Melbourne 2032:

Looking back over the last 25 years

[Edited extract from an internal report of the Victorian Department of Eco-Innovation and Sustainable Living (DEISL), January 2032: "Melbourne: the dynamics of change and the impacts of various policy approaches; learning from the revolution of the last 25 years?" by C. Ryan, Senior Policy Analyst.]

1. Introduction.

Sometimes we need to be reminded just how profoundly different Melbourne is in 2032, in its structure, in its economic base and in the nature of daily life, from the City that it was at the turn of the century.

Many of the significant changes to Melbourne over the last 25 years can be understood in retrospect as the outcomes of certain critical events as well as the changing nature of community concerns, over the intervening period. These events and concerns shaped the way that social, political and technological developments unfolded during and after the decades 2000-2020.

The years 2007-2015 are frequently identified as an era of significant structural change in the economy of Victoria (along with much of the rest of Australia) and historians rightly point to this period as a flowering of 'innovation for sustainability' across all sectors of society.

Five years after the turn of the century, even before the change of government in 2007, public awareness of the implications of various environmental issues, most notably climate change and water supply/consumption, was shifting rapidly. No amount of political obfuscation was able to quell a growing sense of the degree of change to past patterns of resource use necessary for a sustainable existence. A 'business as usual' trajectory for future development was demonstrably not an option. The future could not, in any meaningful sense, be assumed to be a continuation of the past. Government priorities and policy (at local, state and federal levels) were framed against dramatic long term targets for reductions in per-capita consumption (particularly for water and carbon-based energy)[1].

Much has been written about the impact of carbon pricing and the various trading systems trialled in different regions and markets during this period. Clearly these did have a significant long-term affect, progressively and decisively restructuring much of the economic and physical systems of the city. But

1 Key targets for future resource use were set by the then Victorian government in 2006 and are discussed later within this document.

governments quickly discovered that increasing the price of carbon and water was not enough to deliver necessary change. Other policy mechanisms were necessary to limit and shape consumption patterns.

Hindsight shows that there were other more significant, more diffuse, dynamics at work that influenced change. Following a well understood pattern in technological and social development, it is clear that the shape of Melbourne over these past 25 years was affected by a 'disruptive paradigm' that was to fundamentally change ideas about the organisation of systems of production and consumption, and the infrastructure needed to support sustainable economic activity.

Many terms have been used to describe that paradigm change – 'multi-local', 'networked local', 'networked decentralisation', 'glocal' – but the term *distributed* has been the most consistently used: distributed energy, distributed water systems, distributed development, distributed production, distributed economies[2]. The potential for this paradigm change was sufficiently evident in 2006 that a number of future scenario exercises, which were conducted at that time, sketched out visions of Australian identity and economic development that projected aspects of that shift[3] .

Before elaborating on the nature of the new disruptive paradigm it is worth briefly reviewing a number of other factors that were influencing the direction of Melbourne's development.

2. *Security – adaptation and resilience*

The pattern of distributed living that is now evident in 2032 appears to have emerged from a dynamic response to growing concern over the implications and impacts of global warming and more broadly consumption and waste. Connected to those concerns one dominant issue shaped political and social issues: security.

General geopolitical security issues were very important right through the first 25 years of the century. However concern about deliberate attacks on key elements of daily life was greatly compounded by concerns about disruption caused by natural events, particularly from severe weather activity, new global diseases, sea level rise and so on. Modelling the impacts of global warming is complex and although the predictions increased in confidence through the early decades of work, for a long time the only real sense of certainty was that the incidence of extreme climactic events would increase. Every such incident, anywhere in the world, increased the general sense of insecurity. In Australia it is easy to see a pattern of events through the last 25 years that contributed to growing insecurity about the robustness of turn of the century infrastructure and past systems of production and consumption.

The persistent and devastating drought in the first decade of the century increased the community's sense of vulnerability as past investment in water-hungry systems proved to be a barrier to adapting to changed conditions. This problem was evident in so many critical areas of life, from agriculture and food, to parks and home gardens, building systems, bathrooms, kitchens, laundry and sewage. Big engineering solutions such as desalination plants introduced new dependencies and vulnerabilities when supplies were disrupted through technical and other failures[4]. Large systems created large vulnerabilities.

The increasingly serious disruption of essential services from fires and then from the severe storms of 'the cyclone years' (2009 -2011), derailed economic recovery from the end of the 2002-2008 drought.

