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The Royal Institution of Chartered Surveyors (RICS) is pleased to make a submission to the Independent Pricing and Regulatory Tribunal (IPART) of New South Wales on the Review of NSW climate change mitigation measures.

RICS has provided broad comment below based on the expertise of RICS chartered property professionals in New South Wales and research and experience undertaken by RICS globally.

RICS agrees with the overall premise of IPART that, in the main:

- the threshold for justifying additional mitigation measures should be high.
- the review should assume the CPRS will be generally capable of reducing emissions in the long term; and
- should there be design flaws in the CPRS that compromise its ability to reduce emissions efficiently, these would be better addressed by adjusting the scheme rather than introducing additional measures.

However, this should not preclude the NSW Government from considering complementary initiatives to ensure that targets are met.

RICS in addressing the proposed Emissions Trading Scheme (ETS) within the Carbon Pollution Reduction Scheme Green and White Paper supports the establishment of such a scheme. In reaching this view, the RICS has consulted with kindred national bodies, in particular the Australian Property Institute (API), and expert members of the RICS to fully understand the implications of such a scheme in the property sector.

RICS agrees that the establishment of an ETS that provides a marketable commodity in carbon property rights (i.e. the six greenhouse gases) will assist in reducing pollution levels. As proposed, the RICS believes that the ETS provides a robust framework that,
in tandem with the built environment and white certificates, will provide the necessary structures to promote and facilitate the reduction of pollution levels in Australia.

RICS, like the API, believes that there are areas within the climate change mitigation proposals where clarification and a national approach are needed. We highlight these concerns below, particularly in the context of items 4, 5, 6 and 7 of the IPART “Other Industries – Issues Paper” (December 2008).

The establishment of carbon permits as Financial Products, and the associated allocation of Financial Services Licenses (FSL), raises concerns for RICS practitioners. RICS members, like their counterparts in the API, are bound by rigorous codes of professional and ethical conduct that guide the provision of independent property advice. The RICS is of the firm belief that valuers and other members should not be required to hold an FSL and that the government should ensure that valuers are exempted from this.

RICS is also concerned that natural carbon sinks established prior to 1990 may be eliminated to make way for newer ones that under Kyoto receive rewards. The RICS encourages the limitation of landowner property rights under such circumstances, where the actions are motivated by economic gain at the expense of the environment.

RICS has always been a firm believer in national standards and as part of that the RICS agrees with the API that a national carbon register is paramount to ensure the viability of the ETS.

Recent research initiated by the RICS, conducted by Professor Henning Bjornlund of the University of South Australia, highlights complications that arise when attempting to unbundle property rights. Professor Bjornlunds report addressing the unbundling water from land is appended. This research supports the need for a transparent national register of adequately defined carbon property rights.

As the ETS will exist on a national level RICS believes that a national approach to this led by the Federal Government is vital to the ETS.

RICS members practice within a breadth of disciplines that engage all areas of property, from the built environment to spatial sciences, minerals and waste management to geomatics, rural management to construction management. Our membership also has a keen interest in the reduction of carbon emissions through the range of platforms including biosequestration and geosequestration.

RICS supports initiatives such as the Otway project in Victoria, identifying the CO2CRC research is vital for our understanding of how geosequestration can become a vital level in the overall reduction of CO2 and other greenhouse gases within our atmosphere.

Similar to the question of un-bundling water from land in relation to property rights, RICS would be interested in how carbon capture and storage through geosequestration will affect the property rights of landholders, be they large commercial enterprises such as power stations or smaller land holders such as primary producers. The RICS would encourage additional research investigating how, under the ETS, any move to full-scale geosequestration, with the creation of related licences, would affect the valuation of
related property rights in the affected assets. The particular spatial expertise of RICS members will complement such research.

The RICS has taken research leadership in the analysis of total carbon dioxide emissions from all Melbourne CBD office property. This research quantified total building related emissions and modeled three different scenarios for reductions over 5 yearly timeframes to 2020, thereby demonstrating the type of measures required to achieve specified levels of reduced emissions (Wilkinson and Reed, 2006. Wilkinson and Reed 2007). This research was given continued support and has been extended to incorporate all land uses in the Melbourne CBD, thereby illustrating the contribution of all land uses to the total CBD building related emissions (Reed and Wilkinson, 2009). The research is particularly useful to Facility Managers, Property Managers, Portfolio and Fund Managers, as well as Building Surveyors and Valuation Surveyors to enable more informed professional advice to clients. In addition this research is particularly useful to policy makers as it clearly demonstrates which land uses contribute most to carbon emissions in a CBD and whilst based in Melbourne, it is relevant to other major Australian and international cities.

RICS supports complementary measures and initiatives encouraging green refurbishments and improvements in the energy efficiency of existing building stock. As a member of ASBEC, RICS endorses The Second Plank – Building a Low Carbon Economy with Energy Efficient Buildings in broad terms and commends its recommendations for the government's consideration with the exception of the views expressed on the green depreciation of buildings.

As an alternative to Green depreciation, RICS encourages the debate for tax incentives as a tool for improving the green profile of buildings. Tax incentives as a means for improving the green profile of buildings can be found in many jurisdictions. For example, in Oregon USA there are tax credits available for LEED platinum rated developments that can be used by the building owner or passed on to a project partner. This is particularly useful where a non-taxpaying building owner would otherwise not be able to take advantage of the incentives.

Conclusion

The advent of an Emissions Trading Scheme is seen by the RICS as a cornerstone to the advancement of reducing greenhouse gas emissions in the atmosphere. We recommend that the policy is not limited to biosequestration, but that rights, obligations and restrictions related to geosequestration be fully explored.

Moreover, the RICS supports considered debate on tax incentives and green leases within the built environment, to ensure that prudent stewardship of our urban landscape can also play a crucial part in reducing greenhouse gas emissions.

RICS would be pleased to meet with IPART to provide greater comment.
ATTACHMENTS


Water scarcity and its implications for land management: some lessons from Australia

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Dr. Henning Bjornlund holds two academic research positions. He is an Associate Research Professor at the University of South Australia and he holds a Canada Research Chair in Water and the Economy at the University of Lethbridge in Alberta, Canada. For the last 15 years Henning has been involved in water policy research in the irrigation sector. His research has involved assessing the socio-economic impact of water policies, identifying factors influencing market prices and market activities, evaluating the use and likely success of economic instruments to achieve increased water use efficiency, and identifying the non-economic values that influence irrigators' management response to new policy instruments.
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Introduction

“You could write the story of man’s growth in terms of his epic concerns with water”

Bernard Frank (1929-2006, French journalist and writer)
A global context

While much of the debate on sustainability and climate change has focused on energy-related issues, with much attention being placed on the need for a global reduction in carbon emissions, it's important not to forget that there are likely to be other impacts of climate change that are inevitably going to take place and therefore the need for other changes in our behaviour, over and above simply our use of energy. Another key area is our use of water. This is an issue that is now getting greater attention and we're now coming to realise that the easy access to water that we have enjoyed in many developed countries we can no longer take for granted.

Already, a number of countries around the world have to face up to this, and it may be that we can learn lessons from their experience.

The world has experienced enormous human population growth since the beginning of the 20th century. This growth has increased the basic human demand for water for food production as well as for drinking and sanitation. The same period has also experienced a substantial growth in water use per capita. The increased demand for water has also been driven by an escalating urbanization process. During the second half of the last century the proportion of the world’s population living in cities grew from 29% to 47% (UNESCO, 2006). This process is continuing with most of the future population growth expected to take place within cities. At the same time eating and drinking habits are changing to favour products that require more water input into their production, and the demand for a whole range of consumer goods, many of which involve water-intensive production processes, is also growing. Improved living standards are also increasing the use of water for sanitation and lifestyle purposes such as garden watering, car washes, showering, toilet flushing etc. This development has increased demand for water for industrial and municipal uses. The combined impact of these forces has seen massive increases in water consumption.

To keep up with this demand governments and international institutions have made significant investments in water supply infrastructure in the form of major dams, weirs, canals, pumps etc. This development has now reached a point where most freshwater resources are overexploited. As a result many rivers around the world no longer run all year round, many do not reach their terminal oceans or lakes for long periods each year, and the ecosystems in these rivers are suffering, resulting in poor water quality. Similarly many groundwater aquifers are overexploited with the result that: i) water tables are dropping to levels where it becomes increasingly expensive to reach them; ii) salt water is intruding into many coastal aquifers resulting in salty water supply; and iii) land is subsiding in many areas causing structural damage to buildings and roads. All these factors are combining to cause serious environmental and social problems.
A global shift in policy paradigm – water as an economic good

The 1992 earth summit in Rio de Janeiro represented a milestone in the international perception of water resources (Sitarz, 1993). In the Rio Declaration and Agenda21 the international community clearly expressed the view that the era of substantial increases to water supply has come to an end and that the emphasis in the future would be on managing demand for water, and reallocating water from existing to new users. Historically water has been treated as a social good, which is fundamental to all forms of life and that everyone had a fundamental right to have access to. Governments were actively involved in developing water infrastructure and in many instances gave away access to water for irrigation in pursuit of domestic political goals such as closer settlements, employment creation and resettlement of soldiers after the major wars in the last century. In the Rio Declaration, and in a new World Bank Water Policy (World Bank, 1993), the emphasis moved from treating water as a social good to treating it as an economic good.

Treating water as an economic good fundamentally moves water supply from the public to the private sector with units of water sold at prices set by market forces. To facilitate this process private property rights in water, and the creation of markets in such property rights, were promoted. It was perceived that only with such markets in place could water rights be reallocated from existing users to new competing users at prices set by market forces. Following the same principles, the privatization of both urban and rural water supply was also encouraged. Once the supply systems are run by private organization prices charged to consumers whether for untreated water for agricultural or treated water for domestic and industrial users will be set by market forces. Alongside this development was an acceptance that the environment was a legitimate user of water and that specific water rights should be set aside for environmental purposes and that water management should change from being a centrally controlled system and be devolved to the lowest appropriate level in society.

This is all taking place in the context of global population growth. Even though the rate of growth has slowed down, current predictions of the world population by 2050 still vary between 8 and 12 billions. Regardless of where in this range actual world population will be in 2050, the reality will be that water resources will come under increased pressure. Consumption per capita will also continue to grow with the growth of the middle class in countries like India and China, who are increasingly acquiring traditional ‘western’ tastes in food and lifestyle. For example, a traditional North American diet requires a per day per capita water use of 5,400 litres to produce whereas a vegetarian diet, the traditional diet for most people in India and China, requires only 2,600 litres per day for its production (Renault and Wallender, 2000). The thought of the population in India and China moving towards the same per capita consumption of water as North America is a cause of great concern to many involved in global water management. To this concern about growing water demand can be added the likely impact that climate change will have on the availability and distribution of fresh water resources both spatially, in time and in form (e.g. rain/snow/ice).

The problem is not just one of water quantity but also importantly one of water quality and water distribution. The health implications of an insufficient availability of clean water for drinking and sanitation are substantial. Water-borne diseases are becoming increasingly prevalent and are now among the major causes of illness and death especially among children in developing countries with some 3,800 children dying each day from diseases associated with a lack of access to safe drinking water, inadequate sanitation and poor hygiene (UNESCO, 2006). Similarly, poor water quality as a result of over-extraction, and the impact of current water use practices, is also reducing economic use of water threatening the future sustainability of irrigation in areas such as the Aral Sea region in Russia, India, United States of America, Australia and China.

