Australian Academy of Science

RECOMMENDATIONS

THEO MURPHY HIGH FLYERS
THINK TANK 2012

AUSTRALIA'S POPULATION: SHAPING A VISION FOR OUR FUTURE

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THEO MURPHY HIGH FLYERS **THINK TANK 2012**
Adelaide, 26–27 July 2012

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EXECUTIVE SUMMARY

The impact of population trajectories on our social fabric and our natural environment is a critical consideration for the health of Australia as nation, as community and as locality. The 2012 Theo Murphy High Flyers Think Tank brought 60 early to mid-career researchers together with expertise in disciplines across economics, social sciences, ecology, biology and technology to consider how a vision for Australia's future might be shaped by population.

Researchers worked in four groups to consider specific contexts in which population trajectories might affect different aspects of our social and natural environments. Each group considered one of the following questions:

A. Who will we be?

B. How will we share activities and resources?

C. What will we do?

D. How shall we live in our habitat?

As a fundamental basis of discussion, it was agreed that no optimal population size should be sought. There is widespread recognition that no such (scientific) optimum exists and there are very few effective mechanisms that can be used to manage population size. There was also a consensus that continuous growth, either of population or the economy, will not in itself resolve the significant challenges facing Australia. Rather, growth was seen by participants as bound up with other complex and changing dynamics that need to be better understood. Finally, almost all participants were concerned that scientists and science have been relatively absent from debates on Australia's future population. Science has a crucial role in finding solutions to the challenges that are associated with a changing and growing population.

In any envisaging of the future, the ethical dimension is present, and our desired future will influence how we value different decisions and trajectories. Whilst science can inform what we do, the decisions we take will be affected by what we value. The work groups expressed this by articulating shared values that could help guide the development of an Australia we would prefer to see. These commonly shared ideas were **equity**, **sustainability**, **opportunity**, **diversity**, **justice** and **agency**.

This last principle of agency was a commonly occurring theme, in particular when twinned with the question of how science might contribute to an understanding of future trajectories. Participant discussions centred on determining what it is we value, and what kind of future we want for our population. However these are questions not just for scientists, but for everybody, therefore the key recommendation of the Think Tank was for an informed national conversation on Australia's future population.

A national conversation would be an initiative established by universities and researchers, but must be open to a broad cross-section of communities across urban and rural Australia. This conversation would take place at a grass roots community level. Communities would come together through a range of mechanisms to consider what kind of future we would like to see for our population. Science would inform this debate by showing what kinds of scenarios are likely to follow our current choices, and what kinds of decisions we need to make to help us realise a better future.

The role of scientists and science in facilitating this hoped-for increased dialogue about population and Australia's future is multi-faceted. The groups identified three areas where science could contribute to such a conversation: through better access to data, presentation and interpretation of research findings, and improved communication between science and the community.

Facilitation of access to quality data and information. Improved data linkage and dissemination are important supports for more informed debate. Data could be presented using models that inform planning in ways that people can easily relate to.

Provision and translation of research outcomes. Improved communication processes within and around the scientific community through media, education and leadership in debate would increase the utility of science for the wider community. This includes presenting relevant research outcomes to a variety of audiences and providing the broader context to communities considering options.

Facilitation and participation in community conversations. Scientists can bring expertise in methods and approaches to dialogue and participatory exercises, as well as being able to individually act as change agents for communities. They can also participate within the conversation, bringing another aspect to crossdisciplinary thinking and encouraging other forms of science–community participation such as citizen science.

The two-day Think Tank saw enthusiastic contributions from all participants. Discussion was vigorous with passionate debate about a very wide range of possibilities such as obesity disincentives, technological salvation, euthanasia, managing finite resources, robots for aged care and industrial photovoltaic programs. Eventually, however, it was accepted that it is not for scientists to determine the role of such different possibilities in our future. Instead, science can be used to underpin the principles that ought to inform a proper public discussion, that is, the national conversation.

The Think Tank recognised that the current public debate on population issues would benefit from being more adequately informed by best available data and knowledge, an observation publicly shared by several academics and researchers in Australia. Scientists have an important role to play in taking the issues, and the science, directly to the community for consideration. A well-hosted conversation is informative and rewarding to all involved. By participating in such a conversation scientists would also learn how their science can be more relevant and better integrated into societal decision-making. This would help to address the relative absence of science and the role of the community in recent population policy papers such as the 2011 *Sustainable Australia — sustainable communities*, where the questions of what kind of sustainable Australia and sustainable communities the public might want, and how science can help us get there, are largely absent.

All of the different future population scenarios examined by the groups showed that Australia will face big and challenging questions, particularly with pressures on our social and ecological systems. Finding solutions to such problems might come about by considering alternative entry points to population debates, such as consumption, productive ageing, and urban planning. However, we believe the impact of a changing and growing population is a necessary question that needs to be considered, and one that should be part of a national conversation on what Australia we would like to create.

Science has played a remarkably small part in public debates on Australia's future population. Community engagement on this issue has been largely absent within population policymaking. Involving the community through a national conversation, a conversation informed by science but driven by determining what we want for the future, will bring both purpose and direction to some of Australia's most pressing challenges.

GROUP A: WHO WILL WE BE?

INTRODUCTION

The 2012 Theo Murphy Think Tank provided an opportunity for a diverse group of scholars to consider the question 'Who will we be?'