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[2] In 2003, a European partnership of regional development programs created a collaborative laboratory for sustainable development, based on networked local production and consumption, taking the term 'distributed economies' from a research program in a Swedish research Institute. [See: www.DELabs.org]

[3] *See "innovative Oz" ; "Glocal" and "Urban Colonies" – Attachment M2032:1A.*

[4] Early desalination plants, quickly built to alleviate the social vulnerability of city communities facing catastrophically low water supply relative to demand, increased the energy costs of water supply, adding to energy and greenhouse problems. This created new vulnerabilities and community concern led government to guarantee that only renewable energy would be used (to ensure that the new water was 'green'). However community criticism still focused on the energy cost of desalination, arguing that the large wind farm build for the desalination plant slowed down the expansion of all other wind (and other renewable energy) capacity to meet the State's commitment to a renewable energy target for Victoria.

Disruptions to electricity, fuel, agriculture and food supplies, and even fresh water systems, magnified the direct economic losses from the fires and storms.

The debate over nuclear power in Australia (proposed as a viable solution for carbon free-energy in the early part of the century) moved quickly from the usual range of issues to do with the form of power generation (radiation, waste, nuclear weapons proliferation) to issues of vulnerability and security. These arose more directly from the scale of nuclear power plants[5]. A system dependent on a relatively small number of relatively large generation units seemed to heighten the concern about deliberate or accidental (climate related) interruption to supply.

A general sense of distrust of existing systems of production and consumption was also evident in relation to food[6]. Looking back to the turn of the century it is easy to see this latent concern expressed in the rapid growth of farmers markets (particularly in the city) and in the increasing importance of organic and seasonal and 'slow' foods. A mixture of health issues (obesity and diabetes), environmental issues (embodied water, 'food-miles') and ethical concerns (treatment of 'factory-farmed' animals) brought food and agriculture to the centre of controversy about the sustainability of modern life. The demand for land for bio-mass and alternative fuels in the years 2008 -2015, brought many of these concerns into focus as the need to define agricultural priorities became a major policy concern[7].

The surprising shift of food production 'back' into the bounds of urban Melbourne during the decade 2008-2018 has been examined in other reports[8]. This new 'urban agriculture' and the stabilisation of peri-urban food production (which had previously had been relentlessly displaced as demand for residential expansion destroyed the economics of urban fringe farming) was partly a result of a community (and later government) response to security issues. It was also strongly influenced by the rising cost of water and energy – see below.

3. Local action – security and innovation

Evidence that community concern was being focused on localised action was there in the early century. What was not well understood for many years was how the balance between local, regional and national action would play out.

At the beginning of the Century over 210 local governments across Australia had signed up to a 'Cities for Climate Protection' program pursuing voluntary targets for CO2 reduction. By 2008 local government (LG) was also an important focus for new programs in water saving, with a general sense of experimentation and innovation in water systems at a local community and house-hold level, being critical in the reductions in water consumption achieved through the decade 2007- 2017.

The celebrated period of innovation in sustainable buildings in Australia (2005 -2015) seems to have been led by local government following the completion of the early 'icon building' of Council House 2 (CH2) in Melbourne, which opened in 2006. The competitive dynamic of the private sector saw innovative green buildings become a critical 'reputation-symbol', with high profile developers and companies setting higher and higher performance targets for their future developments as evidence of their commitment to action on environmental issues[9]. For some time these private sector developments appear to have followed innovation paths first tested (and proven) at local government level in public buildings. The UK "Woking

[5] Of course the other issues of breach of containment and radiation effects were always a part of the total set of concerns

[6] Where the distrust was probably focused on the intermediaries in the food industry – processors, wholesalers, supermarkets, etc.

[7] The series of diseases that devastated many agricultural crops (apparently the result of global warming) also had a significant economic impact on the country and, although none of them directly affected the quality or safety of food, there were significant dietary impacts on for low socio-economic groups

[8] For a review of this process see the "Urban Food Regeneration Report" – Attachment M2032 2 A.

[9] This was a classic societal 'tipping point' phenomenon - a phrase much used at that time to describe undesirable feedback, or 'runaway' effects in the weather system which so concerned the IPCC.

borough model"[10] inspired many similar projects on distributed renewable energy at local government level in Victoria, initially by the 'greener' inner-city Melbourne city councils, but followed quickly by some of the important regional towns in the Bendigo corridor.

