



Transcript of the Greywater Forum

Held at Melbourne Museum, 10 November 2004

Ms Melissa Fyfe Hello and welcome everybody to Museum Victoria's Greywater Forum. My name is Melissa Fyfe and I'm the Environment Reporter at The Age newspaper. Tonight is part of a series of events here at Museum Victoria under the umbrella of the Water Smart Home Program sponsored by the Smart Water Fund. Each person will have found on their seats a brochure of events happening during the Water Smart Home Program. You will also have found an evaluation form. If you take the time to fill that in you'll go into the draw for one of five copies of Wendy Van Dok's *The Water Efficient Garden*. So if you're not a green thumb perhaps you can save that for a Christmas present.

The format tonight will be quite simple. We will have four speakers but we will hold questions until after they have all finished. We should have about 25 minutes for discussion after the speakers if all goes to plan. And after that we'd love you to join us at 7.30 pm for supper just outside the theatre here. The proceedings tonight are being recorded and will be made available on the Museum's website and I'll remind you of that address a bit later.

Well tonight we are very lucky to have some of Australia's leading experts with us to discuss the topic of greywater. It's the sort of topic that seems a little grey at first but out there people are grappling with it in their backyards, plumbers are embracing it and water retailers are trying to work out how to cope with it. Each speaker has been asked to address the question, *Greywater Reuse, is this a viable option to Australia's water crisis?* So tonight we're going from the macro to the micro.

Peter Cullen, one of Australia's leading water gurus will take us through the big picture stuff with a few specific comments on greywater itself to stir up his panellists. Tony Kelly, who heads up the water retailer, Yarra Valley Water, will tell us about some concerns that he has about greywater. Clare Diaper from CSIRO will talk to us about her research on greywater quality and water savings from such systems. And lastly down to the home and community. Eric Bottomley from CERES will tell us about using greywater in the home.

But first up is Peter Cullen. Peter travels Australia and speaks constantly about water and what water means to Australians. He is a freshwater ecologist and Chair of the Victorian Water Trust Advisory Council. He sits on many boards and science groups and is one of the Wentworth Group of Concerned Scientists, a sort of high powered lobby group made up of scientists who care about water. Very impressively, this year he's been Adelaide's Thinker in Residence and I invite him to the microphone now to share some of his thinking on greywater.

Professor
Peter Cullen

Okay, thank you and it's a pleasure to be here and it's great to see a meeting like this with so many people coming to discuss the sort of issues about using water more efficiently in the home and what we can do with greywater. I guess many of you would have seen the Four Corners program on Urban Water a couple of weeks ago and it's been interesting to see how the water debates have shifted in the last three or four months from a real focus on the Murray and the rural to a realisation that some of our cities are potentially going to run out of water. And when you look at 250,000



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people a year moving into Sydney and roughly the same into Melbourne, into new suburbs in those cities, you've got to say, having all those extra people doesn't make any more rain. What we're doing is dividing the existing water up amongst more people every year and there's going to be an end to that.

So the population growth in our major cities, when you couple that with the ongoing drought, when you look at the sort of climate change scenarios that people are now treating pretty seriously in terms of potentially a 10% or 15% reduction in long term rainfall, you do start to see that we have a squeeze on water in our major cities.

Now when you look at the industry statistics, and my panellists have probably got more up-to-date and more specific ones, but from the facts, Melbournians use about 230 litres per head per day of water. Over the next 50 years if you put another million people into Melbourne that's going to take your water yield from 480 gegalitres to about 620 gegalitres. Now the yield that you catch is 560 so you've got a squeeze.

So what can be done? And I think one of the other interesting things about this realisation that cities are in a bit of trouble with water is the search for a magic bullet, the belief that there is something we can do which will fix this. And of course, there isn't a magic bullet, there's a whole raft of solutions that we're going to have to put in place and use. And the challenge is to be smart with the mix of strategies we use, not to be stupid and doctrinaire and run with fashions. Not that my Sydney colleagues running with the desalination would be put into that category of course, but some might say that.

So the range of tools we have. We can manage demand so that people use less water. We can perhaps find new supplies of catchment water, including purchase it from irrigators, and you have in Melbourne a very good opportunity to do that because the Thompson Dam has water which supplies both irrigators and the city. So there's options to transfer. Adelaide's already doing that, it's buying up dairy farms in the Murray and that's a very appropriate strategy for them. And the third set of tools we've got, finding alternative water supplies. And that's where recycling, stormwater, desalination and the greywater all come into play.

But as I said, there is no single silver bullet. There is a need for us to be smart as we look at all of the options for our cities and finding a unique set of solutions that are appropriate for that community in that city. Now when you look at Melbourne's water use, 19% of your drinking water you flush down toilets, 35% of it you're using to water your gardens. So there's 124 litres a day you're either putting on lawns or flushing down toilets. I don't think you need top quality drinking water for that so that does open up the opportunity for recycling. And it probably doesn't open up the opportunity for desalination, you wouldn't use expensive desalinated water for flushing toilets I hope. But you do use 15% of your water in the laundry, 26% in the bathroom. So there's something like 95 litres a day coming out of that which could potentially be used outdoors. So there is a regular supply of water that might be appropriate.