In considering a horizon of 2030 (i.e. less than a generation from now) we already have a good idea of what the population will look like. As a consequence, the discussion about 'Who will we be?' quickly moved to 'Who do we *want* to be?', emphasising what might be the likely priorities for such a population. A second important question arising was: 'How should we, as scientists, best support that?'

Projections tell us that by 2030, Australia's population will be larger and older. Population projections are based on assumptions about the likely patterns of fertility, mortality (life expectancy) and migration. While it is impossible to know the exact levels of these contributions, reasonable projections can be made, particularly in the short term. Hence, projections for the coming 10 or 20 years are more sensible than those for 50 years from now, let alone 300 years from now. The Australian Bureau of Statistics has three sets of estimates (projection 'series') based on different fertility, life expectancy and migration assumptions. Series B is based on recent observations of the three components: fertility is assumed steady at 1.8, life expectancy at birth is 85 for boys and 88 for girls, and net migration is set at 180 000 people a year (ABS 2008). The projection estimates that the size of the population in 2030 will be about 28.5 million, and that there will be considerable growth in population size in Queensland and Western Australia. The growth will be mainly in the capital cities, but it is the ageing of the population rather than its size that is of real interest. In 2006, the percentage of the population aged 65 years and more was about 15%. This is estimated to be about 21% of the population by 2026, and about 28% by 2056 (ABS 2008). The Intergeneration Report 2010, *Australia to 2050: future challenges* (Australian Government 2010) articulates this future and the challenges it brings.

In terms of 'Who do we want to be?' there was considerable support among the working group for continuing the path to a diverse and culturally rich Australia. Equity was a major emphasis. The group agreed that all parts of Australia's population, both current and future, have an important part to play in growing this country. It recognised that as a wealthy country in a relatively isolated part of the world, Australia has important responsibilities to the region, including the ability to incorporate new migrants from skilled and humanitarian migration. While not included as a specific recommendation, the group also articulated the ongoing need to improve the conditions of Indigenous Australians.

RECOMMENDATIONS

1. Build family networks

Although on the rise, the participation of Australian women of childbearing age in the labour force is the 11th lowest among OECD countries (Abhayaratna and Lattimore 2006), and women of childbearing age are likely to work on a part-time basis in order to negotiate care responsibilities (McDonald and Moyle 2011). For two reasons, it is likely that the need for female labour force participation will increase: first, because population ageing is projected to bring a 'shrinkage' of the labour force and, in turn, an increased need for labour supply, and second, for reasons of gender equity and poverty reduction (Gilfillan and Andrews 2010).

Policies allowing men as well as women to be actively involved in childcare responsibilities need to be further encouraged and developed. Hence, the recently introduced Paid Parental Leave scheme which can be taken up by fathers if they are the primary carer and the forthcoming Dad and Partner Pay are both welcomed as ways to encourage fathers to be involved in welcoming their new child.

Childcare services also play a great part in allowing parents to work, but as currently provided have a number of equity issues. Formal childcare suffers from a general lack of flexibility, has long waiting lists, insufficient availability, and continues to be a large expense for families with young children. Research notes that quality, availability and cost are all important considerations for the use of childcare (Breunig et al. 2011). Childcare delivery in Australia needs to be recast. Family day care, particularly emphasising existing personal

networks, should be piloted. Friend, family or employment networks should be considered as recognised providers, and a scheme providing training and support for implementing care 'family centres' could be one direction. The government should also consider the role of occasional care centres, which can play an important role for short-term care or care requiring non-standard work hours.

2. Emphasise diversity

There will be an ongoing need for workers in the coming years, and immigration has been an important component of building Australia. But it is not only skilled migration that is important to Australia. Australia's global responsibility to humanitarian migrants also needs to be recognised.

In an effort to facilitate a multicultural society, we need to reinforce the education of Australian children about different cultures and about languages other than English. These languages could be taught from the first year of primary school, and be maintained as far as possible in high school. Opportunities to harness the knowledge of communities should be introduced, and financial support for bilingual schools should be considered.

3. Foster a healthy population

Advances in information technology and remote biomedical monitoring, which are emerging areas of scientific strength in Australia, can be used to improve the health of Australia's future population.

The Federal Department of Health and Ageing has made significant commitments to eHealth, both in patient record keeping and in online information sites and self-help treatment programs. These important initiatives need to be carried on to ensure that evidence-based individualised health information is available whenever and wherever it is required. Moreover, exponential advances in mobile communications and information technology have the potential not just to assist with appropriate management of ill health but also to support healthy behaviour change as a preventative strategy.

A novel initiative aimed at addressing the population health problem of physical inactivity needs to be explored. Physical inactivity is an important risk factor for high prevalence physical and mental health disorders, including cardiovascular disease and depression.

The initiative builds on Australia's enviable record of successful public health campaigns, recent scientific advances in automated behavioural monitoring and the fact that Australians have shown themselves to be early adopters of new technology. It is grounded in the behavioural science of motivation and a wellness-focused preventative approach to health and illness.