A critical shift in the period of this review was undoubtedly the recognition that both innovation for sustainability and the generation of diverse localised solutions were important for future economic development. Research and new policy approaches in the UK and the Netherlands, (which became influential in international thinking in the period 2005-15) focused on the role of local communities, local governments and cities. These were viewed as important sources of new 'innovation in socio-technical systems' relevant to sustainable development. This perspective was reinforced by initiatives such as the appointment of a 'City Innovator' in Rotterdam in 2005 who quickly focused on 'innovation for sustainability'. City (eco) Innovator positions quickly appeared in major cities around the world, with Melbourne being one of the early adopters. Diverse experimentation with new sustainable systems at the local level (in terms of energy, water, waste, food, transport, housing) was actively supported by Victorian State governments, (and later, following the radical redefinition of 'federal-state relations' in the second decade of the century, by Federal governments as well).

4. Personal action – the economists' 'irrational consumer'

In the serious drought period from the turn of the century governments were often caught off-guard by the strength of community concern about water supplies and the willingness of citizens to adopt new water saving systems[11]. It was soon apparent that there was a level of household expenditure for becoming 'water smart' (installing rainwater tanks, grey water systems etc) which could not be explained simply as a response to subsidies introduced by government, or by calculations of 'payback', in $ savings, from reduced water consumption[12]. The willingness of people to act – and to be seen as acting[13] – was not driven solely by economic self-interest but by a desire to 'do something' as a personal contribution to a perceived, collective, problem.

In the UK, over the period 2006-2008, there was much discussion of the expected contribution of micro-generation of electricity (variously projected as 30-50% of total by 2050), from solar PV, wind and combined heat and power (CHP) systems, originating from a variety of investments at different scales (including community/local government developments such as Woking, mentioned above). An unexpected growth in these sources derived from the installation of roof-top wind and solar PV systems at individual household level (even though these systems were small and generally inefficient). This was unexpected in that pay-back periods were usually very long (in the case of PV, conservatively in excess of 20 years[14]). However the cost of such systems was not far in excess of discretionary household spending (being in the case of wind turbines about the same as an advanced HD television system) and the motivation for purchase was often found to be a combination of being 'a good environmental citizen' (personal satisfaction) and displaying the fact – being visibly a good environmental citizen. Such expenditure was quickly labelled the 'environmental iPod effect'.

5. Load Limiting – a way of sharing

In 2010, as governments tried to stimulate investment in resource efficiency (in water and energy, for example) and limit peak-loads in demand (for example from air-conditioning), several electricity retailers introduced schemes to encourage consumers (residential and commercial) to limit their instantaneous demand. Initially residential customers were offered a tariff reduction if they opted for a maximum electricity

[10] Woking was one of the first towns in the UK to declare a goal of carbon neutrality and to set about installing diverse renewable energy systems with the council quickly meeting a high percentage of its total consumption in this way.
[11] This was often at some real personal cost as there were many media stories of back pain induced by carrying buckets of waste-water from showers and washing to the garden to keep plants alive.
[12] The sharp and regular rises in the cost of water in the first decade of the century did of course change the payback calculations.
[13] Made visible by the installation of tanks and the by the use of household signs declaring that recycled water was being used.
[14] Particularly in urban areas where wind and sunlight were highly likely to be adversely affected by neighbouring buildings.

demand of 2.5 KW, beyond which supply would be disconnected (requiring customers to hit a 'reset button), or, for those with smart metres, certain appliances would automatically shut down. This proved a popular scheme, particularly when the Italian community pointed out that Italy had operated its electricity system like this for the last 50 years with no apparently detrimental economic effects. Community attitudes changed quickly so that load limiting is now (almost) universal. Australians, like Italians of old, have simply learned how to balance the demand of their appliances. Tariff reduction has given way to a tariff surcharge for anyone needing to have unlimited supply.

Load limiting systems for water are not as universal today as for electricity, but where they exist they stem from a similar motivation to limiting energy use. These too have a counterpart in Italy and some other industrialised economies. The severe water restrictions of the early decades of the century led to real changes in community attitudes to water as a precious resource. Even after the worst of the drought was over many people were found to be in favour of maintaining some levels of restrictions on use which they saw as both fair and equitable. Now, many communities have household or neighbourhood storage system filled under pressure from the 'mains' for a number of hours each week (with local pumps to distribute water to taps, etc). At the rest of the time the system pressure is greatly reduced, although water supply at low pressure is always available for essential needs. Such systems provide a fixed allocation of water which citizens see as fair. Monitoring levels of water availability (tank levels) has had a significant effect on moderating consumption. Reducing pressure levels in water mains has both reduced overall energy consumption and significantly reduced piping losses.