The challenges though are how do we handle greywater? Can we store it or does it just run out when we're emptying the washing machine and whatever? So that's one of our particular questions that we've got to resolve. Are we going to store it? If we're not going to store it, how do we dispose of it during wet periods? Is it just going to run off the surface and contaminate the downstream neighbour? If we are going to



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store it, do we have to treat it in some way, because maintaining human health is of course of paramount consideration. The question is how do you distribute greywater? During a drought most of us, you know, siphon out of our baths and washing machines onto our gardens. But obviously the smarter solutions are to use underground systems and they're of course a lot safer. So what sort of infrastructure do we want to put in at the house block if we're going down this route?

The bigger question, what is the best scale for greywater use? Is it appropriate to use it on a domestic block? Is it possible for us to use it on a suburb? Or the one opportunity that I think has the best option is using it in apartment buildings where we have a high-rise building where we could collect the greywater, treat it in a simple plant in the basement and use it for flushing toilets and for some of the indoor water features and perhaps watering gardens around - things like the ACF Building (Footnote: 60L, 60 Leicester Street, Carlton; <http://www.60lgreenbuilding.com/>) are demonstrating and have been demonstrating for some time. So the apartment buildings seem to me to be one of the real opportunities. And one of the other questions is can we retrofit existing suburbs or are these sort of strategies more appropriate for new Greenfield developments and that depends on what level of infrastructure we're putting in.

There are of course some key issues when we're making any of these decisions. Protecting human health is paramount. We must assume that contaminated material will find its way into washing machines when people wash nappies and whatever and we do not necessarily want that sprayed onto the surface of a garden, especially during wet periods when it's going to contaminate the downstream. So with washing machines, using the rinse cycle water is probably okay, but using the wash water might not be so smart. So that probably requires a bit of fancy plumbing.

What are the infrastructure needs and costs? What are the capital costs? What are the operating costs? What are the skill levels? Because we see a lot of these systems that are put in by enthusiasts and then the house gets sold to someone who hasn't got a clue how it works and the systems start to become a health hazard or break down. What are the environmental impacts of releases of any greywater to urban water ways when you don't need it or it is just running off? So there's a whole lot of issues like that that have got to be built into the decision making.

But as I said before, I do believe the most exciting opportunity is the big office blocks and big apartment blocks where we can collect the greywater. We can give it some rudimentary treatment in a basement type plant and we can have a service company come in to do that, so it's done at a good professional standard, then that recycled water can be used. So I think that somehow we've got to encourage developers to look at those sort of options.

But just to finish off, there are some really outstanding examples of recycling in Australia. And I was at Homebush Bay, the Olympic site, last week and they've got a lot of big roofs and they've got a lot of lawns. The really interesting thing was of their total water usage on the Olympic park site, only 6% is coming from the catchment mains, the rest is roof water or treated effluent and they shandy it and mix it up for watering lawns. Now that's a unique situation but it just shows what can be done with a mix of stormwater and treated water of various sorts.

So we're going to hear more examples and more specific examples of the different



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things people can do if they decide it's the right thing for them. It's one of the tools that we've got. It certainly helps people understand and get conscious and think about water a lot more if they are doing something like this and many people are very enthusiastic about doing it on their own blocks.

Of course when we look at recycling greywater we look at a big city like Melbourne and you think, well, perhaps the problems are too great. But then you go out to country Australia and people have been recycling greywater for a very long time and they're still doing it in the current drought. It's the only way they can keep their vegetable garden or their prize gardens going and people are putting a lot of time each day into carting buckets of water from their washing machines and showers and whatever. So some people are doing it, they're doing it quite tough but it's the only way they can keep their gardens. So this is one of our tools, it's one that we've got to consider along with all of our other options. So thank you very much.

Ms Melissa Fyfe

Thanks Peter. Our next speaker is Tony Kelly, a man who has 30 years experience in the water industry. He is Managing Director of Yarra Valley Water, the biggest of Melbourne's three water retailers. Tony chairs the Victorian Water Industry Association's triple bottom line task group and has committed Yarra Valley Water to be a company that takes sustainability very seriously. Interestingly Tony tells me that his talk is going to be a little controversial and the topic of his talk is *Greywater: Why on earth would you bother?* Please tell us Tony.

Mr Tony Kelly

Thanks Melissa. Someone did ask me to be controversial so let's see what happens. So that's the title, why on earth would you bother? But before I get into that let's talk about what my task is as Managing Director or leader of a public utility and a water business here in Melbourne. And I'm primarily interested in servicing my existing customers in a metropolitan environment. My first responsibility is the provision of safe drinking water. And that all started about 100 years ago in Melbourne when cholera and typhoid was pretty common and the Yarra River was an open sewer, as were all the other rivers in Melbourne. So we must never forget as a water utility what we're primarily here for. And the other side of the coin is [the disposal of waterborne] wastes in a way that again protects public health and can be contained within the carrying capacity of nature.

Okay, in that regard then if when I'm looking at alternatives to the traditional reticulated water and sewage then, these are the sort of guiding principles that help me. I'm not going to contemplate anything that compromises public health, that's first and foremost. As I said, that was the purpose of why we were established. I'm not going to adopt a one size fits all approach either.

