to develop a sustainable food system. The world population reached 6.6 billion people in 2002 and was then expected to grow to 7.5 billion people by 2020. The predicted growth is still on track with global population now standing at 6.9 billion predicted to increase to 9.2 billion by 2050. Most of this predicted growth takes place in urban areas of developing countries where 1.2 billion people now live below the poverty line.

To this end, Australia has promised, along with member states of the United Nations to work towards achieving concrete goals to eliminate extreme poverty and providing global food security by 2015. The United Nations is concerned that the promises made in 2000 will no longer be honoured unless drastic steps are taken to get the program back on track.

Many families in developing countries, particularly in Asia, implement strategy by selecting and supporting a family member to temporarily migrate to accumulate earnings to help smooth home-country family income and bring prosperity to the home community. The repatriated earnings are often used as a family income buffer or insurance and not beneficially applied to project development as intended. This suggests there is a real need to support skilled migrants working abroad to learn how to acquire and apply agricultural improvement technology, agribusiness and project management skills to home-country projects that improve return on hard-won earnings from their work abroad.

While developing countries have an urgent need to develop rural agriculture and support industries, Australia also has a need to develop rural Australia. Australia is well positioned to trade agricultural and rural industry skills development expertise in return for agricultural students, technicians and occupational trainees from developing countries to work within the Australian rural industries.

This strategy offers multiple benefits: supplemental replacement of ageing farmers and rural industry support workers; access to an available motivated labour pool with rural skills to build capacity to provide the 42,000 farm managers needed to progress planned land management and conservation programs put forward under the ‘Caring for Our Country’ initiative, and filling the skills gap now constraining Australia’s regional development.

Australia’s sustainable and inclusive future depends upon the economic viability and vitality of the farming industry to maintain a sustainable food system with minimum waste and environmental impact across the entire Asia-Pacific region.

This study uses systems thinking to understand the forces that shape the rural future of both Australia and the Asia-Pacific with a view to identifying system blockages and areas where resources can be reallocated to support communities to achieve sustainable national resource and socioeconomic development. The study proposes an integrated planning model for stakeholders to refine, providing equitable economic support for rural populations that improves livelihoods across all Australia. This model identifies key leverage points where systemic interventions will be most effective in achieving purpose. Pilot implementation is proposed through a ‘learning laboratory’ process to validate and develop action plans based on community engaged input to refine and implement the model.
Australia, as a complex adaptive system of democracy, self organisation, and interconnected human, digital and social networks, needs a new era of collaborative partnership based on longer-term national planning and coordinating government policies.

1. Global system environment and key system variables

Population, rural development and food security

The global population has reached about 6.6 billion people. This population is expected to grow to over eight billion by 2030. Most of this growth will take place in urban areas of developing countries where an estimated one billion people are chronically hungry. Figure 1 shows the current distribution of global population and predicted over time to 2030.

Farmers living in the rural areas of developing countries (population projected to remain static) will be further challenged to provide food to support an additional one billion people (B) who will live in already overpopulated urban areas of developing countries (A).

The Food and Agriculture organisation (FAO) predicts that food production will need to double by 2050 as the global population rises to nine billion. As people become more affluent, dietary preferences change with growing demand for protein and livestock products as shown in Figure 2.

Three quarters of people in developing countries are marginalised farmers with two thirds keeping livestock. Most of these livestock are pigs, goats and chickens kept in ‘backyards’ to supplement household income. Typically, farmers use ‘a wide variety of farm practices and management systems that differ by commodity, region, and farm and operator characteristics’ to produce the nation’s food output.

Computer and information communication technology is now more affordable and accessible within developing countries. However, more diversified agricultural and animal production improvement knowledge is generally not accessible to many farmers. Many resource poor farmers do not have the capital required to implement modern agriculture and animal science technology on farm without assistance.

The impact of animals on their environment and the welfare of animals are now much better appreciated and can be used for better environmental management within a production system that needs to focus more on managing climate change, pollution control and biodiversity.

Australian animal scientists, technicians and farmers have made significant progress in understanding of animals as biological systems. This has allowed Australian farmers to develop highly productive animals through improved selection methods. Better understanding of nutrition has allowed animals to be optimally fed. New reproduction, pregnancy and lactation knowledge has been developed that allows increased production using reduced animal breeding numbers. The understanding of disease has enabled better animal health and bio-security. These applied science, economic and environmental factors combined have improved animal production in Australia compared to Asia-Pacific trading partners by up to 50 percent for pigs and goats alone, as shown in Table 1.

It would seem that Australia has an opportunity to narrow this differential by working more with Asia-Pacific agricultural students, occupational trainees and farmers to improve yield within home country ‘backyard’ herds for the benefit of Asia-Pacific food security.
Table 1: Some key economic indicators and livestock production outcomes in selected Asia-Pacific countries benchmarked to Australia

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>25.1 million</td>
<td>$1.5 trillion</td>
<td>$35,000</td>
<td>120%</td>
<td>1.5 million</td>
</tr>
<tr>
<td>China</td>
<td>1.4 billion</td>
<td>$12 trillion</td>
<td>$12,000</td>
<td>90%</td>
<td>3.5 million</td>
</tr>
<tr>
<td>India</td>
<td>1.3 billion</td>
<td>$2 trillion</td>
<td>$3,000</td>
<td>70%</td>
<td>0.5 million</td>
</tr>
</tbody>
</table>

Rural development and poverty

In 1990, the Asian Development Bank (ADB), the Economic Development Institute (EDl) of the World Bank and participants from 12 countries convened to explore strategies, policies, and practices to help alleviate rural poverty in developing countries.