The proposed ***Health and Wellness Rebate*** is a scheme for financially rewarding people for objectively measured and automatically logged physical activity. Under the scheme:

- Australians would receive tax credits on the basis of objective evidence of their physical activity across the year. Such schemes have not been viable in the past because reliable non-intrusive objective monitoring of behavioural activity has not been possible. Recent technological advances can change the game: objective evidence for the rebate can be collected in real time by automated behavioural monitoring of locomotor activity (such as walking, running or cycling), using cutting edge automated monitoring technology that is currently being tested worldwide (e.g. Kose, Durmaz Incel & Ersoy, 2012; Wilde, 2011; Indic et al., 2012). The algorithm generating the person's *Health and Wellness Score* can combine information from accelerometer-like devices and GPS (e.g. Smartphone or smart textile-based applications) to objectively confirm the body's self-driven movement through space. Data is automatically uploaded onto a secure site via a personal wireless hub (e.g. Smartphone).

- The calculation of rebate from the *Health and Wellness Score* would be based on improvement relative to one's current levels of activity and improvement relative to national averages. Parts of the population which are particularly inactive and affected by chronic disease may be rewarded at a higher rate than those less affected by these problems. Potential for rorting would be addressed through auditing procedures. The rebate for a successful year's physical activity would be in the area of $1000–3000 (i.e. the flourishing counterpart to health insurance).
- To address privacy concerns, the scheme would be optional. Individuals who elect to participate would have their data stored on a password protected file, and once a year would have the option of submitting the data to the Federal Government for calculation of their rebate.
- Recognising the interaction between individuals and their local environment in determining physical activity levels, local government areas could receive some funding based on the *Health and Wellness Rebates* earned by their residents.
- On many measures of wellbeing, Australia tops world tables. One anomalous indicator is in the area of physical activity and associated measures of weight and cardiovascular disease. From a public health promotion viewpoint, the roll-out of the *Health and Wellness Rebate* could be framed as a 'competition' between Australia and the rest of the world, whereby Australia aims to become the healthiest country on Earth.
- The data can be used to enhance population health research in a number of areas, with an opportunity to showcase Australian researchers as world leaders in the field.

4. Infrastructure for populations

Australia is one of the most urbanised nations on earth, so improving infrastructure within and between our cities has the potential to significantly affect our quality of life. Research across a range of disciplines shows that high density green city living is effective for decreasing car use, increasing physical activity, improving work-life balance and reducing the carbon footprint. Many urban initiatives in this direction are already occurring in Australia and internationally (see e.g. the City 2.0 project).

Australia should build on its strengths to position itself as a world leader in the design and development of green high-density metropolises, where two or three selected capital cities could receive federal, state and local government attention as exemplar global cities.

As part of this infrastructure planning, connections between a small number of high density large Australian cities is essential. Rail transport and freight are critical components of linking urban hubs to each other and to regional centres.

CONCLUSIONS

Challenges and opportunities in the four domains discussed above are central to improvements in/maintenance of Australian quality of life. Innovative strategies could be adopted for improving family networks, capitalising on diversity and fostering individual health within health-promoting infrastructures. Australia already has well documented strengths and achievements in each of these domains, and progress needs to continue. 'Who will we be in 2030?' Australians in 2030 will enjoy stronger family networks, more vibrant diversity, and better health in sustainable high-density cities.

GROUP B: HOW WILL WE SHARE ACTIVITIES AND RESOURCES?

INTRODUCTION

Because population encompasses such a wide range of issues, a stand-alone population policy would be an inadequate response to the challenges of the future Australian population, and a broader vision is required. In particular, policies that affect population should be assessed against the following seven principles:

- equity — sharing with attention to need
- sustainability, in order to support the needs of future generations
- responsibility — that responsibility for local and global wellbeing be held by individuals, communities, private sector, governments and the nation
- opportunity — a flourishing, happy and healthy population with opportunity for all to be the best that they can be: educated, informed, active in society, creative, innovative
- security — broadly conceived
- diversity — culturally and socially diverse with celebration of difference
- justice — valuing human rights and recognising the dignity of all persons.

Given the divisive and nature of the current national debate (see e.g. Wilson 2011), consideration of 'population' should be abandoned as a beginning for discussion and alternative points such as consumption and active contributory/productive ageing could be used instead.

Inequalities in health outcomes vary by neighbourhood and are correlated with socio-economic disadvantage. While some of this association arises from physical characteristics of neighbourhoods, much of it can be linked to social characteristics of neighbourhoods, variously referred to as social connectedness, social capital, social cohesion, etc., that arise from the social networks in which people are embedded. Therefore in each of the issues discussed below the impact of socio-economic disadvantage should be considered and incorporated.

RECOMMENDATIONS

1. A national conversation

A national conversation should be instituted on major issues related to future population changes. Respectful participatory deliberation could be executed through a range or coalition of organisations, with diverse approaches to engagement designed so that people find the discussion relevant to their lives (Fischer 2006; Abelson, Forest et al. 2007; Carson 2008). Such methods have been used successfully in Australia (Mooney and Blackwell 2004; Hartz-Karp 2005; Rogers, Street et al. 2009; Braunack-Mayer, Street et al. 2010). There is also emerging space for public dialogue through connected conversations (e.g. New Economics Foundation) or distributed dialogues (Andersson, Burall et al. 2010). In this model citizens are supported to engage in discussion in a variety of public and private spaces then feedback the results to a central collection point. Broader engagement could also occur through the creation of public spaces for debate through museum exhibits, interactive exhibitions or art.