Here is a slide that shows the ecological footprint and how much resources Australia uses compared to the rest of the world. And most of you here, I'm sure, will be aware that Australia uses typically three or four times what the rest of the world is using, certainly significantly more than the developing part of the world. And the real challenge for us as Australians is to reduce our ecological footprint. It's not just to reduce or increase water conservation or save water. In fact saving water is relatively simple. The technologies are there, there's no challenge with that, it's only a matter of putting a few engineers on the job and we can do it. We can turn sewage effluent into pure drinking water without too much trouble at all. The question is, do you want to do that and what impact does that have on our ecological footprint? Well



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I tell, you're using a lot more pipes and pumps. You're using more of the world's resources to do that. You're also using more energy in the production process, which is increasing the greenhouse gases. Increasing greenhouse gasses is increasing climate variability which is making the problem you're trying to solve even worse. So whatever we do in terms of water conservation, it's critically important that we don't increase our ecological footprint at the same time.

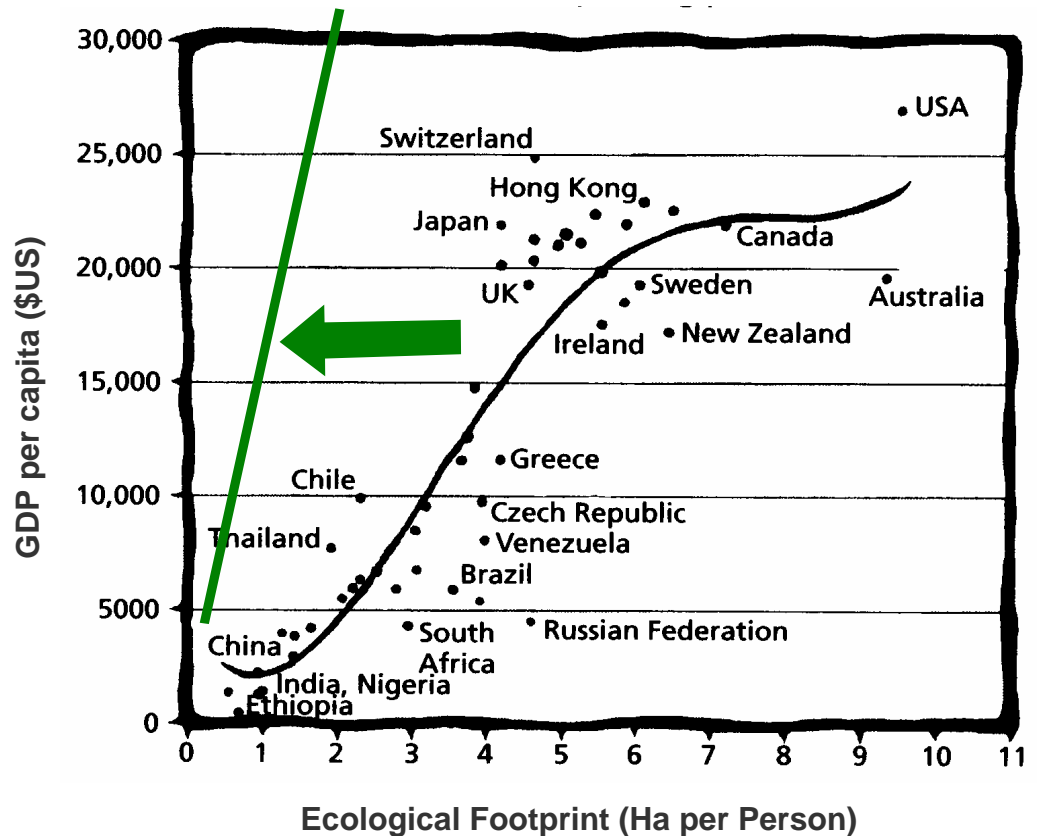


Fig. 1. The Big Picture

So some of the lessons we've learnt from this include - don't adopt a one size fits all approach. For instance, rainwater tanks are a pretty silly idea in the western suburbs of Melbourne where it hardly ever rains. They're a great idea in the Dandenongs for two reasons. One, there is high rainfall. Secondly, we have to pump water right to the top of the mountain which costs us a lot in energy and it would be much more ecologically sound to collect that water at the top of the mountain and gravitate it down from the rainwater tanks in those properties. We don't have that choice at the moment but the point I'm trying to illustrate is one size does not fit all. It depends on your location and your circumstances when you're looking at alternative solutions. In terms of Melbourne, as Peter mentioned, we're now using about 70% of our current yield from the catchment so there's no need to panic right now, we've got time to plan for the future and get it right. And as I said before, don't take a water only view. When you're trying to saving water, you have to consider the other impacts on resources and greenhouse gas production through energy consumption. So let's look at greywater and look at some of the alternatives. Now this slide gives



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you some comparisons of greywater, and our estimates of what you can save in a typical Melbourne household of 2.6 people using about 240 kilolitres a year. On that basis, with an average sized garden you could save somewhere between 35 and 75 kilolitres out of 240. That would save you somewhere between \$60 and \$125 off your bill. Your purchase price for that would be a minimum \$2,000 and that would be a system that would probably dump all the greywater every night. There's no treatment in there, you shouldn't store greywater because it goes septic very quickly. So this is a cheap greywater system and it would cost you probably \$75 a year to maintain, clean the filters, etc, etc.

Shorter showers. If you want to save water cut two minutes off your shower time. If you're taking a seven minute shower and you cut it down to five minutes you're going to save 25 kilolitres a year per person in the household. That's going to save you \$43 off your water bill, it's going to cost you nothing and there's no maintenance cost.