6. The disruptive paradigm of distributed systems

Globally, as the urgent need to shift to carbon-free energy became apparent (to maintain CO2 levels below the initial target of 450 ppm[15]), community support focused on energy efficiency programs, the diffusion of cost-effective renewable energy and increasing public R&D spending on advances in solar PV systems.

Growth in renewable energy has primarily involved grid connected systems, using the grid as load sharing to even out the variability of wind and sun by connecting local generation distributed across the country. Production of electricity involved a mix of wind, solar, biomass, CHP, micro-hydro, geothermal and wave/sea power, sited according to availability of sources and needs. Quickly, the old paradigm, of highly concentrated ('centralised') power generation supplying dispersed users, was replaced with a distributed system of localised, small to medium scale generation, supplying local needs through a grid-connection system. The grid provided for any local shortfall in electricity demand and/or for distribution of any excess to other parts of the system. By 2010-2015 this distributed system was also supporting new businesses in a variety of grid-connected energy storage systems, sited according to opportunity[16]. Energy storage systems have also proved to be a great stimulant for Australian eco-innovation exports over the last 15 years.(see below).

Perhaps this alone would not have generated a sense of paradigm shift were it not for the fact that essentially the same pattern of change started to appear in relation to water supply and distribution at the turn of the century. Here too the old paradigm of large scale rainwater collection systems (catchments and dams) distributing water to distant users, was quickly replaced by 'water sensitive design' systems. These were based on retaining rain water where it fell for local use, with variation in availability evened out through the 'grid connected' supply from local catchments. Freshwater supply was complimented by treatment of waste water at various local scales. In this new infrastructure pattern, the old engineering classification of water into separate 'classes' with separate engineering systems[17]gave way to a more complex eco-

[15] Increased in 2012 (as part of the 'post Kyoto' negotiations) to 550ppm when it became clear that 450 ppm would be reached within a few years.
[16] The big growth in energy related business over this period was in intelligent management systems; the *production* of electricity (and the storage of excess capacity) was decentralised to a large network of smaller units, whilst the monitoring, control and maintenance systems remained regionalised with intelligent trading between regions.
[17] These used to be: *fresh* (potable) water from 'nature' (rivers and dams) – with reticulation systems; *storm* water (rain running off urban structures) – with drainage systems; *waste* water (potable water contaminated by human and industrial use) – with sewerage systems.

systems approach where appropriate supply (quality and quantity) is matched to appropriate use, with the least movement of water.

This new 'distributed system' paradigm was clearly distinguished from older ideas of 'decentralisation' by the emphasis on its connectivity to a 'network' which was required for the sharing of excess. This distributed-systems approach had already shown itself to be robust and secure as the basis for the development of the internet over the 1990's, with networked production and distribution of information underpinning the strong period of economic growth through the early part of the century. In fact, information and communications technology ICT – and the internet as a system – has proven itself to be the enabling technology of the sustainability industrial revolution. This is discussed in more detail below.

Many new services and business grew around this new pattern of production and consumption as it became the model for development. Systems of food production and distribution, along with transport and urban design, were shaped by the changes that started with energy and water (and ICT/the internet). The result is the society and economy that we know as Melbourne today[18].

7. Sustainable technology, information technology and 'recombinant innovation'

In the early years of the century the reality of global warming created much talk of new 'industrial revolutions' and 'break-through', or 'leap-frog' innovation. Broadly, in government policy and industry investment, this meant a focus on the development of new 'low-carbon' technologies. Public interest and confidence revolved around the belief that the innovation system would lead to the discovery of many new super efficient technologies with low greenhouse gas production – LED lighting systems, fuel cells, CO2 sequestration systems, bio-technologies, nano-technologies, and so on.

In retrospect it is clear that the real force of the 'low-carbon' revolution has been located elsewhere: not so much in disruptive technologies but disruptive systems – in the (re)organisation of systems of production and consumption. This reorganisation has involved the development of new products and services and businesses, new infrastructure, new lifestyles and new consumption behaviours. Contrary to early expectations, much of this has relied on exploiting what were existing technologies rather than new ones; innovation has resulted from finding new applications for existing technologies, or the creative recombination of existing technologies to provide new ways to do old things, as well as new ways to do new things.