The convention concluded that, after three decades of development, both developing countries and major development finance institutions have recognised that the strategies of economic growth (1960s), income redistribution (1970s) and economic adjustment (1980s) have failed to alleviate poverty. The main attributed reasons included: poverty is not measured by income alone; a ‘piecemeal’ approach cannot alleviate poverty; and insufficient ‘weight’ from macroeconomic policies provided to smaller farmers. This imbalance calls for reallocation of existing resources, not allocation of additional resources.

Since the Millennium Declaration made in 2000, hunger within the global population is increasing. The number of hungry people worldwide rose from 873 million in 2005 to 1.02 billion during 2009, largely as a result of reduced access to food because of high food prices caused by the global financial and economic crisis.

A necessary condition to increase agricultural productivity is for producers at the grassroots level to have the necessary resources to apply to the tasks. These resources include (but are not limited to) capital for smallholder farmer production project improvement and developing skilled people capable of applying modern agricultural technology to increase yield from the available land.

Targeted investment in smallholder agriculture that adopts modern agriculture and animal science is vital for fighting hunger, financed from a combination of domestic migration, overseas migrant worker remittances, and Official Development Assistance (ODA).

Migration and livelihood development

People migrate from rural to urban areas seeking livelihood improvement opportunities in the form of occupation, income and / or education that is not available at home. Under-rewarded individuals, relatively highly educated individuals in low status and low paying occupations, are more likely to migrate.

The practice referred to above of selecting and supporting a family member to migrate, leads to beneficial flows in the form of remittances, information and return migration. According to Ma, in some provinces in less developed regions of China, total net income from labour migrants outweighs net income of the entire rural area and helps strengthen the rural economy.

Return migration can be an integral part of the migration process. The entrepreneurial activities of one returnee influence four other households through diffusion of ideas, skills and information via strong ties of social networks to relatives, friends and neighbours. In addition, Ma found that social and economic returns from the migration experience are equally important for human capital gains in skills and ability as those for accumulated income savings or capital.

The above findings suggest that governments in developing countries need to provide the necessary infrastructure and incentives to encourage job creating rural industry opportunities that retain and attract people to develop their livelihood in rural areas.

Migrant remittances and capital formation

The evidence is overwhelming that many people from developing countries want to improve their own livelihood without recourse to Western aid assistance. For many years, skilled and employable people from developing countries have been motivated to improve their livelihood by migrating temporarily to repatriate earned income to support families in their country of origin. One of the major motivating forces for this family sacrifice is the desire to provide the best education the family can afford for their children.

For many, after children’s education, their longer term goal is to save enough capital to build income generating agribusiness projects at home. Improved agricultural production comes from motivating the ‘grass roots’ population to improve its own livelihood. Migrants from developing countries therefore play a significant role in home country economic development and food security through overseas remittances and skills acquisition abroad.

Governments in developing countries are increasingly recognising the importance of these remittances and the developmental impact or potential they offer.
remittances have risen sharply since 1971 and are now larger than official development aid and more stable than direct foreign investment. In 2004, migrant remittances amounted to over USD 100 billion.

By 2007, funds repatriated by both temporary and permanent migrants to developing countries totalled USD 240 billion, excluding unrecorded flows the World Bank believes are even larger (Figure 3).

Figure 3: Overseas remittances and capital flows to developing countries

Official Development Assistance (ODA)

According to James Wolfensohn, President of the World Bank, ODA in the form of financial aid and aid projects has failed to alleviate poverty in developing countries: ‘development is not something that can be done to people; it has to be done by them and with them’. It seems that it is not the level of ODA to developing countries that prevents a food secured world; but how the budget is allocated.

Insufficient funds are channelled into agricultural improvement, education and providing farmers, their advisers and technicians the opportunity to develop agriculture and animal science application skills to be applied on farm to increase food supply. Globally, ODA allocated to agriculture is falling. In 2006, agricultural shares were down four percent, and almost 20 percent from only a few decades before. In 2007, ODA to Least Developed Countries (LDCs) was equivalent to 0.09 percent of Gross National Income (GNI) of Organisation for Economic Cooperation and Development (OECD) countries.

2. Australia’s environment within a global system

The key global forces that shape Australia’s market and impact on the country’s socioeconomic development include the following:

- Billions of people from rural areas, many of whom are skilled in farming and farming support, seeking to improve family livelihood and to educate their children.
- A readily available supply of skilled overseas contract workers willing to migrate temporarily to Australia to gain further skills and to repatriate earnings to home countries to support families.
- Australia’s Millennium promise to help relieve poverty and meaningfully assist Asia-Pacific food security.