The aim of the discussion using any of these methods would be to produce tangible outcomes. The Academy along with other key players could undertake a leadership role to initiate and support a debate well informed by best possible evidence. In order to accurately and comprehensively measure population characteristics, this conversation needs a cohesive system of data collection and linking.

2. Data collection and linkage

Improved data linkage and dissemination would support a more informed debate on contentious issues of national importance. For example, in the current debate on asylum seekers and refugees detailed data is available, but the debate is mostly divorced from the evidence base (see e.g. Coghlan 2011). Better data linkage would help answer important questions on the economic value of global migration and the effect of 'churn'

in population, such as those about the impact of Australians leaving and returning, of skilled migrants arriving and leaving, and of temporary migrants such as students and temporary workers.

Most data sets held in Australia are not linked to each other, whereas in other countries such as Norway linked data sets provide a more cohesive system of data collection (Husain, Brophy et al. 2012; Roman and Norheim 2012). Linked data sets would also provide improved information about the value and impact of health policy and health interventions.

3. Issues for debate

To share resources according to the principles described above — equity, sustainability, responsibility, opportunity, security, diversity and justice — we must address the issue of an ageing society. In particular, the rising costs of health care threaten to overwhelm budgets, sidelining other societal needs. In order to face this challenge we could explore the following questions in a national conversation, beginning by initial scoping work and collection of evidence by working groups with representatives from academia, government and communities.

Medicalisation of death and futile care

Not all feasible care is ideal care. With terminally ill patients, aggressive interventions may be not only futile but harmful to the patients and to their carers. Most Australians would prefer to die at home, yet a recent report indicates that 61.5% of people were in hospital on the last day of their lives (Rosenwax, McNamara et al. 2011). Evidence from the USA suggests that a disproportionate amount of health care costs is used in the last year of life and that a simple conversation about the options can reduce health costs substantially (Hogan, Lunney et al. 2001; Zhang B and et al. 2009). In an article in The Conversation in November 2011, Professor Kenneth Hillman, Professor of Intensive Care at the University of New South Wales, described the shift we have had in the way we use intensive care units, from predominantly lifesaving services to places engaged in the art of prolonging dying (Hillman 2012). This is an expensive exercise which often offers little to the patient and the patient's family. In contrast, appropriate and timely introduction of end-of-life care pathways can prolong life and provide an experience more in keeping with the wishes of patients and carers (Horey, Street et al. 2012). This should not be a conversation about euthanasia or physician-assisted death, but rather about improving the quality of life at the end of life.

What do we bring Scientists can assist by informing this debate with research data examining quality of life and patient preferences in the frail elderly and end-of-life care, and the nature and cost of such care. This might include the use of overseas data (e.g. Department of Health UK 2008) with a critique of its application to the Australian context; qualitative interviews with health care workers and carers who have experienced the impact of end-of-life care; and modelling of costs of futile care in the last six months of life. Scientists can also bring knowledge about the use of deliberative methods to engage citizens in informed debate, as described above.

Transition to retirement

Presently there is a clear fracture between work and retirement. In combination with an ageing workforce, this raises the potential for a rapid loss of skilled workers in the near future. The solution to date has been to increase the age of retirement. However, individuals engaged in manual labour may encounter difficulties working at an advanced age. Increasing morbidity with age generally will also affect ability to work. Additionally evidence shows that the retirement savings gap affects the willingness of individuals to retire (Hajkowicz, Cook et al. 2012). A recent report from the CSIRO (Hajkowicz, Cook et al. 2012) also highlighted the need for changed retirement models.

While needs are increasing volunteer hours may be decreasing — the percentage of the population volunteering at least once a year increased from 24% in 1995 to 35% in 2006, but the median annual hours per person fell from 74 hours to 56 hours (Australian Bureau of Statistics 2008). The percentage of the population who volunteer reduces with increasing age. Volunteering is important in the provision of a range of social services, and an ageing society could provide a source of volunteers experienced and skilled in a number of ways. A new life-stage could be conceptualised and supported to develop a more gradual transition from work to retirement, which may include encouragement for volunteering.

What do we bring? Scientists can bring an understanding of what working life at older ages could look like in the future. In particular, a range of tapered retirement models exist (Dawis 2005; Hesketh, Griffin et al. 2011). Community engagement would also help understanding and taking into account the expectations of those who will transition into retirement over the next 20–30 years.

Housing transition

Many people as they get older require progressively higher levels of support. Where and how should older people live? How do we assist older people to downsize, age-in-place or make a successful transition from independent living to nursing home care while maintaining community connections and ensuring that older people can continue to contribute to society? In planning for healthy future cities which cater to an ageing population, the multiple levels of social connectedness need to be recognised, and the social dimensions of urban planning need to be taken into consideration. We need to create places that encourage the types of social connectedness leading to healthier and more equitable populations. In addition, policies to improve health can only succeed if they take account of the physical and social aspects of people's neighbourhood environments, particularly when considering the needs of most disadvantaged neighbourhoods where health services are poorer, but demands upon these services are often greater.

What do we bring? Scientists can provide projections of future requirements for types of housing for the elderly and an analysis of the impact of a range of housing options on health and wellbeing in this age group. In addition, research can take us beyond the well-established association between socio-economic position and health to consider how neighbourhood level factors mediate this association. For example, research on the socio-economic context can provide local (Australian) evidence for ensuring that public health policies are effective (Feldman, Warr et al. 2009; Warr, Feldman et al. 2009).