Let's talk about a AAA rated shower head. You want to keep your seven minute shower but you're going to go from, say, 14 litres a minute to 9 litres a minute which is AAA, you'd save 33 kilolitres, \$56. It costs you about \$40, even less with a government rebate and there's no maintenance costs on that.

A AAAA washing machine. When your washing machine breaks down next time go and buy a AAAA washing machine. The premium on top of the normal price for, say, an inefficient washing machine is about \$300. Assume you get a \$100 discount back from the government, which is being offered, it costs you \$200 extra. You save 16 kilolitres, you save \$27 on your bill and virtually no maintenance costs.

So if you compare those numbers there, you know, you're saving just about as much water with a shorter shower for no cost. And even if you buy a new washing machine then you're going to save about half the amount of water for a tenth of the cost.

Okay, more reasons why you shouldn't consider greywater.

1. There are no standards available at the moment, so there's nothing to protect you as a consumer in terms of what's a good system and what's not a good system.
2. They're not suitable for many soil types, if you're in a heavy clay environment then you're going to struggle to use the greywater sufficiently to make it worthwhile again.
3. Again, it comes back to one size does not fit all. It is likely to increase your energy consumption because you're going to have to discharge it into a tank and pump it out of a tank so you're going to use energy for distribution.
4. The impacts of detergents and household cleaners. It's very hard to get information around these and these are the things that you're going to end up putting on your garden.
5. Most systems require conscientious owners. We've got about 15,000 to 20,000 properties in Yarra Valley Water's area which are currently serviced by septic tanks. There is a very, very small percentage of those septic tanks which are well maintained. If you look at the trends in the community at the moment, people are moving away from high maintenance gardens, homes. They're moving to smaller homes quite often and certainly smaller gardens. They don't want the maintenance hassle. If you're going to put a greywater system in you're going to have to be prepared to maintain it. There's going to



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be filters on it, there's going to be things that go wrong. Your irrigation system's going to block up, you're going to have to spend the time.

6. And I believe that most of these greywater systems are going to have a larger ecological footprint than almost any of the alternatives.

So in conclusion, I think it's too expensive, it's too risky from a public health point of view, it's probably worse for the environment, there are no standards to protect the consumers. It is too maintenance intensive, so as Peter said, you might put it in but the next person that buys the house is unlikely to be as enthusiastic. It's more expensive than all the alternatives; it's less effective than all the alternatives. And if there is any message I want to give you today is, try all the alternatives first because they're a lot easier, a lot less painful and a lot less expensive. When you've exhausted all the other options, go to greywater. Thank you.

Ms Melissa Fyfe

So I think that's a no, greywater is not a viable option for Australia's water crisis. Thanks Tony.

I'd like now to introduce to you Clare Diaper from CSIRO Urban Water. Clare is from the UK originally where she studied water recycling projects. And now at CSIRO she also studies contaminants in the urban water cycle and currently manages a project to monitor the performance and risks of a single household greywater system and she'll talk about that research with you now. Thanks Clare.

Dr Clare Diaper

Thanks Melissa. The title of my presentation, is an alternative title that I've used in the past, *Greywater: good, bad or just a bit ugly?* And Peter has commented already on some of the complexities of selecting greywater reuse systems and where they may be a good option and I'd just like to go through the results of some modelling work that we've done looking at the potential savings that you can get with greywater systems at single house level.

This first graph shows the potential savings for three of the State capitals within Australia, we've got Brisbane, Canberra and Perth. We didn't have the full data for Melbourne. But this graph shows the potential savings and then across the bottom there, the first results are for a rain tank, the potential savings you can make with a rain tank, and then different sources of greywater, bathroom or bathroom and laundry sources and the end use of toilet flushing and garden watering. But we've looked at the toilet flushing end use as well, not just greywater for irrigation. We've also looked at different sizes of storage.

Now this particular graph shows the data for a single lot, a single occupancy lot. So one lot with one house. And some of the data presented here, we can see that going from bathroom to bathroom and laundry – and that's the second and third results presented – we do get increased potential savings so reusing bathroom and laundry water will increase the potential savings from reusing greywater.

If we look at the different sizes of storage, which are the second, fourth and sixth sets of results, increasing storage size doesn't seem to give us that much of an increase in the percentage savings. But we can see a big difference in the savings that we get in the different State capitals. So in Brisbane generally the savings are less because of the higher rainfall in Brisbane that not so much would be used for garden irrigation. So the potential for greywater reuse for toilet flushing does provide a higher level of saving.

And the second graph is for a dual occupancy lot, so looking at two houses, the infill



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scenario, where you'd possibly get two houses built on one original lot. And this data's quite interesting. We see that for Brisbane, where we have that higher rainfall we've actually achieved the optimum savings. And that across the range of different sources of greywater, different tank sizes, we don't actually get any increase in the water savings. But we do see a substantial increase in the savings for the dryer climates, Canberra and Perth, and looking at 30% or 40% savings of water for the different sources of greywater for toilet flushing and garden irrigation.

So I wanted to present those two graphs just to sort of bring out the complexities of where a greywater recycling system is viable and that we do need to look at climate, we need to look at occupancy or housing density, the sources of greywater that are used, the tank sizes have some impact and also the variability in end use. I haven't presented that data here, looking at different end uses but obviously there will be some changes in water savings depending on the end use that are used in these different climatic conditions.