A high level sustainability model

From a wave of everyday events currently being reported, we have constructed a high level Causal Loop Diagram (CLD) as an initial exercise to consider whether there is a causal pattern to these events. The initial CLD is shown in Figure 4.

Figure 4: An initial CLD in developing Australian framework for sustainable development

Legend: “S” means same direction, ie a variable at the head of an arrow goes in the same direction (increase or decrease) with the variable at the tail of the arrow

This initial diagram shows that relationships between the key variables driving reported events are far from simple or linear, but can be traced back to lack of integrated planning. This systems thinking methodology has also been used by Bosch and others when developing a sustainability model in Vietnam. One of the key findings from those authors was that government agencies were working in isolation from each other trying to fix different problems separately.

In order to determine whether an appropriate intervention strategy can be devised to address root causes rather than symptoms of problems, it is necessary to gain deeper understanding of events and underlying causes often fuelled by mental models, or the assumptions and values that influence the way people behave and make decisions. These will be discussed in the following sections of the paper.
**Australia’s Official Development Assistance**

Over past decades, humanitarian considerations have led developed countries to provide aid as ODA to help developing countries. However, these aid projects have failed to alleviate poverty. In 2000, Australia, along with 189 States Members of the UN, made a promise (adopted as the Millennium Declaration), to take concrete action to achieve a set of interwoven concrete goals by 2015: reduce extreme poverty, hunger and disease; promote gender equality, education and environmental sustainability; recognise the right of everyone to good health, education and shelter; and build a global partnership for development.

Australia’s ODA contribution in 2008-2009 was 0.33 percent of Gross National Income (GNI). The forecast ODA / GNI for 2009-2010 was 0.34 percent, increasing to 0.4 percent in 2012-2013 and 0.5 percent by 2015. This relatively high level of ODA contribution reflects Australia’s concern for the needs of developing countries and continuing food insecurity. ‘It is in Australia’s interests to help support economic growth and stability, particularly in our nearest neighbours. This is particularly the case amid a global recession that brings its own economic and security risks’. Yet, only six percent of Australia’s ODA goes to rural development.

Figure 5 shows the allocation of ODA expenditure. This imbalance seems concerning, as the education target requires progress on health; the health target requires progress on nutrition; and the progress on nutrition requires progress in agriculture, which falls under rural development.

**Australia’s education services for overseas students**

Global competition for education of overseas students has become a multibillion dollar industry, dominated by the United States, United Kingdom, Germany, France and, in particular, Australia. These five countries hosted 1.3 million foreign students in 2001-2002. Amidst fierce competition for the international student dollar, the Australian overseas education sector grew to $18.6 billion in 2009 (Figure 7). This growth was fuelled by linking Australian education to a permanent residency outcome, wherein students chose courses that maximised permanent migration points test scores, as opposed to potential career choices.

The ‘extraordinary’ growth in Australia’s education services sector from 228,119 students in 2002 to 491,565 students in 2009, resulted in this sector becoming Australia’s fourth largest export earner, worth $17.2 billion in 2008-2009.
Yet, of the total 467,407 international students studying in Australia as of 30 June 2009, 374,826, or around 80 percent were from the Asia-Pacific region, home to two thirds of the world’s chronically hungry. Of this overseas student total, only 450 studied agriculture related programs. Table 2 shows a breakdown by country, of international students studying agriculture in Australia.

Figure 7: Export income from education services

Table 2: International students studying agriculture related courses in Australia as of 30 June 2009