Water scarcity and its implications for land management: some lessons from Australia
Treating water as an economic good in the way described above is alien to many cultures, especially in developing countries (Appelgren and Klohn, 1999). The privatization of urban water supplies has led in many cases to higher water prices, restricting access by the urban poor to safe and secure water for basic drinking and sanitation. This has led to significant unrest (Hall et al., 2005). In order to obtain World Bank funding for new water infrastructure, Bolivia was required by the World Bank to privatize its water industry. As a direct consequence of the resultant increase in water prices, the city of Cochabamba saw weeks of social unrest and several people were killed and wounded. The outcome was a reversal of the privatization of urban water utilities with a subsequent lawsuit by the British based company that had provided the funding for the privatized water company (Public Citizen, undated). Similarly, in Sri Lanka, there has been civil unrest and opposition to new World Bank sponsored water policies that have led to water becoming treated as an economic good with water rights, water markets and the privatization of water authorities (Guntilake and Gopalakrishnan, 2002). In contrast to this, in 2000 the United Nations General Assembly Millennium Meeting established eight Millennium Development Goals to speed up poverty alleviation and socio-economic development. Many of the goals had to do with securing adequate safe water for drinking and sanitation purposes to reduce the spread of water-borne diseases and alleviating poverty (UNESCO, 2006).

While there is clear social dissatisfaction with the concept of treating water as an economic good, it is evident that radical policy changes need to be introduced to balance the ever-increasing demand for water for social, economic and environmental purposes. There is no doubt that more water is needed to supply safe and secure drinking water and to provide adequate sanitation in the world’s rapidly expanding cities. Given that 80% of the world’s water resources are currently committed to irrigation, it is inevitable that a substantial increase in urban use, within an environment of limited supply, will result in reduced access to water in rural areas. This raises important issues of equity between water exporting and importing regions. Within areas that make extensive use of irrigation the current level of economic activity is linked to the current level of water supply. Taking water out of irrigation will inevitably reduce economic activity as dry land farming is far less productive than irrigated land. For the individual farmers such a reduction will result in decreasing land values and farm income and for the communities it will result in fewer jobs and less support for local businesses and services. This may, in turn, result in increased urbanization as the people depending on these jobs seek new sources of income. The expectations of policy makers are that providing property rights in water and markets in such water rights will enable this rural to urban transfer to take place while still providing some compensation to the selling farmers. The second anticipated impact is that property rights and markets will allow the water remaining in irrigation to move to the most productive farmers producing more units of more valuable crops per drop of water. Such reallocation among irrigators will help reduce the impact on local economic activity of rural to urban transfers.

However, the introduction of property rights in water and the introduction of markets in such rights are very complex and costly. For example property rights need to be defined, identified and registered, supply needs to be metered and monitored, and transfers of water rights need to be evaluated and approved. In very few places is water use for irrigation metered and monitored, and in most places access to water is linked to the ownership of particular parcels of land. The introduction of water markets is therefore associated with significant costs and requires high levels of social capital. Water management based on water rights and active markets in these rights have therefore only emerged in relatively few countries.

One of these countries is Australia. The introduction of these policy changes presents significant challenges and opportunities for a wide range of property professionals. The remainder of this fact sheet will outline how these policy changes were introduced and have evolved in Australia over more than 20 years.
The Australian context

“Anyone who can solve the problems of water will be worthy of two Nobel prizes – one for peace and one for science”

John F. Kennedy
While issues over water quality and water scarcity began to emerge during the 1970s and 1980s, it was not until 1994, when the Council of Australian Governments (CoAG) launched a new water policy framework (CoAG, 1994) that policy reforms gained national attention associated with a sense of urgency. The new policy framework introduced many of the elements embedded in Agenda 21:

1. **Pricing:** consumers should be charged according to their consumption, and prices set on a full cost recovery basis including environmental costs, which is intended to provide a real rate of return on the written down replacement costs of the assets.

2. **Water entitlements:** Water entitlements should be separated from the property right in land and associated with clear specifications of ownership, transferability, reliability and, where appropriate, quality.

3. **Trading in water entitlements:** Water trade should be encouraged to ensure that water is used to maximize its contribution to national income and welfare within social, physical and ecological constraints of catchments.

4. **Institutional reforms:** Integrated Catchment Management should be the concept underlying natural resource management. Water authorities should be devolved into three separate entities concerned with the functions of water resource management, standard setting and regulatory enforcement, and service provision, with clear and non-conflicting objectives including improved and more transparent accountability. Irrigators should be given greater influence over the management of irrigation areas by transferring the operational responsibilities to local bodies.

5. **Consultation and public education:** The community should be involved in natural resource management issues and education programs should be implemented to improve the ability of the community to participate in the decision-making processes.

6. **The environment:** Specific entitlements should be given to the environment, acknowledging it as a legitimate user of water.

In 2003, nine years after the 1994 Communiqué CoAG took the next step in pushing the reform agenda further. The 2003 Communiqué (CoAG, 2003) announced the launch of a new National Water Initiative (NWI). It was acknowledged that good progress was being made in the reform process but that three main issues needed to be addressed to speed up the process:

(i) uncertainty over the long-term access to water was still hampering investments in higher valued and more efficient production systems;

(ii) current water market arrangements were preventing markets from reaching their full potential; and

(iii) there were still serious concerns over the pace of securing adequate environmental flows and adaptive management systems to ensure the health of riverine ecosystems.

In 2004 CoAG approved the Intergovernmental Agreement on a National Water Initiative (CoAG, 2004). The initiative included the objectives of providing: (i) nationally compatible water access entitlements defined as a perpetual share of the consumptive pool of a resource; (ii) a statutory-based water planning process defining the consumptive pool of a resource; (iii) statutory provisions for environmental and other public benefit outcomes, and improved environmental management practices; (iv) clarity about the assignment of risk arising from future changes in the availability of water for the consumptive pool; (v) nationally functioning water markets including the progressive removal of barriers to trade in water; (vi) a return of all currently over-allocated or overused systems to environmentally sustainable levels of extraction; and (vii) urban water reforms.
Two different water markets have emerged in Australia. Firstly, the market for water entitlements; in this market the long-term right to receive water allocations each season is traded. Secondly, the market for water allocations; in this market the seasonal right to use water is traded. Drawing a parallel to the property market, the entitlement markets is the market in which real estate is bought and sold, while the allocation market is the one in which real estate is leased or rented.

Markets for water entitlements and allocations were first introduced in South Australia in 1983. The need for this was brought about by early scarcity, created by a moratorium on new licenses and a reduction in existing unused or underused licenses in the 1970s. When demand started to increase in the early 1980s, as a result of the emergence of new high value water users such as horticulture, the pressure was on to create alternative means to provide water for these ventures. Trading in allocations was introduced in New South Wales the same year and in Victoria allocation trading was piloted in 1987. Markets for entitlements were introduced by legislation in both these states in 1989. Informal water trading took place earlier than this by permitting transfers between entitlements in same ownership, through the purchase and amalgamation of irrigated land, and by water authorities allowing water bailiffs to redirect water between neighbours during periods of severe scarcity (Turral et al., 2005). Following the policy development discussed in the preceding section water markets were made compulsory within all states as part of the new water policy reform.

Wherever water markets have been introduced, the market for water allocations has developed much more quickly than the market for water entitlements. This is because of widespread community concern over the social impacts of trading in water entitlements as such transfers permanently move the right to use water from one location to another (Bjornlund, 2004a). When water use is moved, so is the economic activity generated by irrigation, which is much higher than for dry land farming. The potential impact of such trading is twofold:

1. The impact on the irrigators who are not selling their water:
   - If the water is sold by farmers supplied by a communal supply system to farmers outside this system then the cost of system maintenance goes up for the remaining irrigators as such cost is largely fixed.
   - If a substantial volume of all the water supplied by that channel is sold then the authority might decide that it is unviable to keep the channel open resulting in channel closure. As part of the recent Victorian state reforms the Government has for the fist time acknowledged that this was the case and that some channels would be closed (DSE, 2004). The Government promised irrigators to compensate them for the loss in land value caused by such channel closure. Irrigators would retain their water entitlements, which they can then either sell permanently in the entitlement market or sell annually in the allocation market. However, dry land which can be supplied by irrigation water has a higher value than dry land of the same quality which does not have the capacity to be supplied with irrigation water. It is this value difference that the Government of Victoria has promised to compensate the irrigators for.
2. The impact on the wider community. If a substantial proportion of water is sold out of a local area then:

- the level of economic activity will go down; as irrigated land is converted to dry-land farming or left idle agricultural production will be reduced resulting in a decline in economic activity;
- the population will decline; some existing irrigators will leave the area and as the level of economic activity goes down the number of on-farm and off-farm jobs will be reduced resulting in people moving elsewhere;
- the provision of businesses and services will be reduced; as the population decreases and the level of economic activity goes down, it will be less viable for local businesses and service providers to remain; and,
- council revenue will go down; as the population reduces, and as land values go down as a result of the conversion from irrigated to dry land, the council’s revenue base will decline. The combination of the decline in council revenue and in population will reduce the provision of public services such as schools and school programs, road maintenance, library services etc.

As a result of the above impacts, allocation trading has generally been introduced first in order to allow irrigators and their communities to get familiar with trading. Also restrictions were traditionally placed on trading. In all states in Australia limits were placed on trading out of established irrigation districts in order to alleviate the concerns over the above two types of impacts. Limits were mainly in the form of a cap on the percentage of a district’s total volume of entitlements that can be traded to areas outside the district. Under the National Water Initiative these limits have to be increased or removed in the near future.

A consequence of the above concerns is that allocation markets have generally been far more readily accepted and adopted by irrigators and their communities, as the right to use water is not permanently moved. There is also evidence that irrigators selling their water entitlements are considered by their neighbours as traitors who are letting their community down (Fenton, 2006)

The following discussions of the development of water market activities and prices are based on analyses of trading activities in the Goulburn-Murray Irrigation District (GMID) in Northern Victoria. It is Australia’s largest irrigation district and has developed some of the most active water markets in the world.
Implementing the separation of land and water rights

In response to the policy development at the national level, Australian States have introduced new water legislation to implement the proposed changes. The most recent changes in the state of Victoria introduce an unbundling of property rights in water and a separation of these rights from the land to which it has previously been attached (DSE, 2004). As of 1 July 2007 the following property rights in water were introduced:

1. **A water share**, which gives the owner a perpetual right to a defined share of the resource available for consumptive use at any given time. This volume is determined as part of the ongoing water planning process outlined above and can change each time the water plans are reviewed (on a five year cycle) due to factors such as climate change and improved scientific knowledge about the need of the environment.

2. **A water allocation**, each season the authority managing the resource defines the availability of water for the current season depending on water availability in the storages. Based on this each owner of a water share will receive an allocation in the form of a volume of water that can actually be extracted from the resources and used for consumptive uses. This volume of water is credited to the owner’s water account, much like the dividend from a normal share in a company will be credited to the shareholder’s bank account, which in turn can be spend. Owners of a water allocation do not automatically have the right to use the water, as in order to do that they must have a water use licence. However, they always have the right to sell the allocation. Any person can buy and hold water allocations but only if they have a water use licence do they have the right to use it.

3. **A water use licence**, which gives the holder the right to use water on a specified parcel of land. To obtain such a license the water user must prove that the water will be used following best management practices so that there is no negative impact on river or groundwater quality and that no other externalities will be suffered by third parties due to the use of the water. The use licence will always be linked to the particular parcel of land and cannot be traded. The introduction of this licence is important for the efficient trading in water shares and water allocations. Before this separation was introduced all transfers of water shares had to be evaluated for the impact of the buyer’s proposed use of the water which slowed down trades and creates uncertainty.