Now I'd just like to move on to some of the quality issues with greywater from various sources. And this table just summarises some of the data that's out there on the quality of greywater, different sources from hand basins, a family unit or larger scale collection of college student sort of residence is that final list of quality data. And the information here is biological oxygen demand (BOD₅), which will give you some idea of the biodegradable organic component of the greywater, the ammonia (NH₃) and phosphorous (P), the nutrients that are available in the greywater, then finally the coliforms (cfu/100ml), the bacterial count. And the data varies immensely.

Quality and impacts

	BOD ₅ (mg/l)	NH ₃ (mg/l)	P (mg/l)	Total coliforms (cfu/100ml)
Hand basin	109	9.6	2.58	
Combined	121	1	0.36	
Single person	110			
Single family		0.74	9.3	
Block of flats	33	10	0.4	1x10 ⁶
College	80	10		
Large college	96	0.8	2.4	5.2x10 ⁶
Domestic wastewater	110	12	4	10⁶ to 10⁷

Various sources



**CSIRO Urban Water**

Fig. 2. Quality and Impacts

Greywater quality is highly variable. It won't always have these values and dependent on the sources of greywater, the quality can vary enormously. But what



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we do find, if we compare this to a very average domestic waste water figure, the greywater quality from some sources can have the same parameters, concentrations as domestic waste water. So we need to take into consideration these quality aspects in terms of the biological quality of greywater and certainly some control of the products that are used in the home and on user behaviour within the home, recommending that soiled nappies aren't washed in the washing machine kind of helps to reduce this variability in greywater and reduce the risks associated. So that was biological quality of greywater. This next one is looking at the chemical quality of greywater. And there are many other chemical contaminants that can occur in greywater, the salts from laundry detergents, possible metals, titanium for example is in all of sunscreens, the soaps from detergents, suspended solids, possible disinfectants that are used for cleaning. There would be a temperature variation in the greywater and also pH is important. And certainly when used for irrigation it's these chemical parameters that are more important because they will have impacts on the soil, the plants, and possible impact on groundwater over a long period of use. But again, a lot of these chemical components can be controlled by looking at the products that you use within the home in order to reduce some of the potential impacts.

The final thing I wanted to talk about is public acceptance and some of the surveys that work that's been done in terms of the social acceptance of greywater systems. We did some work back in the UK, a large scale survey where we asked people whether they'd be happy to reuse greywater from a variety of different sources. So this graph shows the first column, the acceptance of using their own bath and shower water was pretty high, about 90% of the survey respondents, that's over 300 survey respondents, were happy to reuse water from baths and showers for toilet flushing. Across the axis of this graph is a variety of different other sources of greywater and over on the right-hand side, the whole of neighbourhood if greywater was collected from the whole of neighbourhood. And the acceptance for this is a lot less than reusing water from your own bath or shower down to about 40% or 50%.

Now other work that's being done here in Australia, Greywater reuse at small scale, generally more acceptable than waste water reuse. But some of the work has shown that homeowners are concerned with their ability to manage and monitor a system that was installed in their own home. So in terms of technology, we need to think of what is required of a technology if greywater reuse is going to be a viable option and provide the high level of service, the high quality of service that we expect from our water infrastructure. There are certainly a list of key things that technology must provide to minimise the health and safety risks and also the environmental impacts, make sure the water is of an appropriate quality for the end use, systems must be relatively simple with minimal maintenance, user control and process control are also important and the scale and costs of the systems. There will be tradeoffs between these, a simple system with low cost may have higher maintenance but that would be very much a user choice. So there is a wide range of things that need to be considered when decision making, deciding on a greywater technology and selecting the appropriate one for a particular situation.

So I'm afraid I'm going to sit on the fence and say greywater is not the answer but an answer. Solutions need to be tailored to local circumstances and really echoing



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Peter's comment that they need to be part of an integrated water management strategy. Thank you.

Ms Melissa Fyfe

Okay, thanks very much Clare. Our last speaker tonight is Eric Bottomley from CERES. Eric is a team leader at CERES Sustainability Projects. He is also a tutor at Monash's School of Environmental Science. Eric is currently preoccupied with an \$800,000 water project at CERES and a slightly less ambitious \$200 water program in his own home. Welcome Eric.

Mr Eric
Bottomley

That was a bit outdated as many, many years ago I was at Monash. And of course it's nice working on a \$0.8 million project at CERES because the government pays for that but at your own home \$200 is about as much as you want to spend on it. I can't really think of any great additional material that I can add after listening to these three wise people talking to us about greywater and my feelings are exactly the same as have been expressed by the others. And I'm struck also by the fact that, Tony's from Birmingham originally and Clare's from London and because I'm from Manchester although I am naturalised because I wanted to support a winning cricket team. And so three of us here are English and I know that this is because the Australians hold the English in great esteem in terms of their water use. There is that very popular saying, you know, it says 'dry as a Pommy's bath towel'. And I know that this is a, you know, it's recognised as the sort of benchmarks that we British have been able to establish around the world for water use, it's no coincidence that we're out in force tonight.

So as we heard, I'm from CERES and many of you will have been to CERES. It's an old landfill site and it's been an environmental park for 22 years. We have to be very careful with water use not to increase too much water going down through the tip and extending the leach out going out into the Merri Creek. We've had to be careful over many years of trying to gather water on the surface, evaporate it, reusing water. And anyway that's allowed us to transform that old tip landscape into this lovely scene that you see now and visitors from all over the world, including our own Premier launching the Water Project, Yarra Valley Water and the Victorian Government put quite a bit of support into the things we're doing onsite.