<table>
<thead>
<tr>
<th>Country</th>
<th>Asia-Pacific</th>
<th>Agriculture</th>
<th>Other</th>
<th>Africa / Middle East</th>
<th>Agriculture</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaysia</td>
<td>60</td>
<td>19,779</td>
<td></td>
<td>Iran</td>
<td>12</td>
<td>1715</td>
</tr>
<tr>
<td>India</td>
<td>53</td>
<td>89,511</td>
<td></td>
<td>Iraq</td>
<td>10</td>
<td>150</td>
</tr>
<tr>
<td>China</td>
<td>52</td>
<td>111,803</td>
<td></td>
<td>Botswana</td>
<td>5</td>
<td>370</td>
</tr>
<tr>
<td>Vietnam</td>
<td>24</td>
<td>16,884</td>
<td></td>
<td>Kenya</td>
<td>4</td>
<td>1746</td>
</tr>
<tr>
<td>Pakistan</td>
<td>16</td>
<td>5400</td>
<td></td>
<td>Saudi Arabia</td>
<td>4</td>
<td>9104</td>
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<tr>
<td>Indonesia</td>
<td>13</td>
<td>13,372</td>
<td></td>
<td>South Africa</td>
<td>3</td>
<td>706</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>12</td>
<td>5428</td>
<td></td>
<td>Israel</td>
<td>2</td>
<td>457</td>
</tr>
<tr>
<td>South Korea</td>
<td>11</td>
<td>27,515</td>
<td></td>
<td>Jordan</td>
<td>2</td>
<td>621</td>
</tr>
<tr>
<td>Nepal</td>
<td>8</td>
<td>18,910</td>
<td></td>
<td>Oman</td>
<td>2</td>
<td>597</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>8</td>
<td>7042</td>
<td></td>
<td>Turkey</td>
<td>2</td>
<td>1747</td>
</tr>
<tr>
<td>Thailand</td>
<td>8</td>
<td>18,543</td>
<td></td>
<td>Uganda</td>
<td>2</td>
<td>65</td>
</tr>
<tr>
<td>Bhutan</td>
<td>6</td>
<td>157</td>
<td></td>
<td>Egypt</td>
<td>1</td>
<td>1776</td>
</tr>
<tr>
<td>Taiwan</td>
<td>6</td>
<td>6,661</td>
<td></td>
<td>Ghana</td>
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<td>108</td>
</tr>
<tr>
<td>Singapore</td>
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<td>7912</td>
<td></td>
<td>Kuwait</td>
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<td>198</td>
</tr>
<tr>
<td>Hong Kong</td>
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<td>11,210</td>
<td></td>
<td>Lebanon</td>
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<td>850</td>
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<tr>
<td>Philippines</td>
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<td>2780</td>
<td></td>
<td>Mauritius</td>
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<td>4223</td>
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<tr>
<td>Brunei</td>
<td>3</td>
<td>580</td>
<td></td>
<td>Tanzania</td>
<td>1</td>
<td>163</td>
</tr>
<tr>
<td>Fiji</td>
<td>3</td>
<td>400</td>
<td></td>
<td>United Arab Emirates</td>
<td>1</td>
<td>1282</td>
</tr>
<tr>
<td>Japan</td>
<td>2</td>
<td>9441</td>
<td></td>
<td>Zimbabwe</td>
<td>1</td>
<td>1902</td>
</tr>
<tr>
<td>East Timor</td>
<td>1</td>
<td>98</td>
<td></td>
<td>Total Africa / Middle East</td>
<td>56</td>
<td>27,780</td>
</tr>
<tr>
<td>Myanmar</td>
<td>1</td>
<td>752</td>
<td></td>
<td>Western / Other</td>
<td>92</td>
<td>47,845</td>
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<tr>
<td>Papua New Guinea</td>
<td>1</td>
<td>572</td>
<td></td>
<td>Total</td>
<td>450</td>
<td>466,757</td>
</tr>
<tr>
<td>Solomon Islands</td>
<td>1</td>
<td>76</td>
<td></td>
<td>Grand Total</td>
<td>467,407</td>
<td></td>
</tr>
</tbody>
</table>

Australia has world class academics and tertiary learning institutions specialising in agriculture and related food industries. These institutions are underutilised. According to the Australian Council of Agricultural Deans, the decline in enrolments between 2001 and 2006 was 18 percent; and the number of Australian agricultural students continues to decrease. Overseas students can and should be encouraged to take up the slack if we are to deliver the Millennium Declaration goals.

A causal constraint for overseas students wanting to study agriculture in Australia is that agriculturalists are not adequately defined as professionals on the General Skills Migration (GSM) lists that drive Australia’s Migration Programs, and are therefore not afforded the same privileges as many non-agricultural positions.

The continuing decline in the number of Australian students attending agricultural and rural science courses across all areas of Australia is a serious concern to both the tertiary and industrial sectors. This enrolment could be improved by government intervention to reallocate the ODA budget to provide more funding for agricultural education to overseas students from developing countries. This reallocation could be followed with reforms to migration policy recognising equitable reallocation of part of the $18 billion overseas student export income from poorer families of developing countries, to be reapplied to agricultural education and skills development initiatives, thus increasing Australia’s chance of keeping promises made under the Millennium Declaration.

3. Population, migration and development

Australia’s current population is a derivative of natural increase and net migration. Net migration is a consequence of economic development. In Australia, there is a clear need to define what Australia wants
to be like as a nation in 20 to 50 years’ time before
deriving any meaningful population, migration and
development policy. A collaborative vision for Australia’s
development to 2030 would seem a good starting point,
documented within a National Development Framework
(NDF) that identifies clear priorities for Australia’s national
infrastructure to support economic growth.

**Australian population trends**

Australia is a land of migrants. The first Australians
are believed to have walked from Africa over many
millennia. The more recent growth over time of Australia’s
population is shown in Figure 8.

**Figure 8: Australia’s population growth since Captain
Cook’s landing**

![Population Growth](image)

Australia’s current population of 22.5 million people is
divided between regional and urban dwellers. The urban
and government population is mostly concentrated in
urban coastal centres, with the state and territory capital
cities comprising 14 million people. The most densely
populated one percent of the continent contains 84
percent of its population.42

Of the total population, 11.27 million are currently
employed.43 During the 2009 financial crisis, young
Australians aged between 15 and 24 years suffered
most of the full time employment reduction, with
potential long term effects.44

The Australian employment landscape has shifted from
agriculture, manufacturing and building industries to the
industry of government and other service industries.
Agriculture was originally Australia’s largest industry,
contributing 20 percent of GDP in 1900. By 2000,
agriculture’s share of GDP had fallen to just under three
percent. Over the same period, the area of land devoted
to agriculture has grown substantially, to around 60
percent of the continent’s land area.45

Australia’s population has aged following the post-World
War II baby boom due to better health, higher expected
longevity, and lower fertility. Up to 25 percent of the
current workforce will need to be replaced due to ageing
over the next 10 years.46 Australian life expectancy for
both males and females continues to be amongst the
highest in the world. Males expect to live an average
of 79.3 years, while females can expect to live 83.9
years. Having survived to age 60, men can expect to live
another 23 years and women another 26 years (Figure 9).