4. **A delivery share**, which gives the owner a guaranteed share of the capacity of the channel or creek supplying water to their fields but also imposes a liability on the holder to contribute to the maintenance of that supply system in proportion to the size of their capacity share. This right is tied to a specified channel or creek and is not traded with the water share. The delivery share can be traded within the bounds of that channel or creek. This right is important for trade as it guarantees the owner access to delivery capacity regardless of how much water other users may buy; conversely it guarantees irrigators on that channel that all users will continue to pay their share of channel maintenance regardless of how many water shares are traded away from the channel. It also allows some water users to sell their water share and replace it with annual purchases of water allocations. Such users will continue to control their right to get such purchased allocations delivered.
**Other developments**

Three other developments have had a significant influence on the development of water markets in Victoria:

In 1996 The Murray-Darling Basin Commission (MDBC) placed a cap on water extraction for consumptive use (MDBMC, 1996). According to this cap, no states can divert more water from the Basin in any given year than it would have done given the same climatic conditions at the 1993/94 level of development. Victoria's main tool to stay within the cap was to reduce the seasonal allocations, and this has been a contributing factor in the lowering of allocations since 1997 (table 2).

In 1998 the Northern Victoria Water Exchange (now called WaterMove) was introduced providing fast, cheap and secure trading in allocations (Bjornlund, 2003a). This water exchange was introduced in response to increased market activity, which was placing increased pressure on the authority to process applications, and increased demand from irrigators for faster and cheaper approval processes.

The same year Goulburn-Murray Water (GMW, the authority managing the GMID) changed its allocation policy. Historically GMW announced allocations at the beginning of the season based on what was available in the reservoirs and on expected inflows based on historical records. This, in effect, provided certainty of supply for irrigators before planting and thereby committing to a certain level of water use. From 1998, GMW only incorporated minimum expectations to inflows during the season when announcing opening allocations. This has resulted in much lower opening allocations (table 2), thereby transferring the risk of supply uncertainty from GMW to the irrigators.
An overview on the impact of markets on overall water allocations: the Goulburn Murray Irrigation District (GMID) an example

During the 2005/06 season the GMID had a total volume of water entitlements of 1,793,637 ML (mega litres, 1 ML = 1,000m³). From the date of the first trade of water entitlement to outside the district in 1996/97 until 30 June 2007, some 168,429 ML has been exported out of the area. This represents a reduction of 8.8% in the total volume of water entitlements. The GMID consists of a number of irrigation districts with very different soil and production characteristics. Export of water out of individual districts, either to other districts within the GMID or to outside the GMID, has therefore varied significantly across districts. The two districts experiencing the biggest proportional export of water have seen a drop in their total volume of water entitlements of some 11.5%. During the first 15 year of entitlement trading from 1992 to 2007, 369,160 ML, representing 19.4% of all water entitlements, have changed hands. Even though entitlement markets have been taken up rather slowly, there is by the end of the first 16 years some indication that it is starting to have an impact on the distribution of water entitlements with annual volumes traded increasing from less than half a percent of the entitlement base during the first five years to more than two and a half percent per year during the last four years (Table 1).

Markets for water allocations were introduced in 1989 and, as for the market for water entitlements, activities were initially low. During the first five seasons only one to one and a half percent of the entitlement base was traded in the allocation market each season. Since then trading has accelerated significantly first to the 10% level from 1994 to 2001 and then accelerating to about 19% of the entitlement base by 2006. These figures suggest that allocation markets have had quite a significant impact on the way that water has been allocated on an annual basis (Table 1).

Table 1: Allocation and entitlement trading within the GMID

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<tr>
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<td>1764870</td>
<td>309189</td>
<td>17.52</td>
</tr>
</tbody>
</table>

Source: Based on the records of Goulburn-Murray Water

¹ August to May, season can vary from year to year; ² total volume of water entitlement within the GMID; ³ total volume of water traded each season; ⁴ volume traded as a percentage of total entitlement
The impact of allocation markets on total water use

What impact has the allocation market had on who gets access to use water each season? Table 2 shows how big a proportion of total water use was generated by the allocation market since 1995 in the two main supply systems of the GMID: the Murray and the Goulburn Systems. As can be seen from the table, the Murray System has in recent time had a higher allocation level than the Goulburn System. Irrigators in the GMID have a very high level of supply security. Their entitlements are designed to be delivered in full in 96 out of 100 years. In addition, in most years irrigators get access to additional water when the reservoirs contain more water than is needed for the current and next season. In many years allocations are well in excess of 100% of entitlement with an estimated long-term average of 160%. However, this excess has declined considerably over the last 20 years from consistently being 200% or more to consistently being at 100% and in three seasons well below. This has caused scarcity for many irrigators as they have developed their properties to rely on the historically high allocations.

It is apparent from Table 2 that the allocation market has succeeded in reallocating water use among competing users during periods of scarcity. When allocations are at 200%, trading accounts for only 8% or less of water use; this level of trade probably reflects irrigators buying water to benefit from good commodity prices or high demand for their commodities. As scarcity increases, trade accounts for a higher proportion of water use, up to about 22% with 100% allocations and as much as 37% when the allocation dropped to 29% in the Goulburn System (also the total volume traded that season was higher than during any other season). It is clear that trading in the Murray System did not accelerate until allocations in that system declined to close to 100%; something that occurred for the first time in 1997/98 and then consistently for the three seasons from 2002 to 2005. It is apparent from these data that the allocation market has had a significant impact on irrigators’ ability to cope with scarcity, allowing high value producers with capital investments in plantings, herds and equipment to protect their investments and stay in business by paying low value producers not to use their water (Bjornlund 2005, 2004b; 2003a,b, 2002a). At the same time this has assisted lower value producers to manage the drought by providing them with a higher net return from selling the water than they could have got from using it on their traditional crops.

Table 2: Opening and closing allocations 1991 to 2008

<table>
<thead>
<tr>
<th>Year</th>
<th>Goulburn System</th>
<th>Murray System</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Closing allocation</td>
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<tr>
<td>2007/08</td>
<td>47</td>
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</tbody>
</table>

As of 15 January 2008. Source: Based on the records of Goulburn-Murray Water
Increase in market participation

This section analyses how farm businesses in the GMID have adopted water markets and how this adoption rate has been influenced by scarcity (Bjornlund, 2006). Farm businesses have, after an initial hesitancy during the first three years, been quite quick to see the advantages of water trading and have started making significant use of them as a regular instrument to adjust their access to water. As in other countries, and in fisheries markets, the allocation market has been far more widely used than the entitlement market. In the first three years of trading only 8% of farm businesses traded in the allocation market each season. After 12 years this increased to about 75% with 45% selling and 30% buying water allocations during 2002/03. Initially only 1% of farm businesses traded each season in the entitlement market but this had increased to about 4.5% by 2003. By 2003, 60% of farm businesses had tried to sell water allocations, 40% to buy water allocations, 8% to sell water entitlements, and 8% to buy water entitlements.

Figure 1 shows the proportion of farm businesses that participated in any kind of water trading during each season within the three main regions of the GMID, either by buying or selling water in the allocation or entitlement markets. During the first six years, when allocations in both systems were in excess of 200% (except during 1995/96 when it was only 150% in the Goulburn System) the participation rate mainly stayed well below 10%. The exceptions are that the participation rate:

1. first peaked during the seasons of 1994/1995 as trading rules were relaxed and trading was introduced between irrigation district irrigators and private diverters;
2. remained high in the eastern part of the Goulburn System during 1995/96 as the allocation dropped to 150%; and
3. started out at just under and above 10% and then increased to about 30% in the western part of the Goulburn System.

Trading in water was first taken up in the western part because this area has the highest proportion of low-value broad acre cropping, grazing and mixed production with lower value water uses as well as large areas with severe soil degradation. This area therefore had the greatest potential for beneficial trade-offs between irrigators with high and low value crops and productive and unproductive soils.

When allocations again were low within both systems during 1997/98 the level of market participation reached a second peak with about 40% of all farm businesses trading in all three areas. Following that year, allocations remained low in the Goulburn System resulting in steadily increasing market participation. The allocation level in the Murray System returned to 200% and the participation rate declined to 10-20% for the next three seasons until allocation levels dropped again during 2002/03. At that time the participation rate in that system again reached the same level as in the Goulburn System, with 60% of all farm businesses participating in trading during that and the following season. Over the 13 year period market participation has increased from about 5% of farm businesses per year to about 60%.

Analysing the rate at which new farm businesses entered water markets for the first time, the same three spikes are apparent, as illustrated in Figure 1. During the first three years only a few percent of new farm businesses entered the market each season with about eight percent having some market experience after the first three years. During 1994/95 (when restrictions were eased) about 16% of all farm businesses had their market debut. The next significant influx of new market participants took place during 1997/98 (when there were record low allocations in both systems) when another 21% of all farm businesses entered water markets for the first time. The final major influx of new market participants took place during 2002/03 (with record low allocations) with another 43% of all farm businesses entering the market for the first time. At the present time, fewer than 15% of farm businesses have not participated in any kind of market activity. Water trading now seems to be an instrument that farmers use routinely to manage scarcity.

**Figure 1: Percentage of farm businesses trading annually**
(Source: Bjornlund, 2006)
Water market prices

Prices for both entitlements and allocations have been steadily increasing since 1993. Entitlement prices have grown at an average annual rate of 12.3% while allocation prices have increased by an average 20.2% p.a. (Figures 2 and 3). The centred moving average (CMA) for entitlement prices shows three price levels with prices heading towards a new level during 2006-07 (Figure 2). The increase to a new price level is associated with a period of exceptional scarcity. The first increase took place after 1997/98 when the seasonal allocation was low for the first time (Table 2). Historically, seasonal allocations had been around 200% of entitlements, but in 1997/98 it was only 120% and they have not exceeded 100% since. The second increase took place in 2002/03 when the seasonal allocation only reached 57%. The third increase started during the season of 2006/07 when allocations only reached 29% and prices have not yet settled at a new level (Bjornlund and Rossini, 2008).

Allocation prices (Figure 3) fluctuate more than entitlement prices but again the centred moving average indicates the same increases in price levels as discussed for water entitlements, and for the same reasons. While it is logical that the price of allocations increases with scarcity it is less intuitively clear that entitlement prices should do so. When a buyer pays a very high price for one ML of allocation during any given year, the buyer receives that ML in full and can put it to extractive use, which will allow the purchaser to endure a drought season. On the other hand when seasonal allocation levels keep decreasing, it could be expected that the willingness to pay for water entitlements should also decrease. Where entitlement holders prior to 1996 could expect to receive 2 ML of allocation for each ML of entitlement they own, it is far less clear how many ML of allocation they will receive in the future. It could therefore be expected that the price of a commodity with that level of uncertainty and actual decline in yield should decrease (Bjornlund and Rossini, 2008).

An analysis of entitlement prices shows that there is no significant seasonal variability in price (Figure 2) with all seasonal indices being around 1. On the other hand analyses of allocation prices show clear signs of seasonality (Figure 3) with prices in the May-July period being only around 50% of the yearly average while prices in October average nearly 30% above the yearly average (Bjornlund and Rossini, 2008). This provides guidance to sellers of allocations as to when to sell their allocations each season.
Property Implications

“Water and air, the two essential fluids on which all life depends, have become global garbage cans”

Jacques Yves Cousteau
Implications for bankers and financiers

The separation of land and water rights, the unbundling of the bundle of rights associated with water entitlements, and the substantial increase in market participation, market activity and market prices (water values) have raised a multitude of concerns. Some of the social and community concerns were discussed above. However, the list of concerns is much longer and more complex, and is related to the facts that:

- the right to access as well as use and delivery of water constitutes most of the traditional value of irrigated farm land;
- land title registers have developed to safeguard private property rights in land; and,
- well tested market procedures and experienced market intermediaries exist to safeguard buyers, sellers as well as third parties when property rights in land are traded.

Not surprisingly the banking sector expressed alarm when trading was first introduced. If owners of irrigated farms were capable of selling their water entitlements without the bank's consent then the value of their mortgage could be eroded overnight and the bank could be left with very little collateral for the outstanding loan.