As we know, for a small economy such as Australia this aspect of the sustainability revolution has proven to be been a great boon. We have limited resources to develop important new technologies (though we have contributed above our 'weight' in this area). The application of existing technologies to new ends requires creativity, ingenuity and vision but can be achieved with much lower capital investment. This has greatly contributed to our ability to develop products, services, production and management systems that are exported and utilised world-wide.

The question of how it was that the 'innovation story' of this country in the last 25 years came to focus on 'innovation for sustainability' has been the subject of many scholarly studies and these are discussed in a later section of this review. There is broad agreement that we were essentially forced by circumstances into research and development to address a local crisis, one that grew to become our sustainable-water-systems industry. The development of Australian fire sensing and control systems probably has a similar origin. However all the other areas of Australia's global position in sustainable systems are harder to explain[19]. It is the case that CSIRO was at one time (in the last century) a global leader in solar thermal research and development. However, that work languished for such a long time that it is hard to relate our

[18] The echoes of 'Innovative Oz', 'Glocal' and 'Urban Colonies' envisioned in 2006 are clear. (See Attachment M2032 1C)

[19] Throughout these Australian Innovation stories there is a clever brand message that links our systems innovation to our global image of survival in a harsh and unforgiving environment and our clean-green tourist icons. This does seem to have helped our global marketing of local technologies, services and systems, but it is debatable whether this in any sense acted as a stimulant or driver for what developed.

current global position in solar thermal desalination and heat storage systems (which we share with Israel) to that earlier knowledge base. The same questions apply to the trajectory for our food processing and packaging systems and the range of energy-cladding systems for high-rise buildings, because again there is a broken link with earlier CSIRO and university work[20]. Of course it is our energy storage systems for which we are best known globally, because they have transformed the viability of distributed renewable energy[21].

What is clear, running though most of our successful 'sustainable systems' industry, is that we quickly developed and exploited information technology. Australian businesses have built on local research into sensors, communications systems, data processing and management, to create new sustainable service industries and 'system solutions'. The success of distributed production systems world-wide has derived from just such hardware and software solutions and, although this is now such a competitive market, Australia's leading position remains essentially unchanged[22]. We have also been successful in developing important internet systems which facilitate localised solutions[23].

8. Innovation in government policy approaches.

Of course government(s) were not merely re-active in response to all of the above issues and dynamics. Not long after the turn of the century Australian governments (at all levels) were faced with a significant dilemma. They could see that all modelling of changes to systems of production and consumption (to deliver the reductions in greenhouse gas they had committed to), would require revolutionary restructuring of systems of production and consumption, including technology, business, infrastructure and life-styles. Continuous, incremental, improvements in the eco-efficiency of the existing economy would not get 'there'. Models pointed to the need for rapid *systemic* change in social, behavioural and technical systems. This presented a truly challenging task for government: to find processes to stimulate and manage restructuring, to change the trajectory of development, to 'unleash' a paradigm shift, without loosing political support.

Governments all over the world were already working on improving the connections between environment policy, industry policy and innovation policy. However, in practice, much of the resulting action was confined to existing sectors of the economy and to technology development, it did not 'unleash' significant structural change.

Recognition that more rapid structural change was required generated some innovative experiments in the formulation of strategy and policy. Ideas were adapted from other spheres. The UK government, for example, turned to the use of prize money to stimulate eco-innovation. Entrepreneurs had already explored the use of large prizes to transform technical innovation (e.g. in space technology) and governments explored this same stimulus for engaging the community in ideas for reducing CO2. In Sweden a strategic environmental research foundation mounted a new program of substantial (four-year) funding to individual researchers or research groups for novel and radical ideas for the environment. There was a range of new 'redesign the future' approaches, in Europe with the Sustainable Everyday Project (SED) and DOTT (Design Of The Times) in the UK. In Australia, the Victorian State government invested in an new approach to change by creating the Victorian Eco-Innovation Lab (VEIL). This project had the explicit task of

[20] At the end of the first decade of this century it was widely assumed we had lost our position of international leadership in efficient solar PV development.

[21] Again, the innovation story of the vanadium redox battery is generally cast as a response to the need to find solutions for storage on remote islands, which ignores much of the real history. See: www.vbr.unsw.edu.au

[22] As later sections of the review argue, it is interesting to classify Victoria's important sustainable-systems exports according to the underlying ICT contribution, e.g.: feedback systems – sensors, data communications, interface design and so on.

changing public expectations about the shape of a sustainable future by focusing the skills of designers on future possibilities and visions.