**Figure 9: Population age and sex structure**

![Population Age and Sex Structure](image)

The period from 2002 to 2010 saw the labour force
participation rate of older men increase to 42 percent,
with growth in the proportion of older men in both full
time and part time work. The industry profile of older
workers largely resembled that of younger workers, with
some notable exceptions. Employed men aged 55 years
and over were twice as likely to work in agriculture,
forestry and fishing (7.8 percent, versus 3.4 percent for
younger men).48

Like most countries around the world, Australia
experiences significant rural to urban migration, which
is fuelled by: better education and health facilities;
enhanced career and social opportunities; issues of
drought and poor economic support in rural areas; and
lack of rural infrastructure development.

**Australian migration**

Since Australia’s first federal immigration portfolio was
created in 1945, its Migration Program focus has shifted
from building up the population for defence purposes
in the 1950s and 1960s to a program aimed to build
up Australia’s manufacturing industries.49 In the early
1990s, the emphasis broadened to encompass family
reunification, humanitarian and economic objectives.
Historically, Australia has had a strong emphasis
on permanent migration, with previously expressed
opposition to temporary and contract workers.50

The decade to 2010, however, witnessed a shift
from permanent settlement in Australia to temporary
migration, allowing skilled workers to work for an
approved employer for up to four years using a
Temporary Business (Long Stay) (Subclass 457) visa.
Australia’s brain gain does not deprive migrants’ home countries of the benefits that the skilled migrant could otherwise contribute. In many developing countries, migration leads to beneficial flows in the form of remittances, information and return migration. Remittances help to smooth family consumption and even bring prosperity to home communities. Only by leaving rural areas can young adults acquire the skills necessary to participate in endogenous development, with migration a prerequisite for rural economic regeneration. Significantly, improved migrant occupational skills and entrepreneurial ability acquired while working abroad overshadow savings and remittances in terms of home country endogenous development. Many migrant brains are refined in country of destination and migration becomes a two way flow.

Current government policy seeks to attract the best and brightest brains, but this is somewhat flawed. Population development is about moving averages, not attracting the best and brightest in a particular field. Migration policy would be more meaningful if policymakers focused on integrating the needs and skills of developing country migrants with Australia’s development needs, in terms of urban and regional location, industry and required skills (Figure 10).

Figure 10: Migration policy shifts most migrant onshore arrivals to urban dwelling

Urban migration and development

Australia’s ‘common sense’ Migration Program, skewed towards permanent urban migration and settlement, places increasing burden on urban infrastructure limits - and, thus, existing urban residents.

Some commentators believe Southeast Queensland’s population can be capped, but according to Professor Martin Bell from the Centre for Population Research at the University of Queensland, ‘calls for a cap on Southeast Queensland population fly in the face of demographic realities and are likely unachievable’.54

Brisbane is an alarming case study in this context. In addition to overseas migrants, increasing numbers of people are migrating from the south and from rural areas to Brisbane to seek a better livelihood. These people compete for housing and other urban infrastructure while, at the same time, an explosion in the number of permanent visas awarded has resulted in increasing urban migrant settlement, increasing competition for urban housing and other infrastructure and services.

The net result is increasing cost of housing and social stress on Brisbane’s population. For many, what was intended to be a net livelihood gain ends up as a nightmare.

Figure 11: A ‘Tragedy of the Commons’ systems archetype: situation in urban Australia

Figure 11 shows a situation where the two different populations, migrants, R1 (including rural and southern migrants), and urban permanents, R2, compete for urban resources to improve their livelihood. In the long term, the increase in total urban population would reduce the livelihood gain for each urban individual, which would then reduce the livelihood gains for both of the two populations.

The key leverage point is rural return migration and migrant settlement outside of urban areas. This reversing balance will require serious government investment and support. A much softer approach is to tie migration to rural resettlement and socioeconomic development.

Energy use, living things and capacity to work

Energy is central and fundamental to all living things, their growth and their capacity to do work. The mental model of many Western proponents of urban based growth is that those working in primary industries knowingly cause environmental problems. Some urban dwellers mistakenly believe they hold a monopoly on moral responsibility, while forgetting their own major energy use. The food we eat accounts for around 23 percent of the global ecological footprint, as shown in Figure 12. Methane and other greenhouse gases are by-products of food production.55
Today's energy consumption comes from yesterday's 'quick fix' fossil fuel solution, with the undesirable consequence of climate change. Climate change is a symptom of this quick fix, resulting in an atmospheric carbon imbalance. Carbon not sufficiently absorbed naturally (for example, through photosynthesis) causes increased atmospheric temperature. Continuing energy demand exacerbates the original problem and has resulted in a reinforcing pattern of further dissatisfaction now called the climate change problem.