The Australian Bankers Association raised this issue very early, when trading in entitlements was first introduced in South Australia (SA). The banks sought the power to veto such transfers, in cases where it would significantly increase the exposure of the bank. This was not acceptable to the SA Government, as it would curtail the absolute discretion of the Minister. Instead a rule was introduced that the authority would conduct a title search of all properties where the owner proposed to sell some or all of the water attached to that land. The authority would then, within 21 days of receiving the application to transfer water, notify the banks with a registered mortgage. Since trade could only take place with effect from 1 January or 1 July, and since the application had to be submitted at least three months prior to such a date, it was considered that the banks would have sufficient time to sort out any issues with the irrigators prior to the transfer being affected (Tuckwell, 1984). This was changed with the Water Resources Act 1997, which requires parties with a right registered on the licence to give their written permission to the transfer. South Australia is introducing a new electronic licensing system, the Water Information and Licensing Management Application (WILMA), which will further improve the recording procedures of prescribed interests.

In Victoria the procedures set out in the Water Act, 1989 require a water right holder (an irrigator within an irrigation district) to advertise the intention to sell for 21 days and the seller has to sign a statutory declaration disclosing all those with an interest in the land, and must obtain their written consent. The ‘authority must not approve any transfer unless it is satisfied that each person whom it knows, or ought to have known, to have an interest has consented’ (DNRE, 2001). The Act does not, however, require the same procedures for the sale of water licenses, but it has been argued that in practice the same procedures are being followed. These systems, however, still rely on interests registered on the land and not on the water entitlement. To provide for more flexible finance systems it will be necessary to be able to register interests in the water entitlement separate from the land title.

As of 1 July 2007 a Victorian Water Register of water shares has been in operation. This register records a number of important pieces of information about the water share: which water source it relates to, how big a share, the zone it can be traded within, delivery system, managing authority, the water plan it is subject to etc. It also records ongoing water allocation availability and trading in such allocations. All prescribed interests can be registered such as mortgages, survivorship, caveats etc.

Following the new Acts in New South Wales and Queensland new water entitlement registers have been established, to be managed by the Registrar of Land Titles, and allowing parties with prescribed interest in a water entitlement to record such interests on the register (Department of Lands, 2007; Natural Resources and Water, 2007). NSW government has declared that, within a ten year period, it intends that this register should provide indefeasible property rights in the same way as the Torrens Title register for land titles. In the context of the National Water initiative, work is currently in progress to develop compatible Water Registers (NWC, 2005).

The key impacts that this has had have been in the areas of registration. Financiers have pointed out that the registers must be able to record priority between interests, have systemic efficiency (that is, dealing in water rights must be registered promptly at the time of lodgment, which is the case for land transactions), and provide the ability for the holders of unregistered interests to lodge caveats protecting their unregistered rights (Boxall, 2000). Entitlement registers is not the only issue of concern for the use of water entitlements as collateral for loans on the cheapest possible terms. Lenders need to be assured that the entitlement in water cannot be defeated, that the entitlement gives the borrower the long-term security of access to the water, that the lender has the ability to take possession of the water entitlement if the borrower defaults, and that the lender has the power to sell the entitlement, either together with the land as a going concern, or as a separate asset (Boxall, 2000).
Council rates

The new water entitlements (water shares) are classed as private property and thus cannot be made part of the land value for rating and taxing purposes. On the other hand the water use right and the supply capacity is still linked to specific parcels of land and should therefore be part of the land value for rating and taxing purposes. The separation of land and water rights could therefore potentially have significant impacts on the distribution of the rate burden. At present irrigated land is valued at a much higher price than is dry land. Irrigation farmers therefore pay much higher council rates than dry land farmers. This is considered by most people to be equitable, since farm incomes are much higher for irrigated properties. If water is taken out of the valuation process the value of irrigated farms will be reduced sharply. To maintain revenue councils will have to increase the percentage charged on all properties, which will shift the rate burden to dry land farmers and towns. The Queensland approach to avoid this is to get councils to use their ability to apply differential rates. In South Australia land that has the capacity to be irrigated is rated at a different rate to land which does not have the capacity to be irrigated resulting in higher land values, and a higher rate burden, on farms which have the capacity to be irrigated.

In Victoria there is evidence that some irrigators have been selling their entitlements in order to reduce their property value. This has the effect of reducing their council rates, and also to avoid the payment of some of the water rates payable to GMW (DNRE, 2001). The new pricing policy adopted by GMW of charging part of the rates for the supply capacity to cover the maintenance of the channel system and another charge per ML of water delivered to cover variable costs will curtail this strategy.

Taxation issues

The present tax system favours the use of allocation markets rather than entitlements markets (Bjornlund 2002b). The transfer of an allocation is treated as an annual operating cost or revenue, that is, the cost can be deducted from tax in the year of purchase, and the revenue can be offset against cost during that year or losses from past years. The transfer of a water entitlement is not deductible in the year of purchase, and it cannot be depreciated, while the revenue of such sale might be subject to capital gains tax. However, in many instances capital gains tax will not be an issue in the first instance, since most irrigators have owned their entitlements from before the introduction of capital gains tax in 1985 (DNRE, 2001). The fact that those farmers who sell generally have very low or negative farm incomes (Bjornlund, 2002a) has significantly increased the benefit for sellers of using the allocation market, since they pay low or no income tax on such income (Bjornlund 2002b).
When a property is sold the purchase price should therefore be split into the different types of property and stamp duty paid accordingly. In the process of dividing the purchase price up into the different types of property the ruling passed in New South Wales stressed that it is not enough to deduct the going market price for water in the water market from the purchase price, and acknowledged that the price paid for water together with land is likely to be different from the price paid for water in the water market. The key point is that, when sold together with land, water is likely to be sold at a discount price and that the value of the land must take into account the accessibility of water and any existing irrigation infrastructure.

The change in the property rights status of the water entitlement can have unintended consequences unless farmers make changes to their wills. The situation could arise where a child taking on the family farm might be left without water; that is, without much of an opportunity to carry on the farm business, as the other children will inherit the water entitlements i.e. most of the value of the estate.

In South Australia the issue of stamp duty was raised when trade was first introduced. The original policy statement specified that a transfer fee had to be paid. This fee was set to reflect the general stamp duty of 1% on transfer of land. Valuers at the time advised that the water entitlement added about Aus$150/ML to $200/ML to the value of dry land. The transfer fee was therefore set at Aus$2/ML. The early transfers soon proved that the market placed a much higher value on water, with the most common price during the first year being Aus$330/ML, but in a range from a minimum of Aus$200/ML to a maximum of Aus$450/ML (Tuckwell, 1984). The National Stamp Duties Act 2000 should have settled this matter, by stating that duty is confined to land, buildings and goods, i.e. physical chattel and not personal chattel (DNRE, 2001). Since all water entitlements are now personal chattel it should be clear that they do not attract stamp duty.

In NSW, the Revenue Ruling DUT 023 (Achterstraat, 2001) sets out the stamp duty rules in that state. This ruling further emphasizes the complexity of the issue. The ruling differentiates between water entitlements in general and water entitlements attached to shares in Irrigation Corporations. The ruling in general states that water entitlements, which can be freely traded separately from land do not attract stamp duty. On the other hand a water entitlement, which cannot be traded separately from land, is considered to add value to the land and improvements and therefore does attract stamp duty. In most instances water entitlements within Irrigation Corporations cannot be traded separately from the share in the company and therefore attract stamp duty at the rate applied to the transfer of shares.

The separation of land and water rights and the classification of water entitlements as personal property have caught some farm families by surprise. The normal practice in Australian farm families when it comes to the inheritance of the family farm is that one of the children inherits the production unit and the responsibility of carrying on the family tradition, while the other children share the rest of the estate.
Challenges for land managers and property professionals

“Water is fundamental for life and health. The human right to water is indispensable for leading a healthy life in human dignity. It is a pre-requisite to the realization of all other human rights”

The United Nations Committee on Economic, Cultural and Social Rights
The increased scarcity of water resources and the associated increase in the competition for water resources between existing and new competing uses on a global scale, as well as the implications of the increased use of water market and the increased value of the property rights in water, all have significant implications for land managers and other property professionals.

- The dealing in water rights is complex and will become increasingly complex as the various rights embedded in the water entitlements are unbundled and several of them are made tradable. This will require new skill sets for brokers and other intermediaries dealing in water products as well as managers of businesses controlling the various property rights in water.

- This unbundling of the property rights in water and their separation from land ownership will enable the creation of more sophisticated derivatives products of these underlying rights. This development will require that managers of land and other properties depending on water develop new skill sets.

- Water use efficiency, and securing access to water rights and use, will become major issues across all sectors of the economy and the community in the future planning and development of urban, industrial and rural properties. This will require property managers, planners, developers and architects to develop new thinking and new skills.

- The unbundling of and the increased value of water rights as well as the separation of land and water will require new methods of valuing property for lending, rating and taxing as well as insurance purposes. This will require a rethinking of the valuation process as well as new skills by property valuers.

- The creation of the unbundled rights in water and of new derivative water products, as well as the emergence and increased use of markets in such products, could represent significant potential for managers of and investors in property trusts. To fully benefit from such opportunities property trust managers and their valuers need to understand these markets.

- Institutions involved in the initial and ongoing education and training of property professionals will have to develop new courses, programs and educational materials which will assist the various professionals to meet these challenges.

- Increased water scarcity will require property managers, planners and architects to implement increasingly stringent building codes to increase the efficiency of water use and manage water restrictions.
To take water out of the valuation of irrigated farmland could, however, be more complicated than it might initially seem. Some of the complexities that might be encountered are as follows:

- Irrigation infrastructure, such as irrigation and drainage systems, farm layout, and permanent plantings and pastures, are dependent on water for their ability to produce an income. If water is taken from water-dependent improvements, these improvements will lose their income producing capacity, and therefore will have little or no value. The question is, should the value of such improvements be added to the value of the water and be taken out of the valuation or stay with the land?

- Within some areas water that actively supports farm improvements, such as those just described, has a much higher value than unused water when traded as part of an irrigated property. What value should then be taken out for valuation purposes?

- Prices paid in the entitlement market are generally lower than the value of water when attached to land and actively used to support plantings and other farm improvements, while such prices are higher than the value of unused water attached to land.

- The link between water-dependent farm infrastructure and water values is not uniform across regions. The strength of this link depends on a number of issues, such as the capital intensity of the production, the time and investment that would be needed to change or improve such infrastructure, the ability of the production to rely on the purchase of annual allocations, and the ability of the land in that particular location to be put to a productive use without the presence of irrigation water.

Valuers

As the separation of land and water rights has been embedded in legislation in the Australian States, water entitlements have clearly become personal property or personal chattel.

However, for a long time valuers continued to include water in the value of irrigated properties. Queensland was among the first states to accept the consequences and to decide to take water out of the value of an irrigated property. The other states were slower to respond to this, but they were aware of the inconsistency. The decision to maintain water as part of the property value was challenged in the court by some Victorian irrigation ratepayers, who were upset by increases in their rates associated with water rights. The Valuer General argued that water rights have been included in valuations for many decades, and that the introduction of water trading has made no difference; in other words, water entitlements are still legally attached to land (DNRE, 2001). The case was settled out of court, so no decision was made.
It could therefore be argued that prices paid in the entitlement market do not reflect the value of water attached to existing farm improvements. Such entitlement prices should therefore not be used as the basis for separating land and water values when valuing irrigated properties for rating and taxing purposes. If that is the case, what then should be used as the basis for the separation?

It may well be that, as water markets mature, buyers of irrigated farmland more fully incorporate the implication of water as a chattel in their pricing decisions when buying irrigated farmland.