And when thinking of the water use onsite, taps obviously a big thing to look at. We've got timers on taps just to control the flows if people leave the running. We have control valves in the taps to minimise the amount of water going through. So I suppose our approach straight away is not trying to collect all the greywater coming from a sink but to minimise the water going into a sink. Washing machines - we're just about to experiment with a connection into one of the gardens at CERES with the greywater from the washing machine. But we've been held up with the EPA, trying to get clarification on what's allowed and what's not. If you filter the greywater going out, does that sort of constitute a treatment? Does this push up the price of commercial units that you buy to process the greywater into the garden? So there's a lot of uncertainty I think in Victoria about the legal situation about filtration and aeration and does that constitute a treatment?

The shower water is probably some of the best of the greywater that can be used and we are using, we send most of that into a Watt system – and I don't know if Steve Watt is here tonight, but he of course is one of the great pioneers of greywater in Victoria. Over many years, the Watt systems he's been selling that capture the water



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from the shower and in that blue box you can see in the photograph, and then it's pumped back into the toilet cistern and provides the toilet water. So it's a great idea. There are still issues using water like that because, you've got to pay for a system that's designed like this, it has to meet EPA requirements, it has to empty water out everyday even though you might want to store it longer but because of bacterial load it's unwise to do so. If the water is stored in the toilet cistern then you get the bacterial development in that water body.

We also have the famous reed bed at CERES that about 1,000 litres a day are collected from the café, which is sort of warm, greasy water and also that mixes in with some urine and it goes down through the reed bed system and the nutrients get filtered out to some extent in that and into a holding pond and then we use it subsurface, under what we call the village green. So we got into trouble in summer, people kept looking at this wonderful emerald green that we had at CERES thinking we were cheating and watering it all the time but it was the greywater from the café through subsurface irrigation.

And that's just a summary of some of the things we've got in the house at CERES to minimise water use.

I haven't got anywhere near the impressive figures that the other speakers have but this was taken from the technical paper which came out last year and it's just a very simple summary when the people got the technical paper together. They are known as temporary systems which are simple diversions, not costly and, used in dry periods. Many of you would be interested in that, whether it's at the scale of emptying a bucket in the garden or it's linking it up through a hose pipe to run out into the veggie area. And the EPA, you know, tends to condone that sort of limited use in dry periods that goes with these temporary systems.

With permanent systems where you bought a treatment or some special device to hold and redistribute the water into the garden we begin to run into more costs. And some of the figures are shown on here where we get into permanent systems. It might be running up to about \$9.20 a kilolitre to get water that way into the garden and, you know, you'd have to be, you know, it's crazy economics. If you just look at the economics of it when we pay, what, 79 cents a kilolitre water and it's going to be costing \$9.20 a kilolitre doing it that way. So we go down to communal systems which get down to about \$5.50 a kilolitre. One example a previous speaker raised the possibility of high-rise buildings in the city reusing some of the greywater. The Inkerman Oasis example in St Kilda is often used - 236 units there with a communal system for greywater collection and reuse through toilets and gardens.

The environmental risks have been described in detailed before, by Clare particularly and then Tony's mentioned about the greenhouse gas and energy use that we've always got to consider. And then there may be some risks of disease, and there's certainly the management time that has to go into looking after the greywater system. But there's also the benefits and those are set out there in the table, the business opportunities and employment in setting up these new systems, the environmental ones. There could be up to a 40% saving on water in some Greenfield sites with third pipe systems that I think Yarra Valley is looking at some examples like that. And also we have to recognise, as we can see with the people here tonight, the high community interest, especially in the temporary systems, things that people like to



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potter around and work with in their own gardens.

I had trouble spelling 'gRRReywater'. I actually spelt it like that on purpose because it's just to remind me that, you know, with greywater we still come back to that same trinity of, you know, reduce, reuse and recycle. And it's always better to reduce the amount being used then reuse it before we get onto the more complex recycling systems.

If we use the greywater around our own homes it can't be stored for more than a day so we can't get a lot in storage. It costs a lot to set up if we buy the approved systems. We'd have to use certain types of soaps and detergents to avoid the build up of salt and metals. Then we need to be able to redirect the water at certain times of the year, say, in winter when the ground's waterlogged we don't want greywater going down there. So we need an easy switching system for turning the water in and out of the sewer. We have to make sure the water doesn't creep under the fence, you know, and go into the kids' sandpit next door. We have to be careful that pets don't drink it and, you know, if you are friendly with your worms like I am you have to keep the pet worms out of the soil. The EPA approaches probably need some clarification on, you know, what's advisable. We shouldn't be using it on the veggie garden, on crops that are going to be eaten uncooked and there could be a danger of splash infection, you know, in toilets if we do use greywater in toilets. So there are all those considerations but I'm sure that won't dampen the enthusiasm for a lot of aficionados who will like to use it.