Global policymakers are having real difficulty coming to grips with the politics surrounding the many stakeholder groups with their diverging interests.

It is helpful to read nature's record, tracing backwards to the beginning of primitive earth when there was no burning of fossil fuel to produce energy. Life is believed to have started about five billion years ago with initial energy creating the first cellular structures. The process still continues till today, but modern living has created an imbalance. The causal relationships are presented in Figure 13.

A close look at this diagram shows the virtuous cellular energy loop ‘Cell Energy R’ counterbalanced by the energy loop ‘Energy B’. The balance is insufficient, creating an undesirable, vicious loop resulting from atmospheric carbon imbalance, ‘Energy R’.

Despite this, food production must be increased to feed the growing global population. According to Driscoll, global food production needs to double by 2050 as the population rises to about nine billion people.

Sustainable food systems rely on the development and economic viability of the agriculture and farming industry. Yet, global investment in agriculture and animal science research and development is decreasing while a renewed scientific community effort is required to deliver sustainable food systems that produce food with minimal environmental impact.

The leverage point to restore balance is for market mechanisms to provide incentives to reduce consumer energy demand, provide alternative energy sources and increase opportunities for agriculture and forestry to absorb carbon dioxide through photosynthesis.

Water for living things, food production and environmental conservation

Australia is extremely dry and water is treasured: necessary for survival of the population and essential for providing food for both animal and human life.

The Murray-Darling Basin Authority (MDBA) was commissioned to conduct a 10 year consultation program, study and report on the sustainable yields on agricultural activity surrounding the Murray-Darling basin. Disengaged stakeholders burned copies of the MDBA draft report.

The events surrounding the Murray-Darling Basin controversy are fundamentally related to the fact that the basin is home to around two million rural Australians whose livelihood depends on producing 40 percent of the nation's agricultural production, and valued at around $43 billion annually. The controversy surrounding water availability impacts many stakeholders and has multiple drivers and interconnected dimensions, including social, economic, environmental, behavioural, governmental and leadership, requiring systemic stakeholder responses within a participatory integrative framework as shown in Figure 14.
These factors tend to be ignored in linear thinking models, as has been confirmed by the MDBA controversy. The government strategy now is to take more of a partnership approach to include affected stakeholders, and to recognise socioeconomic issues surrounding the current MDBA controversy that were excluded from the draft MDBA consultative report.

4. The need for integrated planning and coordinated government policy

In order to plan its workforce, migration program and population, Australia needs to have a clear vision of where the nation wants to be in 10, 20 or 50 years time. From this vision, a broad national development plan could be developed specifying required regional infrastructure and industry priorities so that government and business could match national development goals with business objectives.

Australia’s current skills demand

The Australian economy has undergone significant structural change over the last few decades, with industry embracing new technology and becoming increasingly involved in the global economy. Considerations that were once relevant no longer apply in today’s labour market. This structural change has been accompanied by significant changes in labour demand.

An Academy of Social Sciences in Australia (ASSA) examination of the labour market revealed that ‘one of the biggest issues facing the Australian economy has been a shortage of labour’. Yet, over 1.5 million people of working age rely on social security payments as their major means of income. Australia today faces a shortage of industry skills, rather than a shortage of labour.

Rural development: agriculture and mining

During 2008-2009, Australian farmers produced $41.8 billion in farm agricultural produce. The farm sector employs over 290,000 people. About 60 percent of Australian produce was exported, while about $1.5 billion in food is imported annually. During 2009, the Australian mining industry generated sales and services income of $171.7 billion, contributed $117.6 billion to export revenue, and paid $15.5 billion in wages and salaries to 135,000 workers employed across rural Australia. Rural Australia can be developed from its agricultural and mining base into broader areas of residence, recreation and environmental conservation. Counter-urbanisation can be encouraged, especially within the aged population and those motivated by quality of life considerations, thus bringing valuable entrepreneurial spirit and talent to combine with local experience and knowledge, creating more sustainable and equitable rural development.

The minerals and energy industries could readily make more important contributions to Australian rural development. In years past, mining companies actively supported host local communities by establishing permanent and semipermanent bases for housing their workforce onsite, as opposed to the current practice of fly-in and fly-out from major urban centres. For example, Mount Isa, Blackwater and Charters Towers in Queensland, Greenvale, Victoria and Mount Newman in Western Australia were communities built with mining company support, prospering from direct minerals extraction activities that drove expansion in agribusiness, hospitality, tourism, health, education and other rural businesses.

Mining companies now seem to have formed a mental model that, because labour cannot be obtained from within local communities at start up, it needs to be flown in from outside. The reality is minerals and energy extraction companies need to budget for the cost of onsite accommodation, as opposed to fly-ins and fly-outs from capital cities.