GROUP C: WHAT WILL WE DO?

INTRODUCTION

The composition, size and geographic location of Australia's future population will drive and be influenced by economic, cultural and employment factors. The question 'What will we do?' attempts to outline possible changes to workforce, consumption patterns, health and wellbeing norms, values, technology and resulting economies that may stem from current population trajectories and major drivers of change, nationally and within the region.

Using 50 years as the approximate timeframe, and envisioning an innovative, healthy, well balanced, well educated, tolerant, productive, responsible, and happy future Australian population, we considered five major themes:

- culture
- health
- education
- population
- natural resources.

Five crosscutting values and tools are also discussed as important drivers of choices made within these five major themes.

RECOMMENDATIONS

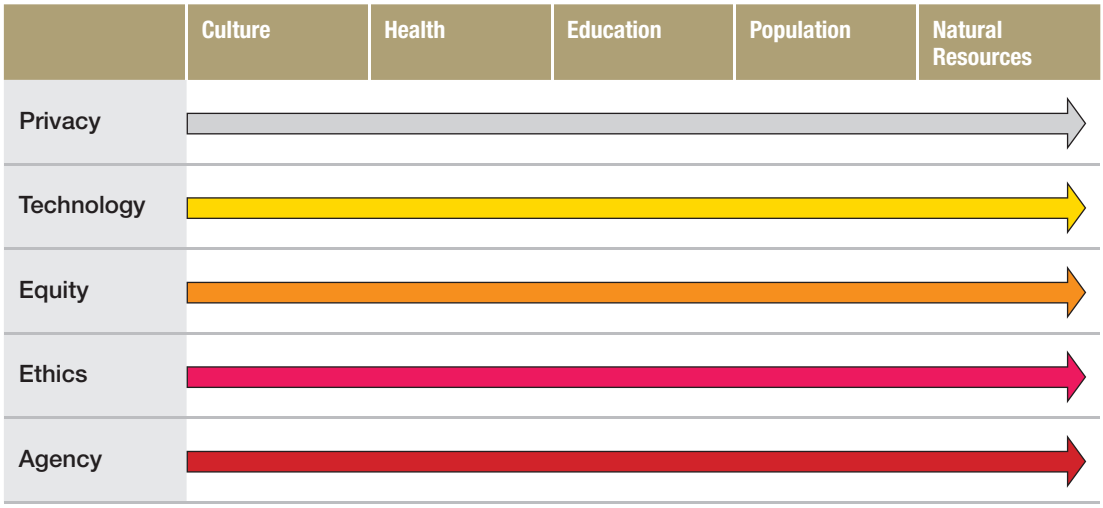
1. Culture

Multiculturalism is Australia's norm. With generations of migrants and of people born to migrant parents, multiculturalism has been our past. It is our present — 44% of Australians are born overseas, or have an overseas-born parent (Australian Bureau of Statistics 2009). And it is also our future. Over the next 50 years issues of culture in Australia will be shaped by the current multicultural population and by ongoing streams of immigration.

An important finding of the Challenging Racism research project (2011) is that Australians are in large part secure with cultural difference. However, around 85% of respondents in that study's survey believed that racism is a problem in Australia. Australia is a place of tensions between a 'Multicultural and Diverse Australia' push on the one hand, and a 'One Australia' imperative on the other.

Appropriate responses to the unique and varied Australian cultural context need to be developed. We need an informed national conversation about cultural diversity, which would recognise our connections to our region and the world.

Figure 1: Influences on 'What will we do?'



In the prospect of a multicultural nation, the following initiatives are proposed:

- Revisit migration legislation and policies to consider strategic economic, regional, moral and ethical issues and responsibilities (include potential climate change displacement) to support true equity and diversity within the Australian population.
- Evaluate the equity policies for workplace relations, higher education and service delivery based on recognition of cultural and linguistic diversity, socio-economic status, disabilities, gender and sexuality issues.
- Expand education programs centred on the value of cultural and religious diversity and diverse family structures, genders and sexualities with appropriate modules for primary and secondary level curriculums.
- Expand multicultural arts education and practical courses (music, dance, visual and digital arts) at all levels with appropriate curriculums and infrastructure supported by local, state and national competitions, festivals, fairs and grants (see UNESCO's *Convention for the Safeguarding of Intangible Cultural Heritage* and *Convention on the Protection and Promotion of the Diversity of Cultural Expressions*).

- Increase migration intake, improve processing and facilitate rapid settling in and movement into productive work (better start-up help).
- Recognise overseas qualifications in a more comprehensive and timely manner and identify potential additional training required to attain Australian equivalence.

2. Health and wellbeing

Physical and mental health and wellbeing are critical to supporting an innovative, productive and happy future population. Longer lifespans and periods of employment will require policy adjustments in terms of retirement age, lifelong learning and training, consumption patterns and habits, and both physical and mental healthcare resources and infrastructure (see the European Commission's project on Cross-National Health Care Policy and Leadership, involving collaboration between EU Countries, the US, Canada, Australia, Japan and New Zealand). The following tensions and challenges were identified:

- health services availability constrained
- obesity and unhealthy lifestyles on the rise
- underdevelopment and lack of recreational space in urban environments
- lack of outdoor education in schools
- dense housing, larger homes, smaller backyards
- privacy concerns surrounding genomic data
- ethics of personalised medicine.