But just stressing, as the other speakers have stressed before now, if we're looking at reduce, reuse, recycle, we should be just trying to get our water use down in the home without having to rely a lot on greywater at all. And I noticed Elizabeth Heij – and I don't know if she is here tonight, but she actually writes or edits the *Sustainability Network Bulletin* for the CSIRO and she gave this wonderful example of her family and how they got their water use down to 25 litres per person per day, which is a very small amount of water. That's the kind of minimum that they're trying to make in South Africa, they're going to try and guarantee people get 25 litres per person per day. And in the household she's got it down to 25 litres per person per day through most of the year, except the midsummer. And she's done it without really any use of greywater, even without a water tank and it's just through those simple things of abandoning lawn, you know, going for indigenous vegetation. Careful use inside, like not flushing the toilet all the time. If you urinate do you have to flush the toilet, do you need all that water for a little bit of urine, or do you just go outside and use the lemon tree? And other traditional Australian ways. The collecting - if you have a shower, using buckets, having a bucket there, water goes into the bucket as you're having your shower, collecting that, using that in the toilet. Using the washing machine water, the rinse water is used into the next load of washing. The soapy water again can be used in the toilet. I hope I'm doing justice to Elizabeth here and not, you know, exposing too many of her sanitary habits. But she did write about this in the journal. So I was just amazed that she got it down to 25 and in using storm water, using roof water with simple corrugated piping just instead of the water going down the drain, turning that into the garden and using the soil as a storage for water so there's good moisture content in the soil up to summer. And in fact I've followed some of her ideas. I haven't got onto the buckets yet because my wife needs



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Mr Eric
Bottomley

accreditation on that side of things. But I've found that our water use has gone down to about 50 litres per person per day, which is a good start. I thought Tony would probably go back and check my bill because I'm in the Yarra Valley Water area now. So that's a good contrast with 240 litres per person per day which we heard was the average for a family. And so I think all of us tonight have been saying that really, we should be looking at how we reduce the use of water, how do we reuse it before going onto some of the areas of recycling that might be more expensive or riskier. And so in conclusion we've been talking about greywater in Melbourne - it's only ever going to be a small part of the water supply. Melbourne only uses about 8% of Victoria's water. Residential use in Melbourne is only about 5% of Victoria's water, 75% of water is used in country Victoria. And so maybe we should be more worried about things like oranges and cotton. I mean, if we have an orange, an orange is what, 500 litres of water gone into an orange. So if you see your greywater coloured orange because, you know, there's been a waste of oranges in the washing up, we've probably wasted more embodied water in an orange being wasted than in just letting the water going down the plughole. So it reminds us that everywhere we look there is water, not just coming through the tap. It's in all the materials around us and so it's only through developing a conserver society that we can really make a big dent on water use in Australia.

And so I think tonight we've heard there are useful techniques with greywater. We have to be careful. We all like tinkering around so it's worth doing, it's worth doing something. And it's worth doing something in the city because we do take country water through the Thompson scheme and we should emphasise with the country and, you know, do what we can. We should probably have a 25% increase on our water rates I think. I looked at my water bill. It was \$124 for the last quarter and water use was \$7.00 and then the equivalence of the sewage another \$7.00. So it was about \$14 out of \$120. So no matter what savings I make it wouldn't really show up much on the bill. I'd be quite happy to have a 25% increase on the water use and pay for it that way. In fact when I look at the bill, \$50 is actually for parks and so I said to Tony, why did you give me a parking fine? And I think parks should be paid for but I think the water bill should be a really good document, a bit of intelligence that helps us to develop our water use at home and clearly sets out what is the cost of water to us and encourages us to save it. So greywater is a small part of the whole thing. The big thing is saving water in all the ways we can, and not only saving water because if we're pumping water around to save it we're going to use extra electricity and produce more greenhouse gases. So it's all part of that general environmental equation. We've got to move to a conserver society. So in response to tonight's theme which was *Greywater: black or white?* I think really the answer is green.

Ms Melissa Fyfe

I just can't get over that 25 litres a day, that's quite astonishing. Very impressive but I think all the water retailers would go out of business, wouldn't they Tony? Yeah. A very expensive 25 litres.

Well thanks Eric, that's a lot of cautionary notes there about greywater but now I'd like to invite you, the audience, to ask questions or make a point about anything that the speakers have said tonight. There's a roving microphone out there somewhere, there's one over there and there's one on the other side. So if you could just please indicate clearly and we'll get one to you.



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Mr Ian Allen

Tony Kelly, Ian Allen, what you said about health is really paramount but as a water retailer you have responsibilities. You distribute water and you collect it and so forth and all that costs money. You have some fixed costs. Can you see a scenario where in the future people adopt the AAA appliances and make lots of savings and get to the point where you're not selling enough product and you have to raise your prices therefore reducing that economic benefit that you were talking about in your talk?

Mr Tony Kelly

The prices Eric just talked about some pricing there before. We've just changed the nature of the pricing. On the 1st of October the three step tariff was introduced with the highest level of the tariff \$1.30 a kilolitre whereas previously it was 79 cents a kilolitre. Now that's all about water conservation. So the Government's introduced that pricing. I think it demonstrates the Government's serious about water conservation and my business is serious about water conservation. We're in this for the long haul. The water industry is a long term gain. We're not necessarily interested in next year's profit, we're interested in the long term viability of the industry. Now if we get to the stage where we have to build another dam at some stage in the future, we wouldn't get the community support for that, it would cost us a fortune and we may not get the revenue to cover that so the best financial outcome for us as we move forward is to manage the demand down gradually over time and that's what's been happening. The per capita consumption in Melbourne has been dropping gradually since the last drought and we just need to keep going on that trend and exploit all the opportunities. There's no chance of a major step change that's going to give my business a financial shock. The community just doesn't react that quickly but if we can transition them down over, you know, 10 or 20 years down to much lower levels of consumption there will be very little impact on my business.