This strategy would also remove unwanted windfall profit taxes through community development at local areas, consistent with the need for rural return migration, with costs shared in partnership with governments that need rural infrastructure. By the same token, former migrants and refugees can be better attracted to rural Australia. What seems needed is much more incentive for rural skills migration, as opposed to the regional skills migration program. ‘Regional’, under current DIAC definition, includes parts of coastal Australia where many would aspire to holiday and retire.

A policy of attraction and retention is required. It is not necessarily true that Australians do not want to live in rural areas, rather that rural areas require public infrastructure, development and business support to incentivise ‘rural migrants’.
Environment: caring for our country
In July 2009, the Australian government announced accelerated work across the country on environmental and sustainable farming projects, with $403 million committed under the landmark $2 billion ‘Caring for our Country’ program.65

An increasing number of agricultural technicians will be required to deliver the outcomes envisaged by this program. The program will also require improving the skills and knowledge of up to 42,000 land managers and farmers required for sustainable farm and land management practices under the proposed program.66 In addition, the government has allocated $464 million of 2009-2010 International Development Assistance Budget to support Asia-Pacific and African nations in addressing food insecurity. This program will also require agricultural professionals skilled in the application of modern production improvement technology to increase yield from available land, plants and animals.

These programs may well be challenged by current and future agricultural workforce shortages evidenced by the decline in the number of students enrolled in tertiary agriculture and agricultural skills development courses. These multi-skilled professionals are not being developed in Australia in sufficient numbers to meet current or future need.

These factors, coupled with Australia’s ageing population, will continue to place increasing stress on both Australian and Asia-Pacific rural development and food security.

5. A proposed framework for integrative national planning
The CLD in Figure 15 is a refined version of the CLD in Figure 4, reflecting a deeper understanding of where appropriate intervention strategies can be devised that address root causes as to why Australia’s socioeconomic system is not performing as well as expected. Some of the intervention leverage points it contains have been defined in previous sections of this paper. These leverage points are where small changes can be made to reap large rewards in the system as a whole.67

When the CLD shown in Figure 15 was constructed, it became obvious that key leverage points can be traced back to integrated planning and coordinated government policy.

Figure 15: The CLD structure where key leverage intervention points may be found68

Legend: ‘S’ - same direction; ‘O’ - opposite direction; ‘R’ - reinforcing loop

These interventions can be seen in the reinforcing loops ‘R’, where the loops represent reciprocal and beneficial effects of integrated planning and international cooperation through official development assistance.

Figure 15 incorporates parts of the total system discussed previously and maps the holistic system where Australia could provide key systemic interventions for a rural industry and national development partnership that will add value and support Asia-Pacific rural development and subsequent food security.

Rural industries and national development partnership

Figure 16: A proposed integrative planning and sustainability model for Australia’s rural development

Legend: ‘S’ - same direction; ‘O’ - opposite direction; ‘B’ - balancing loop; ‘R’ - reinforcing loop

Funding rural infrastructure
Progress in achieving the Millennium Development Goals requires progress in agriculture to provide adequate human diets, thereby progressing health,
education and rural skills development. In the same way, Australia needs progress in providing rural infrastructure to support development of minerals, energy and agricultural production; this, in turn, would reinforce increased rural commodities revenue, leading to increased GDP per capita.

Increased GDP per capita would improve rural and urban livelihoods, consumer purchasing power and aggregate demand. Increased aggregate demand would place further pressure on land, water and energy use, but could be balanced by increased awareness and government policy measures to work with all stakeholders in protecting the environment. This rural virtuous development reinforcing loop is shown as RUR_Dev_R in Figure 16. A social development loop is embedded wherein increased individual livelihood gain leads to reduced poverty, better health, reduced settling payments and better overall GDP per capita distribution.

Both public and private funding could be used to finance long neglected rural infrastructure development. The provision of adequate rural infrastructure would lead to increased commodity revenue, providing a more favourable balance of trade and payment positions necessary to debt-finance major public infrastructure projects, such as previously proposed northern pipelines to the Darling River basin. This, in turn, would provide water for agriculture and sustain the Murray-Darling River system. Increased external debt would devalue the Australian dollar, allowing greater returns for agricultural export producers. This virtuous reinforcing loop is also shown in Figure 16 as NAT_ECON_R.

The leverage point now is for the government to re-establish a somewhat regulated Rural Development Bank and rural financing in Australia that supports infrastructure, socioeconomic and business in rural areas.

### 6. Rural Australia as a ‘learning laboratory’ for sustainability

The University of Queensland through the former School of Integrative Systems (now part of the new School of Agriculture and Food Sciences) has the expertise to customise and facilitate systems thinking approaches and the Learning Laboratory concept successfully implemented and being implemented in various biosphere reserves in Vietnam, Cambodia and Australia. This framework and concept have also been acknowledged by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) as best practice to be applied to the global network of more than 570 biosphere reserves worldwide.

Sustainable national resources and development are achieved through people systems, their knowledge, enterprise and ability to innovate and adapt. The Learning Laboratory is the setting and process to create meaningful dialogue, shape and make transparent new mental models and to develop shared vision. This process is delivered through understanding of complexity, capacity building and cross sectional collaboration between stakeholders, leading to higher levels of learning and sustainability.