The following initiatives are recommended:

- Diversify funding model to include more disease prevention.
- Ensure greater control of personal medical information.
- Improve lifestyle choices by increased tax on lower nutritional valued foods and small subsidy on healthier food choices.
- Introduce daily sports, and nutritional and physical education at all levels with appropriate curriculums and infrastructure at local, state and national levels.
- Establish a national 'Healthy Living Week' with education programs, food fests, etc.

3. Natural resources

Australia is exceptionally lucky to have a large wealth of natural resources at its disposal. However this wealth is based on non-renewable resources which in the next 100 years will be depleted, removing a significant source of revenue and employment. Australia's unique position is also complemented by solid governance structures and political stability. However, countries whose natural resources are extracted without counterbalancing their exploitation with appropriate regulation and taxation provisions can be vulnerable to rapid and unwanted economic transformations. The most vivid example of a positive transformation is Norway and its sovereign wealth fund and ability to be resilient to economic volatility and uncertainty. An example on the negative side is the Netherlands whose natural gas resources led to economic turmoil and inflation. Australia's implementation of a resource super profits tax (Freebairn and Quiggin 2010) is the first step in dealing with such natural resource wealth.

The following tensions remain:

- Regulation surrounding the liabilities and responsibilities of mining companies is not applied uniformly.
- Rural and regional communities suffer from underdevelopment.
- Infrastructure is being paid for out of mining royalties rather than by mining companies.

The following recommendations can help addressing these issues.

- Establish a sovereign wealth fund to capture long-term security for the proceeds of Australia's non-renewable resources.
- Exert greater control over reasonable deductions from mining royalty liabilities.
- Fund rural and regional development directly by mining companies to ensure areas surrounding mines are not left behind.

GROUP D: HOW SHALL WE LIVE IN OUR HABITAT?

INTRODUCTION

> *'A river is like a mirror: it reflects the care given by people whose lives depend upon it... How people take care of social relationships and how they take care of ecological relationships are the same question.'* (Muir et al. 2010)

'How shall we live in our habitat?' Our habitat is what sustains us, our health and wellbeing, and our social and economic stability. The questions of how and where we shall *not* live in our habitat are also critical. Living in our habitat is considered in terms of habitat function and health, acknowledging that ecosystem carrying capacity and human carrying capacity are not the same (Graymore et al. 2010). Because of the importance and complexities of interacting social and ecological systems, many disciplines need to work together in the complex decision-making about how many people there will be, and how and where they can live (Reid et al. 2010). Science has an important role to play in this most complex and challenging policy question of our time (Walker 2010; Royal Society 2012).

A lot is known about our habitat and we need to improve management of national and global habitats (Morton et al. 2009; Rockström et al. 2009; Reid et al. 2010). These improvements need to be rooted in better knowledge of drivers of change, stressors to ecological systems (our habitat), the inevitabilities of the future, the uncertainties, and what our responses might be. Biodiversity is declining, fresh water is a scarce resource, climate change will create more extreme habitats, and marine and aquatic systems pose specific challenges (Halpern et al. 2011). Our growing population and increasing consumption patterns are also well documented (Hugo 2010; Sobel et al. 2010; Royal Society 2012). The world population will likely increase by another 3.5 billion by 2075 before stabilising, and Australia's ecological footprint is 6.8, slightly below the US high of 8.0 (Global Footprint Network, 2010) — in other words, we are living as if we had the equivalent of 6.8 planets of resources and ecosystems to sustain us. Existing problems of biodiversity decline, congestion, and competition for access to services (i.e. health, education, amenities or habitat) will be amplified in the future. Even the potential marginal increase in wealth gained from doubling Australia's population will not compensate for a very crowded, deteriorating living environment.

Australia also has substantial opportunities. For example, desert/remote Australia has abundant natural energy resources from solar, geothermal, biomass fuels and other renewable sources (Pittock 2011). However, opportunity has a cost. As identified by Turner (2008) and Meadows et al. (1972), technological and population stabilisation scenarios have been overly optimistic.

RECOMMENDATIONS

1. Maintain ecological integrity

We can identify three types of Australian habitat: pristine areas with little or no human impact; semi-natural or modified areas including rural and agricultural land; and urban or industrial areas with biodiversity adapted to high levels of human impact (Beeton & Lynch 2012). We need guiding principles for management of these habitat types, including recommended thresholds of acceptable levels of development (impact and configuration).

We also urgently need conservation values to be treated equitably with development. This requires increased communication about ecosystem values, the diversity and importance of ecosystem services upon which we depend, and sustainable management practices. It also requires increased social knowledge of consumer choices and consequent impacts on biodiversity values. We need stronger incentives to reward those who maintain ecological integrity and adopt a stewardship perspective, which may include development of a conservation values market. Fundamentally, we need to reassess the extent, proportions and configurations of the habitat types that we wish to sustain into the future, and to improve the currently poor knowledge of coastal and marine resources, values and management requirements.

2. Ensure effective and sensitive planning regulation

Australian 'green space' contains significant biodiversity values, particularly in comparison with many northern hemisphere regions, while rural lands maintain significant agricultural productivity values. Environmental planning should promote design for ecological integrity, recognising different values as well as hierarchies of human impact. Conservation values are inadequately protected and we need to identify further areas that are able to sustain biodiversity or other non-use values. This includes marine and near-coastal environments, where more no-take zones are necessary. The ocean is one of our main food sources and is also an important tourist attraction, creating livelihood opportunities and connectivity between people and nature.