At the moment, valuation practices vary across jurisdictions reflecting the legacy of different legislation. While the states are accepting that land and water assets should be separated, they differ on the process of separation and are developing independent valuation methodologies to reflect the separation in the valuation process. The following is a brief discussion of the present position within the four jurisdictions:

**In South Australia**, water licences are classed as personal property and the value of such licenses is excluded from the value of rural properties for rating purposes. Where properties have access to a water source, or where it is possible for a non-irrigated property to gain access to a water source, the added value of this benefit is included in the property value. The South Australian Valuer General is currently reviewing existing methodologies to further separate the value of water entitlements from the value of irrigated farmland.

**In Victoria**, water entitlements continued to be included in the value of land for rating purposes up to July 2007. The Valuer General and the State Revenue Office had divergent interpretations. While the Valuer General argued that water was still part of an irrigation property, the State Revenue Office argued in favour of the personal nature of water entitlements, and therefore excludes them from valuations for stamp duty purposes.

**In New South Wales**, water entitlements are excluded from valuations for rating purposes. Under the Water Management Act 2000, the right to water for irrigation has been split into two categories. Firstly, there is a Use Licence, which is attached to land and conveys a right for a property owner to apply a given volume of water to the land. As these are property specific they are included in property valuations. Secondly, there are Access Rights which are classed as personal property and are therefore not included in the land value.

**In Queensland**, resource operation plans have been developed for all water resources and in this process existing water entitlements have been converted to tradable entitlements which are classed as personal chattel. Following this conversion the value of the new tradable entitlements has been excluded from the valuation of unimproved land. A period of twelve month of grace was granted to the councils to implement the changeover to allow affected councils time to make any necessary adjustments to their rating systems.

The implications for valuing a property for lending purposes might be slightly different. The collateral value will depend on the property’s market value. The market value of the property will clearly depend on its ability to control sufficient water, get it delivered and have the right to use the water on the land. In the context of Victoria, this will include an evaluation of the delivery share and the water-use license. The valuer will have to evaluate whether the property under valuation has sufficient provision for these two rights both of which are attached to land. If a valuer assesses that the delivery share is too low to supply the property with sufficient water then it increases the risk associated with the value of the property. Similarly if the water use licence is inadequate or constrained in some way then it might reduce the value of the property as a potential buyer will have to invest further in the farm to obtain the necessary water use licence. Next the valuer will have to consider whether the owner of the land has adequate access to water allocations each year based on the water share held by the proprietor of the land. If not, it might represent an additional risk to the bank as the operator of the farm will depend on annual purchases of water allocations. From a collateral perspective the bank will have to assess the risk of the mortgage on both the land title and the water entitlement.
Agents and brokers

When water markets were first introduced, trading took place as a result of personal dealings between neighbours and other private parties, or contact made through word of mouth and some newspaper advertising.

Slowly, some real estate brokers and stock agents started to get involved in brokering water transactions. As markets really took off in the second half of the 1990s transfer processes became a major problem, both for the approving agencies and for the trading parties. Within the GMID during the first years from 1989 to 1994 the authority had to deal with only a few hundred transactions each year in the allocation market. However, by 1997 the number of transactions had increased to more than 4,000 per year, and by 2002 to 8,000 transactions. To deal with the increased volume and the demand for faster approvals the authority introduced a new electronic Water Exchange, which cleared all trade once a week (Bjornlund, 2003a). Buyers and sellers launch their bids to buy and sell water each Monday, the exchange is conducted on Thursday morning setting the clearing price and determining who are the successful buyers and sellers, and water is made available to successful buyers on the Friday. The Exchange pays the seller the sale price net of fees, and collects the purchase price from the buyer within ten days. Operations are thus quick, easy, cheap, and offer a high level of security for buyers and sellers. This Water Exchange, therefore, over the first three years increased its market share from 15% to 31% of all trade (Bjornlund, 2003a). The rest of the trading was conducted either as private dealings or by water brokers, in about equal proportions. A survey of traders during 1998/99 indicated that 20% used the exchange 38% used a broker, 19% sold to a neighbour and 23% was direct trading between other private parties (Bjornlund and McKay, 2001). The Exchange clearing price is public information and it seems to set the weekly price for other trades. During periods of scarcity many buyers are relying heavily on weekly purchases as they need the water. Brokers therefore report a strong demand for their services each Friday as unsuccessful buyers on the Exchange are desperate to buy water to enable them to irrigate their crops (Bjornlund, 2003a).

Both the irrigators trading in the market and the water brokers and other intermediaries facilitating trade entered this market without any experience and it has been very much a ‘learn-as-you-go’ process. There has been some concern about dubious and unethical behaviour by some intermediaries with calls for the mandatory licensing of intermediaries and the introduction of codes of good practice. The National Water Commission seems to conclude that it would be too costly an option to introduce mandatory licensing of intermediaries and has instead suggested relying on existing consumer protection and has appealed to the industry for self-regulation. In that context it has suggested that it would be useful: i) for brokers to form an Australian Water Agents Association with a code of practice and a voluntary accreditation scheme; ii) to develop consistent protocols to handle complaints about the conduct of intermediaries; iii) to improve market design to streamline trade approval, clarify intermediary obligations to both authorities and their clients and develop contract templates; and iv) improve lines of communications between intermediaries about trading rules and protocols. (Matthews, 2007).

Private internet brokers have also emerged to facilitate trades within all trading zones offering a one-stop solution.

Developers

In many water-scarce regions of the world, rivers and other water sources are now fully committed.

In that process, urban authorities are also likely to be issued with water licences or entitlements giving them a limited access to water. Once such licences are used they will have to access the market just like any other water user in order to expand urban development. As a consequence some cities and towns both in the USA and in Australia require developers of new subdivisions to enter the water markets to buy sufficient water entitlements to supply the proposed development and as part of the approval process give such water entitlements to the water authority that is going to supply the new development.

In Alberta, Canada the South Saskatchewan River Basin has just been closed. A recent new major shopping mall and racecourse development was threatened due to lack of access to water. Finally a deal was made by a nearby irrigation district whereby the developer lined some of the district’s canals, with most of the resultant water savings being transferred to satisfy the needs for the new development.

As urban water supplies get scarcer it is likely that building and development codes will need to be changed to require new building and landscaping design such as low water use appliances in kitchens, laundries and bathrooms, compulsory rain water tanks and storm water recycling, low water use landscaping and plants etc.
Planners

Water use efficiency will play an important part of future planning and zoning regulations.

A dual supply system would allow recycled water to be supplied to all domestic, institutional and industrial uses where drinking water quality is not required. Similarly a dual sewerage system separating toilets and kitchen waste waters from shower water and storm water would allow for cheaper and more efficient recycling of water.

Increased scarcity is also likely to change requirements for the landscaping of public spaces such as parks and sports grounds towards increasing use of native low water using species and the use of recycled water and best management irrigation practices when irrigation is needed.

Property managers

Managers or owners of larger irrigation farms and other heavy water-using industries are likely to need to be far more astute in the way they deal with their water rights.

It is already apparent that the irrigators have become far more business-like in their dealings in the allocation markets, buying and selling access to water for a particular season based on business decisions depending on water availability, water prices and commodity prices. As some irrigation companies acquire substantial positions in water entitlements partly to secure their supply during serious droughts, but also as sound investments, the management of such interests in water will become more and more crucial for the financial performance of the companies. As derivative products in water entitlements are developed, the need to professionally manage a company’s portfolio of water rights becomes more and more crucial. When similar tradable property rights were introduced in the fishing industry and when tradable air pollution rights were introduced for many industries, larger corporations soon learned to employ specially trained staff to manage these rights.

It could be anticipated that in the long term other industries and properties using large volumes of water will be required to manage their own water entitlements. In Australia it has been proposed to issue all urban users with individual tradable property rights in their water supply exposing urban water users to the same market discipline as the irrigation industry (Young et al, 2007). Such a development is likely to require increased water right management skills of property managers.

What is also becoming increasingly clear is that there are real benefits from investing in and managing water entitlements. Figure 4 shows the return on investing in water entitlements and selling the seasonal allocations yielded by such entitlements on an annual basis over a five year holding period and compares such returns with investments in Australian shares over the same holding periods. The results clearly show the potential benefits from investing in water entitlements.

Figure 4: Total return, capital growth and the S&P ASX accumulation index
(Source: Bjornlund and Rossini, 2008)
Globally what can be learned from the Australian experience?

“Water, like religion and ideology, has the power to move millions of people. Since the very birth of human civilization, people have moved to settle close to it. People move when there is too little of it. People move when there is too much of it. People journey down it. People write, sing and dance about it. People fight over it. And all people, everywhere and every day, need it”

Mikhail Gorbachev
Australia is one of the first countries in the world to have to face up to the realities of persistent water shortage. In seeing how Australia has learnt to deal with this, we have seen that the property professions can draw numerous lessons from the Australian experience.

However, for policy makers there are also a number of essential lessons to be learned.

The first point to note is that the drastic policy measures that were introduced in Australia only happened when the problems associated with water quality and quantity had reached very serious levels. As a result policy measures had to be radical, the speed of introduction fast, and the impact on current water users and their communities substantial. This has caused much community dissatisfaction with policy outcomes and opposition to policy measures. An important lesson for other countries is that policy reforms should be taken early, before conflicts over water use get too ingrained.

The Australian experience also indicates that it is important to deal with unused or underused water entitlements before introducing tradable property rights in water. In Australia, it was decided to accept existing water entitlements, even though they have never been fully used. It is this decision that has caused most of the opposition to water trading and has increased the hardship on active irrigators. As markets were introduced, such unused entitlements obtained a value and many of the holders of such entitlements therefore started to sell them or the seasonal allocations. Since water use was capped in 1996 the increase in water use caused by this activation of unused entitlements has been a contributing factor in declining seasonal allocations, forcing active irrigators to purchase water. Many of these buyers consider this to be an inequitable wealth transfer. They do not consider this equitable, as they believe that by developing their land to use the water they have done what policy makers intended, whereas those who got the water and never invested in using it, did not do the right thing and should therefore not be able to benefit by reaping this windfall gain. Only in South Australia were some unused and underused entitlements withdrawn by the government prior to introducing trading in 1984. As a consequence, the impact of trading in that state has been quite different to the impact in other states. It is highly recommended that jurisdictions considering introducing a market and property right based water management approach should take steps to bring existing water entitlements into line with actual water use before initiating trading.

It must also be considered that Australia is a highly developed country with high levels of financial, social and institutional capital, and that even in that context the introduction and development of property rights in water and the introduction of markets in these rights have been very slow and complex, and is still evolving after 20 years. For most developing countries not so richly endowed with capital, it will be necessary to undertake this development with a great deal of caution. A lot of the benefits of water trading discussed in this paper can be achieved without taking the full step of introducing property rights and formal markets. The challenge is to tailor solutions to suit each situation taking into account social and cultural norms and the social capacity available.

Important lessons can also be learned for the property profession and organisations like RICS. It is clear that more training and procedures are necessary for property professionals who are going to deal with the implications of developing water markets and managing the associated water products. The discussion in this paper has clearly indicated areas in which increased training, processes, codes of conduct and management practices might be required as a result of such developments. Lessons from Australia indicate that it would be an advantage to start the process of training and development at an early stage of implementation.
References


DNRE, Department of Natural Resources and Environment (2001): The Value of Water – A guide to Water Trading in Victoria. Melbourne DNRE.


UNESCO (2006): Water - a shared responsibility. UNESCO, Parish, France


RICS (Royal Institution of Chartered Surveyors) is the leading organisation of its kind in the world for professionals in property, land, construction and related environmental issues. As part of our role we help to set, maintain and regulate standards – as well as providing impartial advice to Governments and policymakers. RICS has 140 000 members who operate out of 146 countries, supported by an extensive network of regional offices located in every continent around the world.