Maani and Bosch have developed seven steps used within the Learning Laboratory process for addressing various complex issues and problems. This framework and process could be effectively adapted to fit within the development aims for rural Australia and the Asia-Pacific. This will be the scope of the next stage of this study.

### 7. Conclusion

This study has used systems thinking methodology and tools to understand the forces shaping decision making behaviours and identified key global and domestic variables or factors affecting Australia’s urban and rural socioeconomic and environmental development systems.

From these understandings, points of systemic intervention have been identified within key leverage areas where decision makers could make most impact in removing system blockages and allowing the energy of economic and livelihood development to flow freely through interdependent rural economies within both Australia and Asia-Pacific trading partners.

Key success factors would include: unfreezing mental models to allow participatory stakeholders to develop; recognising the contribution rural Australia makes to the national economy; and breaking down departmental,
organisational and functional barriers to allow a genuine dialogue to flow between stakeholders.

The outcome from a proposed integrative national planning process would be action plans owned and implemented by participatory stakeholders to improve national resources management, livelihoods, and food security capability across both Australia and Asia-Pacific trading partners, as well as improved chance of delivering Australia’s promises under the Millennium Declaration.

Skilling agricultural, livestock and environmental scientists and technicians has emerged as a critical issue that must be faced in replacing Australia’s ageing rural population and providing the agricultural and environmental technicians necessary to implement the proposed ‘Caring for Our Country’ program. A collaborative partnership between Australia and Asia-Pacific countries to develop rural skills in agriculture, minerals and energy development and environmental management seems to be a win-win proposition.

Adaptation of science within an integrative socioeconomic, population adaptation and capacity building framework could provide a more sustainable world, in turn making it easier for people in Australia and developing countries to ensure their own food security.

The path forward for institutions, government, corporations, stakeholders and political interest groups will be challenging and will need collaborative courage to change the wasteful and destructive practices of the past: courage to take value-driven action through a systems thinking and sustainability framework that identifies key leverage points for 21st century leaders to intervene within a globally focused system.

In this way, 21st century leaders can be more confident that decisions they take based on national integrative planning and equitable rural economic and community support, will shift their organisations towards sustainable value and profit.

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1 Australian Broadcasting Corporation (ABC), 7.30 Report, August-October 2010.
8 AgriFood Skills Australia, Assuming the Mantle: 2009 Environmental Scan of the AgriFood Industries (Kingston, ACT, 2009).
10 UN, Millennium Development Goals Report, above n 5.
13 Hoste, above n 3.
18 Ibid.
20 J-y Lee, M B Toney and E H Berry, ‘Social Status Inconsistency and Migration’ (2009) 27 1 Research in Social Stratification and Mobility 35.
21 Ma, above n 6.
22 Ibid.
25 Maimbo and Ratha, above n 23.
26 UN, ‘Keeping the Promise’, above n 19.
27 UN, Millennium Development Goals Report, above n 5.
28 Maani and Cavana, above n 2.
30 Ibid.
31 Maani and Cavana, above n 2.
32 D’Silva and Bysouth, above n 17; World Bank, above n 24.
33 UN, Millennium Development Goals Report, above n 5.
35 Ibid.
36 Ibid.
40 AEI, above n 38.
44 Alison Anlezark, ‘Young People in an Economic Downturn’ (Briefing Paper 23, National Centre for Vocational Education Research (NCVER), 2011).
46 ABS, ‘Older People and the Labour Market: Australian Social Trends September 2010’ (Catalogue no 4102.0).
47 ABS, ‘Australian Demographic Statistics June 2009’ (Catalogue no 3101.0); ABS.
15. Migration Institute of Australia

‘Population by Age and Sex, Australian States and Territories, June 2006’ (Catalogue no 3201.0).

48 ABS, above n 46.

49 J Phillips, Skilled Migration to Australia (Australian Government, Canberra, 2006).

50 Graeme Hugo, Temporary Migration: A New Paradigm of International Migration (Parliamentary Library, Canberra, 2004).

51 ibid., above n 6.


53 Skellon, above n 37.


56 ibid.

57 Driscoll, above n 55.


59 ABS, ‘Value of Agricultural Commodities Produced’ 2009 (Catalogue no 7503.0).

60 Maani and Cavana, above n 2.


62 ABS, above n 46.

63 AgriFood Skills Australia, above n 8.

64 ibid.

65 Tony Burke and Peter Garrett, ‘$403 Million Investment for the Australian Environment and Sustainable Agriculture’ (Media Release, Daffd09/287BJ, 2 July 2009).

66 AgriFood Skills Australia, above n 8.


68 O Bosch, K Maani and C Smith, ‘Systems Thinking: Language of Complexity for Scientists and Managers’ in S R Hanson, A Bosch and J L Herbohn (eds), Improving the triple bottom line returns from small-scale forestry: Proceedings from an International Conference, Omlac, the Philippines, 18-21 June 2007 (University of Queensland, Gatton, 2007).


70 Nguyen, Bosch and Maani, above n 69.

71 ibid.

72 ibid.