It is especially important to adopt more strategic planning to improve our capacity to deal with cumulative impacts, which are currently inadequately addressed within the Environmental Impact Assessment process and under the *Environmental Protection and Biodiversity Conservation Act* (see also http://theconversation.edu.au/squaring-up-to-difficult-truths-population-and-the-environment-5909). In terms of environmental governance, struggles between knowledge and power are inevitable but could be lessened with proactive development of more resilient governance structures and increased evaluation of management systems and programs for social and environmental needs (Beeton & Lynch 2012).

3. Increase urban liveability

Urban areas must become more sustainable. Uptake of renewable energies should be fast-tracked and supported by progressive policies and innovative tax mechanisms to accelerate the transition. Transport systems must be made more effective. Policy instruments and associated tax levers can be introduced to impede multi-vehicle households, particularly in areas with accessible public transport. Increased use of public transport depends on increased infrastructure investment, with a possible return to government-owned public transport systems.

Increased adoption of telework arrangements would also reduce transport pressure.

The possible side-effect of reduced social interaction and thus social capital could be addressed through provision of home office type facilities with space rented on a short-term basis at a nominal fee. Safer, faster bike lanes would lessen transport pressure and air pollution and improve health by encouraging increased exercise. Society should also progress towards zero waste, water sensitive and other resource sensitive design and construction practices as the norm, since improvements in urban design including insulation and ecological design principles can lead to significant reductions in resource consumption over the longer term (Daniell et al. 2005). Increasing urban food production and maintaining fertile peri-urban agricultural and conservation lands should also be priorities for future urban planning.

4. Set outward-looking population policies

Australia has a moral responsibility (as a regional colonial power) to support our Asia-Pacific neighbours. A prosperous Australia surrounded by islands of poverty would increase regional instability and exacerbate refugee movements across the region.

The number of people who will be displaced by environmental degradation in the near future is hard to predict but the rise in climate change refugees will inevitably create pressure on Australia to take in many more immigrants over the next 40 years, mostly from neighbouring countries. Australia needs to formulate its response to climate change refugees as a domestic issue and is well positioned to sponsor such a debate internationally, even more so as it will sit at the non-permanent UN Security Council in 2013–2014.

Australia's overseas development aid is also one of the lowest amongst developed countries (less than 0.4% of GDP). Increasing development aid and support to neighbouring countries and exploration of non economy-based immigration policies may also assist in finding suitable local solutions or immigration pathways.

5. Reduce consumption

Australia's large ecological footprint indicates that the population debate is not just one of size, but also a resource use and equity problem. Population is a major concern if we all expect to maintain or attain current developed world lifestyles. Conspicuous consumption has increased, and so has waste production with Australians throwing out an estimated $7.8 billion worth of food every year which equates to 4 million tonnes of food (Foodwise). This is equivalent to 178 kilograms per person every year. We urgently need strong incentives for reducing resource consumption and waste production.

6. Improve scientific-community communication

We need improved communication to increase awareness and knowledge on our habitat and its future. The media can facilitate communication between scientists and the public, and between economists and the public to relay information about the impacts of social choices. Environmental education should also be increased at schools, with mandatory courses covering climate science, ecology, environmental science and engineering, food production and environmental impact studies to ensure a scientifically literate and environmentally conscious population. Scientists should be better equipped to engage in communicating science and contextualising the impacts of contentious issues (i.e. population, urbanisation, climate change). Scientists would be most effective by taking a stronger role in communicating in a local context: with personal contacts and those we meet in passing.

7. Introduce new ways of thinking

To promote people's curiosity to explore new ways of living and to challenge dominant assumptions, we need more effective, sustainability-aware policy. One of the strengths of this Think Tank was to bring disciplines together. This type of dialogue is needed to solve some of the challenging environmental problems, including in academic forums and multidisciplinary research opportunities. New interactions bring new ideas, so novel interactions should be encouraged, particularly with typically isolated groups (e.g. regional and remote people) and those who will implement ideas. The importance of Indigenous ecological knowledge (Yunupingu & Muller 2009; Lynch et al. 2010; Muir et al. 2010) is being increasingly recognised, and there is also an emerging field of citizen science (Ledford 2010; Mayer et al. 2012; Newman et al. 2012). Fostering these will draw out innovative solutions.

8. Create a national conversation

A national conversation is entirely consistent with the above recommendations on involving people in their communities, in their futures, and about their options. This is a process of small 'g' governance in an initiative led by universities and researchers but not controlled by them. The community voices across rural and urban Australia need to be heard. A national conversation could be hosted by expert scientists on the issues relating to population, conducted in local community contexts to provide an opportunity for everyday people to consider the consequences of decisions and determine the path forward. Scientists could advise on scenarios, required actions and their implications, with communities deciding which scenarios they would prefer to pursue.