To ensure that our members are able to provide the quality of advice and level of integrity required by the market, RICS qualifications are only awarded to individuals who meet the most rigorous requirements for both education and experience and who are prepared to maintain high standards in the public interest. With this in mind it’s perhaps not surprising that the letters RICS represent the mark of property professionalism worldwide.
Combating climate change: how can cities best adapt?

A report commissioned for the RICS Education Trust Golden Jubilee

FiBRE
Findings in Built and Rural Environments

Sixty second summary

The debate on climate change has moved into the mainstream – the only question now is what we are going to do. In the UK, for instance, it has been estimated that buildings are responsible for almost half of all carbon emissions, so improving the energy efficiency of the buildings in our cities is one obvious area for action. But what are the best strategies to adopt? By analysing the energy profile of the office stock of the entire central business district (CBD) of a major global city – Melbourne, Australia, this research identified what the key strategies should be. By analysing the impact of a range of energy efficiency measures on the Melbourne CBD over the next fifteen years, a number of key messages emerge:

• Doing nothing is simply not an option. Carbon emissions from office buildings will increase in the future if no action is taken
• The level of emissions is closely linked to the amount of office space per worker
• Smaller buildings are not very energy efficient, but nor are very large buildings
• As office buildings increase in age, both energy use and CO₂ emissions increase dramatically
• Increased occupancy levels of CBD office buildings are linked to lower energy use and lower CO₂ emissions on a per person basis.

For buildings, it is recommended that a phased approach be taken, with an initial period of gradual change, followed by a much more significant introduction of energy efficiency measures, including:

• Increasing the use of ‘green power’
• Increasing the number of employees per buildings
• Reducing electricity and gas consumption.
Introduction

We have moved from a position where the activities of the human population in bringing about climate change were regarded as a hypothesis to be tested to one where the results are now in – we are to blame. The challenge now is to see how best we can respond to this. One area of human activity which has a profound effect is the way in which we make use of and occupy buildings. If we are to respond to the challenge of climate change, then this is one area where action is imperative – we simply have to reduce the energy use of our buildings. As property professionals, chartered surveyors are in the front line and must take a lead in advising clients appropriately on measures to reduce greenhouse gas emissions from their buildings. What are the issues?

- **There is the embodied energy in buildings** – how much energy has gone into the construction of the built stock that we already have?
- **There is the energy involved in getting to and from buildings** – this relates not so much to the form of the buildings themselves, but where they are and how people get to them
- **Finally, there is the energy used in the buildings themselves**, for instance in heating and cooling them and in running the services that they need to function.

This research looked in detail at the last of these – what is the energy use of the buildings in Melbourne, and how may this change over time? What are the options and where can chartered surveyors make the greatest contribution? Based on the normal life-cycle of development and re-development of the office stock of Melbourne, it then worked out the most effective way of introducing a city-wide approach to carbon emission reduction.

Why Melbourne?

Melbourne has high carbon emissions and they are increasing. Chief Scientist of Australia, Sir Robin Batterham has said that 50% reductions in carbon emissions are required by 2050 and that mankind needs to change behaviours and practices as well as adopting state of the art technology (Financial Review, 2005). Moreover, Melbourne is similar in many ways to other global cities such as Toronto and London, and the lessons learnt can be applied to other cities.

Why commercial buildings?

In Victoria, commercial buildings produce 12% of greenhouse gas emissions (DSE, 2005). Buildings produce more greenhouse gases than all cars on Australian roads (Australian Building Codes Board, 2001). Doing nothing is simply not an option – decisive steps need to be taken to promote wider acceptance and uptake of measures to reduce CO₂ emissions from the built environment.

But the positive aspect of this is that there is great scope for improvement – Australian office markets are mature, with a high proportion of older, less energy-efficient buildings. In Melbourne, the average age of offices is 31 years and the average time since construction or last refurbishment is 17 years. Many office buildings built before 1960 require refurbishment to remain competitive and offer substantial scope for improvements to energy efficiency (JLL, 2005).

This does seem to be a real opportunity – work on existing buildings accounts for around 60% of all construction activity, with less than 3% added to the overall stock annually (JLL, 2005). Since 1995, refurbishments accounted for 60% of all Melbourne CBD completions (JLL, 2005) and replacement is a slow process. With energy efficiency included in the Building Code of Australia introduced in 2005, it is argued that most stock is inefficient as a minimum energy standard is new to the regulations. It is seemingly impossible to deliver sufficient reductions in
CO₂ emissions to meet targets or address climate change through reliance on building regulations. The onus falls squarely on those who influence stakeholders to explain that improving energy efficiency to existing stock is vital. Although offices require a major refurbishment every 20-25 years, many Australian owners have opted for minor refurbishments to lower capital expenditure outlay and avoid access problems (JLL, 2005). Refurbishment drivers are:

- Reducing vacancy rates
- Improving rental levels
- Upgrading assets
- Offsetting obsolescence.

In essence the drivers are financial (Burton, 2001) – here is the opportunity to increase the energy efficiency and reduce CO₂ emissions.

The City of Melbourne, a local government authority, has set itself the target of achieving zero net greenhouse gas emissions by 2020 (City of Melbourne, 2003). Using market mechanisms and appropriate regulations to influence business investment in buildings, in plant and machinery and in power generation, it sees this as an opportunity to combine economic growth with environmental improvements and social cohesion. If issues relating to climate change are to be seriously addressed, this approach should be endorsed by other local government authorities.
Combating climate change: how can cities best adapt?

The five key findings and recommendations

What can be achieved? The first task was to work out the current carbon emissions of the buildings in the Melbourne CBD and, rather than using a small sample of buildings, this research analysed every office building to a high level of detail. Having done this, the next task was to see whether any of these physical characteristics seem to correlate strongly with their carbon emissions characteristics. Much detailed work has already been done on determining the carbon emissions characteristics in the buildings in the Melbourne CBD, and this research was able to compare the findings of that work with the detailed physical survey of these buildings in this research.

A number of key correlations emerge:

• The level of carbon emissions is strongly correlated with the amount of office space per person, with more densely occupied buildings producing lower emissions per person

• As well as a relationship with the density of occupation, there is also a relationship with the intensity of use. Buildings that are intensively used seem to have lower levels of carbon emissions

• Whether measured by area or by person, small buildings emerge as the least efficient. However, the benefit of increased size only improves up to a certain point. Very large buildings are also relatively inefficient

• The carbon emissions of buildings increases dramatically with age.

Based on these findings, the research was then able to test three different scenarios against predicted patterns of development and re-development of Melbourne. The first scenario is no change – we simply keep on using energy and occupying our buildings in same way that we do now. The next scenarios suggest increasing use of ‘green power’, greater energy efficiency and a more efficient use of space in buildings (Table 1 gives the details).

After analysing the three alternative scenarios based on (a) no change, (b) minor change, or (c) major change, it was recommended that the best approach was a hybrid, which incorporated a transition period from the minor change scenario to the major change scenario. This proposes, over time, increasing the use of ‘green power’, increasing the number of employees per building and reducing electricity and gas consumption.

Table 1. Variables altered in no change, minor and major scenarios

<table>
<thead>
<tr>
<th>Variable</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>no change</td>
<td>minor change</td>
<td>major change</td>
</tr>
<tr>
<td>Number of employees</td>
<td>No increase</td>
<td>Increase by 10%</td>
<td>Increase by 25%</td>
</tr>
<tr>
<td>Green power use by</td>
<td>5%, 2%, 1%, 0%</td>
<td>10%, 5%, 2%, 1%</td>
<td>50%, 25%, 10%, 5%</td>
</tr>
<tr>
<td>Grade (premium, A, B, C and D)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity consumption (kWh)</td>
<td>No reduction</td>
<td>Less 10%</td>
<td>Less 25%</td>
</tr>
<tr>
<td>Gas (MJ)</td>
<td>No reduction</td>
<td>Less 10%</td>
<td>Less 25%</td>
</tr>
</tbody>
</table>

(Source: Author)
Combating climate change: how can cities best adapt?

**Figure 1** illustrates the three scenarios and includes a fourth, the intermediate scenario, which combines the minor and major change scenarios over time.

Using these scenarios, we find that – in addition to the building-specific energy efficiency measures described above – there are some wider issues about the overall building stock that can have a major impact on the overall energy efficiency of the CBD. There are five key findings.

**Finding 1** The first finding is obvious and is our starting point. Based on current and projected levels of development and refurbishment, doing nothing is simply not an option. Emissions from office buildings will inexorably increase in the future if no action is taken.
Finding 2 The level of emissions is closely linked to the amount of office space per worker. Again, a clear link exists between the efficiency with which a building is occupied and the total carbon emissions. While it takes a while to bring about changes in the density of office occupation, the effect is clear and dramatic when it is achieved, delivering significant savings in carbon emissions.

Finding 3 Whether assessed by area or by person, smaller buildings are inefficient. However, increasing the size only improves the energy efficiency up to a certain point. Buildings of over 10,000 square metres tend also to be less efficient. Policies to encourage the development of medium size buildings and to closely monitor the supply of smaller office buildings would improve the overall energy efficiency of the CBD.

Finding 4 As office buildings increase in age, energy use and CO₂ emissions increase dramatically. This is particularly true of buildings over 50 years old – in most global cities a higher than average proportion of older lower grade stock remains predominantly or completely vacant and awaits demolition or refurbishment, especially in market downturns when it is not economically viable to conduct these activities. While it is important to bear in mind heritage issues, the aim should be to reduce the proportion of older office buildings in the CBD that are not economically viable on an efficiency basis as soon as possible. However, a key caveat is that the embodied energy contained in these buildings is taken into account – it may be counter-productive to demolish old buildings and replace them, even if the new ones are more energy efficient.

Finding 5 Increased occupancy levels of CBD office buildings are linked to lower energy use and lower carbon emissions. The aim should be to reduce carbon emissions per person by monitoring buildings with low occupancy (not vacancy) rates and introducing a scheme to increase occupancy levels.
Combating climate change: how can cities best adapt?

What can the chartered surveyor do?

The role played by chartered surveyors is vitally important if carbon emissions in the built environment are to be reduced and sustainability issues are to be addressed. Voluntary measures advocated by the professions are where the biggest reductions will occur. There is no doubt that the rates of replacement of stock and the slow integration of new standards in building codes mean that chartered surveyors have key roles through the life cycle of the built environment from inception to demolition or deconstruction. They can provide strategic ‘big picture’ advice to clients on matters such as:

- Estate strategy
- Property management
- Refurbishment and maintenance
- Leasing
- Costing
- Valuation.

Sustainability issues have been around since the late 1980s and to date only a minority of far sighted ‘early adopters’ within the profession have had the courage and foresight to embrace sustainability and lead from the front. It is time for the whole profession as a whole to fully embrace the sustainability paradigm in the services offered to all clients.

Sustainability has to be embedded in the education and training of all members and it should be a goal that chartered surveyors include sustainability issues in all advice provided to clients. If this is achieved, then the chartered surveying profession will be making a significant contribution to responding to the challenge of climate change.

About this research

This research was carried out by Sara Wilkinson and Dr Richard Reed, of the Faculty of Architecture, Building and Planning at the University of Melbourne. It was one of two projects commissioned by the RICS Education Trust for the celebration of the Trust’s Golden Jubilee in 2005. The full report is available at www.rics.org/research

Selected references


RICS (Royal Institution of Chartered Surveyors) is the largest organisation for professionals in property, land, construction and related environmental issues worldwide. We promote best practice, regulation and consumer protection to business and the public. With 120 000 members, RICS is the leading source of property related knowledge, providing independent, impartial advice to governments and global organisations.
Barriers and drivers towards the transition to a low carbon built environment.

Sara WILKINSON, Australia
Richard REED, Australia

Keywords: low carbon built environment, sustainability, offices, property, construction.