In 2009, eager to stimulate significant innovation, the Victorian government decided to build on the success of some innovative commercial buildings that set new standards for energy and water consumption. Individual buildings (such as the Melbourne City's Council House - CH2, which opened in 2006) were a powerful demonstration of the power of the 'icon effect' in driving socio-technical change; the design, construction and then the living presence of an innovative development stood as the physical embodiment of new possibilities against which future developments then became measured. The government interest was in expanding the scope of an icon development to encompass all the systems, infrastructure, culture and 'spirit' of a complex urban community, one with high quality of life and desirable conditions but with a revolutionary break from past patterns of consumption.

An impending development site close to the Centre of Melbourne (originally know as 'EGate') was set aside as a visionary new test-bed of social and technical innovation in a living and working, a 'future city within the city', a focus for:

> *the best of Victorian design and innovation, in residential and commercial building, in services and infrastructure, in the delivery and utilisation of water, energy, food and transport suited to a zero-carbon future.*

As a centre-piece of this new development the federal and state governments established *The Australian Centre for Urban Resilience* which, in part, took the surrounding living neighbourhood as its laboratory, expanding its role as a research institute to one of community engagement and support, encouraging local experimentation and evaluation and acting as an information hub to disseminate results.

M2032: Appendix 1A: Medium term policy directions (2006-2015)

This period was one of escalating focus on environmental issues in the economy, driven by community concern and media attention. It produced a flurry of new policy thinking and action, almost equally divided between policies to deliver structural change in the economy and those to facilitate and support action by individuals and local communities. Action on global warming divided between GHG reduction – mitigation – and adaptation to climate change. A sample of research projects initiated by government gives some flavour of the times. Research contracts were let to investigate:

- (2007) The creation of a Victorian/national research centre for adaptation to climate change.
- (2008) Labelling schemes for embedded water, in a range of goods, including food.
- (2008) The most effective planning controls to enforce optimum collection, storage and use of rainwater in new developments.
- (2008) The most effective planning controls to enforce safe and efficient treatment and reuse of grey-water in new developments.
- (2008) Best-practice processes for the evaluation of trajectories of new and emerging technologies and innovation for their contribution to environmental sustainability; and the most effective way of creating a standing capacity in Victoria to advise government and industry on new technologies for eco-innovation.
- (2008) Ways to best to ensure that all new government investment in science, technology and innovation supports R&D and new business ventures that led to a 'significant de-coupling' of resource use from economic growth and/or provide innovative solutions for adaptation to climate change.
- (2009) The scale, potential impact and policy implications of a variety of 'voluntary' social movements motivated by a desire to change patterns of consumption (e.g. farmers markets; organics; seasonal foods; slow food; community composting; carbon-neutral households and communities; shared housing; culture jamming; skip-dipping; sufficiency pledges).
- (2009) How to develop effective policies and subsidies to ensure that new export growth derives from businesses selling sustainable solutions (in areas defined above).
- (2009) Effective ways to subsidise the capital costs of installation of small grid-connected solar and wind systems on residential and commercial buildings and to minimise planning barriers to such installations, whilst ensuring public safety.
- (20010) Mechanisms to support innovation in sewage systems for cities to dramatically lower water consumption.
- (2010) How to formulate policies and implement systems to ensure that electricity generated from any small-scale (under 25kw) renewable sources, (including CHP) can be sold into the electricity market at 'marginal-retail' rates (retail market rate plus margin for avoided cost of new fossil fuel generation)
- (2011) Mechanisms to identify and disseminate commercially viable innovations that arise from a range of voluntary local programs for energy saving and sustainability action (e.g. Cities for Climate Protection or Sustainability Street).
- (2011) The most appropriate forms of communication and most appropriate mechanisms for delivering data (feedback systems) on resource consumption at different scales (products, buildings, communities, towns and cities) in order to stimulate behaviour change. (Government smart-meter pilot project in electricity was extended to smart metering of water consumption, in 2007.)