CONCLUSION – THE ROLE FOR SCIENCE IN OUR LIVEABLE FUTURE

As scientists contributing to living in our future habitat, we can assist by:

- providing information and tools to support evidence-based policy and decision-making
- increasing engagement with communities by working on issues important in rural and remote areas, and increasing our presence in these areas
- exploring scenarios to advise on implications (and anticipating non-intuitive outcomes)
- continuing to learn from communities about how they organise and function in response to environmental and other shocks
- acting as change agents to enable a national conversation to answer 'How do you want to live in your habitat?'

SUGGESTED ACTIONS FOR DISCUSSION

While the contexts and areas of expertise within each group were different, all groups discussed options and actions that might contribute to an awareness of population pressures and the agreed values. The Think Tank groups identified the following ideas that would contribute to innovative ways to work and live, and could be considered in a national conversation.

PRODUCTIVITY

- Address gender inequity in both paid work and family care through improved access to support, more flexible practices and better work/life balance for men and women.
- Create better transition pathways to retirement and revaluate the role of the ageing population in both paid work and family care.
- Evaluate equity policies and ensure participation across many cross-cultural diversity factors such as culture, linguistic background, socio-economic status, disability, gender and sexuality.
- Increase migration intake and facilitate movement into productive work, including more timely recognition of overseas experience and qualifications.

VALUING DIVERSITY IN EDUCATION

- Increase equity of access to education at all levels.
- Emphasise learning of languages other than English, especially bilingual education in Aboriginal communities and second/foreign language learning throughout schooling.
- Ensure that education programs include content on the value of cultural diversity.
- Expand multicultural arts education and practical courses, especially through strengthening of TAFE (Technical and Further Education) and bigger contributions by employers to an appropriately skilled workforce.

HEALTH AND WELLBEING

- Use advances in IT, remote biomedical monitoring and eHealth to adjust funding towards prevention, perhaps through producing a Health and Wellness rebate.
- Reassess our priorities for end-of-life care, so that 'prolonging death' is not given priority over saving lives or prevention, by maximising quality-adjusted life year.
- Encourage better education programs including physical and nutritional education in schools and communities.
- Recognise and overcome the special difficulties of Australia's indigenous population.

URBAN AND ENVIRONMENTAL PLANNING

- Leverage high-density urban environments for transport, environment and health benefits.
- Think about housing transition for an ageing population, especially the social and economic advantages of people staying in their own homes whenever possible, rather than moving into institutional care, i.e. strengthening domiciliary care and distributed services rather than building more relegation centres.
- Maintain ecological integrity in planning, encourage conservation in development, and preserve biodiversity in green and marine spaces, especially recognising the need for connected wildlife refuges and parks, and the increasing difficulty of regeneration after disasters (bushfires, floods, etc.) because of human encroachment.
- Strengthen the rail network, both locally in the cities and long distance.

RESOURCES

- Ensure long-term security of non-renewable resources and proceeds from them by, for example, strengthening Future Fund into a sovereign wealth fund for the whole population.
- Make mining royalties more uniform across states, and control reasonable deductions.
- Speed up the uptake of renewable energies, noting the widespread popularity of home photovoltaic systems and the fact that South Australia, the host state for the Think Tank, is already obtaining over 20% of its electricity from wind generation.

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BACKGROUND TO THE THINK TANK

PURPOSE OF THINK TANKS

The purpose of the Theo Murphy High Flyers Think Tank series is to bring together early and mid-career researchers from a broad range of relevant disciplines to engage in thinking about novel applications of existing science (including social science) and technology to issues of national significance, and to identify gaps in knowledge that should be addressed. These events are a unique opportunity for career development and networking among the nation's next generation of research leaders and their institutions.

Think Tanks are one of the premier events of the Academy's calendar. The 2012 Think Tank is the eleventh that the Academy has held since 2002.

PREVIOUS THINK TANKS

Previous Think Tanks have resulted in reports to government that have been timely, well received and instrumental in influencing policy development. Past Think Tank topics (available at www.science.org.au/events/thinktank/) have been:

2002 Australia's national research priorities

2003 Safeguarding the nation

2004 Emerging diseases: ready and waiting?

2005 Biotechnology and the future of Australian agriculture

2006 Innovative technical solutions for water management in Australia

2007 Extreme natural hazards in Australia

2008 Preventative health: science and technology in the prevention and early detection of disease

2009 Agricultural productivity and climate change

2010 Searching the deep earth: the future of Australian resource discovery and utilisation

2011 Stressed ecosystems: better decisions for Australia's future

Group work in Group C during the Think Tank

THE PROCESS

The Think Tank involved about seven hours of group work, which was conducted as follows:

1. A discussion on the major crises and barriers we need to anticipate in terms of supporting a healthy, equitable and sustainable way of life for our future population;
2. A brainstorming session generating a variety of future scenarios where we were encouraged by the Chairs to 'push the boundaries';
3. An analysis and culling of the scenarios, working through best and worst case scenarios, generating five themes focused on practical and implementable measures and recommendations for supporting a healthy, productive, equitable and sustainable future population;
4. A presentation by the group rapporteurs.

SUPPLEMENTARY MATERIAL

Supplementary material, including the event program, is available at www.science.org.au/events/thinktank/thinktank2012/

THINK TANK 2012 PARTICIPANTS

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Chair

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Rapporteurs

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Think Tank 2012 participants and steering committee in Adelaide

THE ROYAL SOCIETY

The 2012 Think Tank is supported by the Royal Society — the national academy of science of the UK and the Commonwealth — through the Theo Murphy (Australia) Fund.