SUMMARY

The Stern Report (HMSO, 2006) highlighted economic and social consequences for mankind globally with limited action addressing climate change - it asserted that only stringent action now would reduce the extent of irreversible climate changes. After years of reporting the need for action on climate change, the message appears to have been taken on board by the governments of countries like the US, who were hitherto unconvinced by the scientific research. If a greater political will to act is now in place, the property and construction industry needs to move quickly and decisively to reduce building related carbon emissions. Stern’s view (2006) is that the window in which we need to make stringent change is open between 2016 and 2021, otherwise humankind faces ’climatic disaster’.

This paper examines the total office building stock of a typical global city, Melbourne, over a 15 year time frame to 2020 with reference to greenhouse gas emissions. The focus is placed on introducing measures that will deliver the reductions noted by Stern. A comprehensive examination was undertaken of characteristics relating to all office buildings in the CBD including age, quality, floor area, energy use, number of employees and prevailing market conditions. Uniquely, a longitudinal analysis profiled the entire office stock and CO₂ emissions during 2005, 2010, 2015 and 2020. To understand the full implications of change, four alternative scenarios were used over this time period based on ‘no change’, ‘minor change’, ‘intermediate change’ or ‘major change’. The research identified clear links between characteristics of office buildings located in a CBD and their respective consumption of energy plus CO₂ emissions. The process produced results that were both reliable and accurate in respect of the energy consumption and CO₂ emissions for a global city. Five major findings and recommendations for addressing the contribution of office buildings towards climate change were produced. In conducting this research there was evidence that hurdles still exist that severely inhibit attempts to fully embrace climate change, where these barriers are partly political, social and economic. To embrace change requires commitment from all stakeholders – anything less will result in a lack of understanding, disillusion and the type of fragmented approach that arguably exists today.
Barriers and drivers towards the transition to a low carbon built environment.

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ABSTRACT

The Stern Report (HMSO, 2006) highlighted the economic and social consequences for mankind globally of limited action on climate change and asserted that only stringent action now would reduce the extent of irreversible climate changes. After many years of reporting the need for action on climate change, the message appears to have been taken on board by the governments of countries like the US and Australia, who were not fully unconvinced by the scientific research. In November 2006 Australia’s Prime Minister Howard agreed to negotiate on carbon trading. If a greater political will to act is now being set in place, the property and construction industry needs to move decisively to reduce building related carbon emissions. Stern’s view (2006) is that the window in which we need to make stringent change is open between 2016 and 2021, otherwise society in general will face climatic disaster. This paper explores the extent of measures required to the office building stock of a typical global city, Melbourne, over a 15 year time frame to 2020 that will deliver the reductions noted by Stern.

1. Introduction

This paper commences by discussing the results of the first stage of a research project funded by the Royal Institution of Chartered Surveyors (RICS) into carbon emissions from a central business district (CBD) (or downtown) office buildings in a global city, Melbourne, Australia (Wilkinson and Reed, 2006). This research has recently been further extended and work is underway to profile the carbon emissions from other property sectors such as retail, residential, hotel, recreational and educational buildings also located in the CBD (or downtown district). The aim of the research is (a) to determine how a city performs in terms of carbon emissions and (b) to identify a range of measures to target optimum reductions in carbon emissions across the stock. The Melbourne City Council is committed to making Melbourne a carbon neutral city by 2020 - therefore to promote this policy policy makers need to know which sectors to target for reductions. The learning outcomes of this research and others conducted by the authors has identified various barriers against and drivers towards a low carbon built environment.

The paper also examines recent developments towards universal acceptance of global warming and climate change by politicians - for example the much publicised Stren Report.
(HMSO, 2006) and the IPCC report in 2007. Along with other social, economic and environmental drivers these developments are practically forcing humankind to making widespread changes in the living and working standards, particularly in the design, construction and occupation of buildings. Overall these changes are beginning to occur more rapidly than previously envisaged, however there is still resistance to change still in some quarters.

**Profiling the carbon emissions of the Melbourne CBD office stock.**

The research comprised an analysis of all office buildings in the Melbourne CBD and scrutinised variables such as building size, number of employees in each building, occupancy levels, visual appearance, and the age of each building. Each variable was used to examine the Melbourne CBD and then to calculate existing and future levels of carbon emissions. It should be noted that CBDs are relevant because all major cities have a CBD, often with an aging stock of high rise buildings (Jones Lang LaSalle, 2005). There are other implications from CBDs with an associated higher density of office buildings, with many having contributed to the provision of a poorer environmental quality for city workers and residents. As cities grow, improving the quality of the CBD stock is important for investors, occupiers, policy makers and the community. This research analysed all office buildings to a high level of detail and the results give a valuable insight into CBD office buildings and climate change.

**Scope and Limitations**

Studies into energy efficiency often examine factors that relate to the consumption and emissions of CO₂, however there are other aspects of energy efficiency that would be evaluated if additional resources were available. Two of these additional aspects are (a) embodied and (b) transport energy, which both require more attention than was possible to allocate in this study. Although pilot investigations into these areas were undertaken during the study, this paper does not include direct reference to these areas and reference should be made to the original paper (Wilkinson & Reed, 2006). Although the original paper evaluated the impact of green power in the reduction of CO₂ emissions, it did not consider micro-generation of energy although was acknowledged as an emerging and important aspect of energy efficiency.

**Methodology and data collection**

In the original project a full census was undertaken of all Melbourne CBD office buildings. During this process a detailed database was compiled based on inspections of every office building, evaluating relevant characteristics for each building including:

- age;
- net lettable area (NLA);
- gross floor area (GFA);
- physical location; and
- the usage of electricity and gas.
The 2nd stage of the research was to model the data via a longitudinal analysis over 5, 10 and 15 year timeframes. This approach enabled the research team to examine change over time, and alternative approaches to reducing CO2 emissions in the office stock. The data used in this research is founded on reliable sources of information based on individual buildings without sampling only a proportion of the research population. The final results were confirmed as reliable by a check method and designed to provide an insight into office buildings and climate change over time.

**Sources of detailed building characteristics**

The central data file was compiled with limited reference to existing databases. Two primary databases were used, although there were issues resolved regarding access to the databases and extensive data ‘cleaning’ for the study. The two databases employed were the City of Melbourne’s ‘Census of Land Use and Employment’ (CLUE) and ‘Cityscope’. The databases assisted profiling the office stock in Melbourne CBD but did not include data about energy consumption or energy efficiency. CLUE is an information system about land use, employment and economic activity across Melbourne (www.melbourne.vic.gov.au/clue). Note: the information in this database was aggregated to a building level and not information was available that would permit identification of individual buildings. Cityscope information was used to compile part of the main data file of office buildings. It is a commercially available database and claims to be the ‘most detailed, accurate and extensive CBD property information service available’ in Australia (Cityscope, 2005). The type of office building data held on the database include parameters such as street frontage, zoning information and site area, detail of development applications, building progress and completion, title and property details such as building services. Over 3000 Melbourne CBD properties are included on the database which is updated annually. Cityscope was used with CLUE to provide data for the modelling and forecasting of baseline carbon emissions for the CBD offices. This research was supported by the 2005 version of Cityscope. Another key data source was a questionnaire survey to establish information regarding energy consumption and use within the buildings, as well as existing data about office buildings. The survey provided supplementary information to support the data not available from other sources such as the CLUE and Cityscope databases.

**Carbon emissions**

After data collection was completed and the database assembled, the research team used a greenhouse rating diagnostic tool to convert energy consumption into carbon emissions. All data used in this process was obtained from reliable sources and verified. This process was undertaken using information and data from the following ABARE, Australian Energy paper 05.9, Australian Building Greenhouse Rating (www.abgr.com.au), AGO 2004, Stationary Sector GHG Emission Projections, Vicpool Information Bulletin 3, 43, Department of Infrastructure. 2005. Energy retail tariffs for 2005, ESAA, Electricity Gas Australia 2005, OECD IEA 2005, Electricity Information (2003 data); and TXU - schedule of distribution use of system tariffs.
With regards to green power, the following rates were adopted for the baseline data calculations: *Premium* and *A Grade* - 5%, *B Grade* - 2%, *C Grade* - 1%, and *D Grade* - 0%. In Australia office buildings are graded alphabetically according to quality. Higher quality buildings use more green power than lower grade stock. It is noted the buildings in the returned surveys had higher levels of green power however the researchers felt that the sample was biased to buildings where more green power was used and references to other sources confirmed this view and indicated uptake across the stock was lower. All buildings on the main data file were processed in order to calculate carbon emissions.

### Research process and data validation

The research population for the profiling of stock comprised all Melbourne CBD offices. To ensure the validity of the database a direct survey was also conducted, where the research population for the questionnaire survey comprised a sample of owners of office property and Property Council of Australia (PCA) members in Melbourne. Twenty-six questionnaires were distributed to owners of Melbourne CBD office buildings in October and November 2005 by the Property Council of Australia in Sydney. Fourteen returns were received, equating to a response rate of approximately 50%.

The database was ‘cleaned’ by the research team and all non-office property that included less than 50% of a core office component was removed. The survey helped to ensure that the information in the database was accurate and reliable. The following steps in Table 1 below were undertaken:

<table>
<thead>
<tr>
<th>Steps</th>
<th>Activity</th>
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<tbody>
<tr>
<td>Step 1</td>
<td>Assemble preliminary dataset of all Melbourne CBD buildings including non-conforming property (e.g. carparks and residential).</td>
</tr>
<tr>
<td>Step 2</td>
<td>Add other data including details from the CLUE database - physical building characteristics and physical characteristics (note: this data was examined in aggregate format and individual floors or tenancies could not be isolated).</td>
</tr>
<tr>
<td>Step 3</td>
<td>Using GIS mapping and Cityscope, and individual inspections, each building was examined and the database was reduced from 1,354 to 328 office buildings with an office component of at least 50%.</td>
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<tr>
<td>Step 4</td>
<td>Additional information relating to individual buildings was added to the database and resulted in comprehensive and detailed information set.</td>
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<tr>
<td>Step 5</td>
<td>The data from the survey were input to the database and checked against existing data.</td>
</tr>
<tr>
<td>Step 6</td>
<td>Rating for CO₂ emissions for all 328 CBD office building in database. The AGBR online diagnostic tool was used (<a href="http://www.agbr.com.au">www.agbr.com.au</a>). Data based on rated area, occupancy hours, number of employees, electricity and gas consumption per annum (kWh and MJ) and amounts of green power used. The rates used for energy consumption sourced from the PCA Benchmarks Survey of Operating Costs 2005 for Melbourne (PCA, 2005) on a pro-rata basis using current energy tariffs for Victoria.</td>
</tr>
<tr>
<td>Step 7</td>
<td>An analysis of energy consumption and emissions for all 328 office buildings for all scenarios was conducted for 3 time periods, 2010, 2015 and 2020. The results formed the basis for profiling the office stock in 5, 10 and 15 years.</td>
</tr>
</tbody>
</table>
Forecasting and modelling the research scenarios

The study examined four different scenarios: (a) no change, (b) minor change, (c) intermediate change and (d) major change – table 2 lists the variables altered in three of the scenarios. The intermediate scenario was a hybrid between the minor and major scenarios, adopting a more realistic approach to the introduction of change into the office market. The intermediate approach commences with no change, then a minor change followed by major change. The three scenario time frames were 2010, 2015 and 2020 in figure 1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Scenario 1 - no change</th>
<th>Scenario 2 - minor change</th>
<th>Scenario 3 - major change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of employees</td>
<td>No change</td>
<td>Increase by 10%</td>
<td>Increase by 25%</td>
</tr>
<tr>
<td>Green power use by Grade (premium, A, B, C and D)</td>
<td>5%,2%, 1%, 0%</td>
<td>10%,5%, 2%, 1%</td>
<td>50%,25%, 10%, 5%</td>
</tr>
<tr>
<td>Electricity consumption (kWh)</td>
<td>No reduction</td>
<td>Less 10%</td>
<td>Less 25%</td>
</tr>
<tr>
<td>Gas (MJ)</td>
<td>No reduction</td>
<td>Less 10%</td>
<td>Less 25%</td>
</tr>
</tbody>
</table>

Figure 1. Varying change over time for each scenario

Major findings and recommendations

This research comprised a detailed analysis of all office buildings in Melbourne, a global CBD, analysing existing stock as at 2005, and modelling emissions for 2010, 2015 and 2020. Given to three alternative scenarios (in figure 1) and the changes listed in table 2, the major findings are discussed further below with accompanying recommendations.
Finding 1
*Emissions from office buildings will increase in the future if no action is taken.*
There is clear evidence to indicate that, if remaining unchanged, emissions in the CBD office market will rise on both an ‘aggregate’ and ‘per person’ basis. These increases are due to the factors such as the ageing of the office stock over time and the volume of new stock under construction that will soon be released onto the market.