M2032: Appendix 1B : 2006: Examples of future policy targets (various government sources)

In 2006, leading into an election, the Victorian government had set in place the following targets:

Greenhouse:

- Cut GHG emissions by 60% by 2050 compared to 2000 levels
- Adopt a target of a 10% reduction in household emissions by 2016
- Cut the Government's energy use by a further 5 per cent by 2010 on top of the current 15 per cent improvement - total 20% below 2000 levels by 2010)

Water:

- Reduce Melbourne's water usage by 15 per cent on a per capita basis by 2010
- Set a target for industry in Melbourne and regional cities to reduce water use by 10% over the next ten years
- Increase water recycling in Melbourne to 20% by 2010

Renewable energy:

- Increase the share of Victoria's electricity consumption from renewable energy sources from the current 4 per cent to 10 per cent by the year 2016
- 20% renewable and low-carbon emissions energy by 2020
- 5 per cent Biofuels target (about 400 million litres of either ethanol or biodiesel) in Victoria by 2010
- Increase the Government's use of Green Power to 25% by 2010

Waste:

- A 1.5 million tonne reduction in the projected quantity of solid waste generated, by 2014; 75% by weight of solid waste recovered for reuse, recylcing and or energy generation;. 80% for construction and demolition waste; 80% for commercial and industrial waste; 65% for Municipal waste (interim targets at 65%, 65% and 45% by 2008-09)
- Be well advance along the pathway of becoming a low waste society by 2014

Exports:

- $30 billion in exports and to double the number of Victorian exporters by 2010
- Food and fibre export target of $12 billion by 2010

M2032: Appendix 1 C: Examples of future visions from 2006

Concern and uncertainty about the future in 2006 led to some intensive activity to envisage desirable futures in Australia and (for similar reasons) in the UK. The following three summaries of such work appear in retrospect to be particularly relevant to the way the future for Australia was to unfold. They are summarised and slightly modified for this document.

The first two are reproduced from a two day process run by the Melbourne University Business School in September 2006. They represent two aspects of preferred Visions of Australian Identity from this process. They were presented to the Australian Davos Forum in 2006:

Innovative Oz:
"A resurgence of Australia as a creative knowledge producer, a design and innovation export economy. The self-image of the boxing kangaroo, having the capacity to meet any adversity. Adversity brings out the best in Australians – they network, they invent, they innovate, they create a new future, to overcome adversity. Global connection, early technology adoption and social experimentation were all attributes of this future. Gender equity, embracing the ways of knowing of other cultures are all attributes that help Australia stay innovative. Culture enhances science and technology, creating a unique country and people. Identity is both tough – the nerves of steel as exhibited by female and male sports heroes – and soft, open to others, desiring to learn from all so as to be best one can be".

Glocal:
"An alternative future, that of the "enlightened Australian" living in a more secure Global – Local world. National identity is softer, commitment to sustainability, the environment and (bio)regional locale stronger. The nation-state and states themselves are less important than multi-local networks as a confederalism of national interests. Identity is Gaian, linked to the planet as whole and one's own locale. The "cultural creatives" demographic group is the driver for this future. Sustainability, spiritual values, global-local governance are key values in this future. Indigenous culture and spirituality are not external to identity but embraced at deep levels. Innovation emerges not just from science and technology but from ethics and integrity, from a diversity of decentralised models of production and consumption".

The third came from the UK department of Trade and Industry from a foresight process in 2006. This vision was developed to plan for technological innovation:

Urban Colonies
"Investment in technology primarily focuses on minimising environmental impacts. Good environmental practice is at the heart of economic and social policies; sustainable buildings, distributed power generation and new urban planning policies have created compact, sustainable cities. Transport is permitted only if green and clean – car use is still energy expensive and is restricted. Public transport – electric and low-energy – is efficient and widely used. Competitive cities have the IT infrastructure needed to link high-value knowledge businesses with IT, supporting transport systems and networked virtual communities. Rural areas have become more decentralised, effectively acting as food and bio-fuel sources for cities. Consumption of energy, water, materials has fallen. New environmentally driven service systems have increased systems of leasing, renting, sharing of goods and the service sector is now an even stronger part of the economy. Efficient resource use is now a fundamental part of the tax system and disposable items are less popular. Improved urban design, organised to minimise the need for travel, is a response to environmental concerns and climate change, but also driven by the desire for everyday social contact and the need for consumers to be closer to systems of production. Cleaner technologies and low-carbon-emission energy create an environmental benefit, but the overall economic focus is more local and

regional/city-based than global, with low-to-medium economic growth. Societal benefits accrue from a society integrated more at the local level. People in this scenario are environmentally aware and more careful in their use of resources, attracted to diversity of solutions and the resilience and security that comes from networked decentralisation".