The recommendation is that steps are taken to reduce the level of emissions from office buildings, and the best course of action would be to adopt the intermediate scenario. It is recommended that this process would commence with no change in the first five years (allowing for professional and industry related education), followed by a minor change in the next five years and then a major change over the ensuing five years. Following this course of action will lead to a decrease in emissions using an incremental and viable approach.

**Key finding 2**
*The level of emissions is closely linked to the amount of office space per worker.*
As emissions increase in 2005 and over the next 5, 10 and 15 years, there will also be a corresponding increase in the net lettable area per office worker. This relationship is also maintained for each of the four scenarios, with the correlation between emissions and area per office worker highlighted for each scenario in figure 2.

**Figure 2. Levels of emissions vs. amount of space per office worker for each scenario**

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TS 10 – Commission 10 session III (T.S. 10.3)
Sara J Wilkinson & Dr Richard Reed
Barriers and drivers towards a low carbon built environment.

Strategic Integration of Surveying Services
FIG Working Week 2007
Hong Kong SAR, China 13-17 May 2007
The recommendation is that the density of office workers in each building should be increased on a ‘office worker per building’ basis. This can be achieved by undertaking one or more of the following steps:

   a) Ensuring that office buildings are fully let and vacancies are minimised at all times;
   b) Decreasing the amount of office space that is leased although actually unused or empty;
   c) Increasing the ratio of office worker to floor space; and/or
   d) Modifying the approach to using office space to increase efficiency.

**Key finding 3**
*Higher energy use and CO₂ emissions are positively associated with smaller buildings but negatively associated with medium sized buildings.*

Buildings with a gross lettable area under 5,000m² are the highest aggregate consumers of energy by gross floor area and on a ‘per person’ basis, and produce the highest level of emissions per person. However, buildings with a gross floor area between 5,000 and 10,000m² use the least energy and have the lowest emission levels. Reasons for these results for each group are as follows:

   a) smaller building are usually associated with a high proportion of older stock that exhibit typically higher than average vacancy rates. This is partly due to the higher levels of obsolescence in this group, especially with regards to physical and functional use.
   b) in contrast to smaller buildings, increasing the building floor area will raise the level of efficiency due to the enhanced economies of scale.

The recommendation is for the focus to be placed on encouraging the development of medium sized office buildings in global cities. In respect of energy consumption and efficiency, this group is the highest and best use of the land. This may be achieved by closely monitoring the supply of smaller and larger buildings and the effect on the aggregate amount of office space would be negligible.

**Key finding 4**
*As office buildings increase in age, energy use and CO₂ emissions also increases.*

The age of a building is directly related to obsolescence levels, which is turn has an effect on energy efficiency and CO₂ emissions. New buildings incorporate the latest advances in technology and building design, as well as minimal physical and functional deterioration this results in lower aggregate emissions and energy consumption. The focus should be placed on a ‘per person’ basis, where there is a direct relationship between age and energy consumption.

The recommendation is that the focus should be placed on reducing the proportion of older buildings in the CBD. This group are the highest energy users and produce the most CO₂ emissions. Policy makers should consider using incentives (or disincentives not to redevelop) which would ensure the highest and best use of the CBD office stock is maintained at all times. However it should be noted that this research did not consider the embodied energy...
within buildings and it is possible that consideration of embodied energy would have some influence on this data.

**Key finding 5**

*Increase the occupancy levels of CBD office buildings which is linked to lower energy use and lower CO₂ emissions.*

The number of employees in a building is positively correlated with energy use and energy efficiency, where buildings with more employees (but not necessarily floor area) have enhanced energy use and produce less CO₂ emissions. However, buildings containing fewer office workers have higher costs and emit more CO₂. This relationship is adversely affected by buildings with 50 or less office workers and exhibits poor use of resources. This finding does not conclude that buildings should contain more office workers on sliding scale, but rather that buildings containing a relatively small number of employees should be monitored.

The recommendation is that monitoring of buildings with low occupancy (not vacancy) levels based on the number of office workers should be undertaken. Since energy consumption and CO₂ emissions are closely linked to this group, a scheme based on either incentives or disincentives (e.g. property rating or property taxation) to maintain low occupancy rates should be introduced as soon as possible.

**Barriers to a low carbon built environment**

Based on the research, the barriers can be divided into the following categories: social (or professional), economic (market driven), and political.

The social barriers are related to the professions who are able to implement and deliver reductions in CO₂ emissions. There is a lack of knowledge about energy efficiency and sustainability amongst the property profession in Australia, which is understandable to a degree. Partly this has been attributed to professional conservatism (Scrase, 2001). There was also a perceived lack of expertise with this newly emerging area of professional services. This knowledge and expertise gap reflects a lack of education and continuing professional development (CPD) training. These gaps are being addressed with a variety of CPD events relating to energy and sustainability being offered and within built environment University courses sustainability and energy efficiency subjects are being offered to students. Furthermore understanding and knowledge of energy efficiency can be improved through more web-based information and access. CPD, training and short courses, regular professional body newsletters and web-based bulletin board are ways to improve knowledge and expertise. Though the choice of CPD events professionals attend is voluntary and member may choose alternate events. Profession bodies need to consider some element of mandatory attendance for existing members to sustainability related CPD. In addition it takes time for the knowledge gap to close and for a majority of practitioners to become fully conversant with best practice approaches.
The economic barriers are that the overall market is still yet to be fully convinced of the value of energy efficient buildings. Until valuers assign additional value (if any) to buildings with energy efficient features, then the market will not demand more buildings with such features. Clearly this is partly related to knowledge levels but also it requires different methods of evaluating value. Work is being undertaken by others (Grissom, 2006; Myers, Reed & Robinson, 2007) in valuing sustainability in the buildings although certainty about the relationship between value and sustainability is yet to be fully understood by all stakeholders in the market. Increasing the uptake of corporate social responsibility (CSR) in organisations will send a clear signal to practitioners and valuers about the need for buildings with low carbon emissions. In addition, explicit statements regarding sustainability in company annual reports and policy and strategy documents will advertise the importance of sustainability to the market. Another argument against implementing energy efficiency is the perceived prohibitive cost of the measures, with a greater uptake across the sector economies of scale will result – since this is based on perception it seems the use of reliable case studies and their respective costs will confirm the actual implementation costs are not necessarily excessive.

When political barriers are considered, in this type of research there are several issues which arise and need further attention. Firstly there needs to be a high profile support and lead from government. Arguably in Australia this is beginning to emerge at a state level – for example, the State Government of Victoria will only lease office space with a 4.5 Greenstar rating in Victoria. This is not yet the case for federal government although John Howards government has softened in its views towards climate change and global warming since mid-2006. Clearly further innovative initiatives are also required from local authorities to support this momentum. Melbourne is taking a proactive stance here, in 2006 the Melbourne City Council occupied it’s new 6 GreenStar rated office building CH2, while the old council building is currently being extensively refurbished to high environmental standards. However it takes time for exemplar buildings to come on line and sceptics comment that local authorities can afford to spend on expensive features because of the long term tenure arrangements they have. At a micro-political level there is also resistance between professional groups themselves, whereby suggestions to implements energy efficient measures in a project may be rejected by others in the professional team. It is a dynamic that has not been explored to-date and would involve a candid insight into professional activities.

Conclusions

This research identified clear links between characteristics of office buildings located in a CBD and their respective consumption of energy plus CO2 emissions. To undertake this task a comprehensive examination was undertaken of characteristics relating to all office buildings in the Melbourne CBD including age, quality, floor area, energy use, number of employees and prevailing market conditions. Importantly a longitudinal analysis was used to profile the entire office stock and CO2 emissions during 2005, 2010, 2015 and 2020. In order to understand the full implications of change, there were four alternative scenarios introduced over this time period based on ‘no change’, ‘minor change’, ‘intermediate change’ or ‘major change’. This process produced results that were both reliable and accurate in respect of the energy consumption and CO2 emissions for a global city.
The research produced five major findings with accompanying recommendations for addressing the contribution of office buildings towards climate change. In the process of conducting this research there was evidence that hurdles still existed that would severely inhibit any attempts to fully embrace climate change. Part of the problem appears to be related to the nature of the real estate market and its highly competitive and complex nature. For example, the rate of response for the survey returns was unexpectedly slower than anticipated even though the respondents were fully conversant with the information required. The researchers argue this is indicative of the prevailing attitudes towards energy efficiency in a portion of the sector where serious concerns abound in the property market about the level of confidentiality with this information. It should be noted that, in a similar manner to the broader real estate market, office markets are influenced by an extremely large number of factors including prevailing market conditions, government policy, investor sentiment and overall market perception. Consideration should be given to these external influences, some of which drive change others are barriers to change. To embrace change requires commitment from all property stakeholders – anything less will result in a lack of understanding, disillusion and the type of fragmented approach that arguably exists today.

References
Cityscoope Publications (2005), Cityscope, Melbourne.
Jones Lang LaSalle (2005), Building Refurbishment – Repositioning your Asset for Success, Jones Lang Lasalle, Sydney.
Property Council of Australia (2005), Benchmarks 200 - Survey of Operating Costs, PCA Sydney Australia.
http://www.rics.org/RICSservices/RICSresearch/RICS+Education+Trust+Golden+Jubilee+project+on+climate+change.htm (date accessed 10th November 2005)

BIOGRAPHICAL NOTES

Sara joined the University of Melbourne in January 2005 from Sheffield Hallam University in the UK. She is a Chartered Building Surveyor and a Fellow of the Royal Institution of Chartered Surveyors (RICS). Sara completed an MPhil at the University of Salford in 1995 examining conceptual understanding of green buildings within the UK construction industry and in 2002 she was awarded an MA in Social Science Research Methods. She has published over 80 conference and journal papers and co-edited an RICS/Blackwell Science book on Best Value in Construction. Her research interests include energy efficiency and environmental issues and sustainability in the built environment. Sara is a member of the editorial board of Structural Survey journal and Vice Chair Commission 10 Construction Management Construction Economics of FIG (International Federation of Surveyors).

Richard Reed has conducted research in a diverse range of property-related topics including fast food businesses, intellectual property, retirement villages, national parks, auctions and demographic influences. His research interests are focussed upon three main areas: sustainability (depreciation and obsolescence) in the built environment, the housing market including reverse mortgages and demography, and the application of valuation in the property industry. After completing his first two Property Studies degrees at the University of Queensland he was employed as a property valuer in both the private and public sectors, gaining a wealth of ‘hands-on’ experience during this period. His PhD focussed upon the relationship between demographic influences and property values. He has published in numerous Australian and overseas journals, and presents regularly at local and overseas property conferences. In addition, he is an active member of property organisations such as the Australian Property Institute, the Pacific Rim Real Estate Society, the International Real Estate Society and RICS.

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