Comment from audience

Yeah, very impressed by what was said tonight, particularly on Tony and Clare's notes of caution. If I could say one thing. I work with greywater every day and if each of us here wants to do something to help the wider greywater projects out at Werribee and Carrum Downs to succeed, look at the household cleaning products you're using at home. A lot of these are full of salt and unnecessary ingredients. Generally liquid cleaning products of the less known brands, or less brand-orientated brands are a lot better and they'll improve the chances of major projects out of Werribee and Carrum Downs and other places around Victoria succeeding. But, we've got to be careful with greywater. We're running over 100 homes around Melbourne on an extended two year trial and it's been good but we have identified the key risks and we're currently working on strategies to ensure they don't have a negative environmental or health impact.

Ms Melissa Fyfe

Would anyone from the panel like to respond to that?

Mr Tony Kelly

I think that's spot on. I think, you know, in one regard the greywater I was talking about was domestic greywater recycling if you like, but clearly large-scale greywater recycling or recycling at a sewage treatment plant is definitely going to be part of our future. And that's where I believe it's best managed. Sure we manage the demand at the top end, it reduces what goes to the sewage treatment plants, that's important. Once its there we have to deal with it effectively and that's where the economies of scale work best in our favour, to produce something that's viable. And we can also put the management practices in place and the protection mechanisms to ensure that



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- we do it in the safest possible way as well.
- Question from audience This is mostly for Tony but to anyone on the board. The previous statement you made about your 10 to 20 year consumption graph, what are you looking at population and household growth for Melbourne as an example? Are we talking 500,000 homes, are we talking 100,000 homes? What's going to happen 20 years down as far as you being able to reduce the rate of consumption growth according to population?
- Mr Tony Kelly It's the biggest challenge we face. The Government is projecting another million people in Melbourne in the next 30 years and that's about a 30% increase. If we're going to service that additional population with a lower ecological footprint that's a major challenge for us.
- This graph shows the ecological footprint down the bottom axis and up the top and side is the GDP measure of wealth. Over on the middle right-hand side you've got Australia circled there showing that we have a very large ecological footprint compared to a lot of the other western countries even. And if you compare us with some of the developing countries, and down the bottom there you've got China and India who also want a share of the wealth, they want to go up that axis and increase their wealth as well. And if they go up that axis and do what we're doing there simply isn't enough planet to provide the resources for them to be in the same space. So there's only two solutions here. One is that we keep them down, the other one is that Australia reduces its ecological footprint. So the message I was trying to get across was, and when we're looking at all the alternatives be it water, energy, whatever, our objective is to reduce our ecological footprint, not to take a single-minded view about we've got to save our water or we've got to reduce our water consumption. It's about reducing our ecological footprint.
- Marcus, from audience Tony I was heartened by your comments about bringing energy into the equation and greenhouse and also the work that Yarra Valley Water is doing on reducing its energy consumption. This is a question for yourself and also for Peter. There's talk at the moment about taking water from the Eastern Treatment Plant and pumping it across down to Gippsland and a lot of this water would be used for brown coal fired power stations. I'm just wondering about the long-term feasibility of such a concept.
- Professor Peter Cullen Thanks Tony. I said in my talk that I didn't want to have any doctrinaire solutions and I don't think, we want to run around with fashions here. What I and others have advocated in a report to the Prime Minister's Science Council is we need to develop a sustainability scorecard so that we can really evaluate these options seriously, in the way Tony was talking, that, I mean, they're just wicked questions of how do you balance seagrass in Bass Strait with greenhouse impacts on Victoria and in Australia. And we can't get all those things into sensible dollar values so the normal cost benefit just doesn't really help us. All we can do is try to get the best predictions of each of those environmental, economic and social impacts and get them onto a table so that decision makers can make those tradeoffs. So what I'm asking for is really good analysis of all the options, very hard-headed analysis, so that we can make the best informed judgements we can. And that's where I am with that proposal, that it needs to be developed and put through that sort of scrutiny and then we'll see where it shapes up. But you've always got to look at, well for instance, desalination is one of your bottom lines with recycling. If you can desalinate, well if you assume the dollar



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values are okay for \$1.40 a kilolitre, why would you pay \$10 a kilolitre for recycling? So you've got that as a bottom line but none of those economic things are putting the greenhouse stuff into the equation properly. And I'm not sure we really know how to do that yet.

Ms Melissa Fyfe
Mr Tony Kelly

Are you going to attempt that one Tony or just leave that with a wide berth? Obviously Peter's talking a lot of sense there. I think that project provides a great opportunity to focus Peter's model. Now I think the Government's done the smart thing by setting up a project to assess the viability. I'm just hopeful that they'll use Peter's criteria to do that and that will be a magic learning exercise for the whole community. And we'll take, no matter what happens with that project, there'll be some learning out of that which will help us in all sorts of other areas.

Ms Melissa Fyfe
Comment from
audience

Another question. I have more of an observation really in that when you're assessing your pros and cons of greywater reuse what you're actually doing is putting greywater reuse into a box where basically it's just when a system gets installed. Whereas your good old invention is the bucket and that's something which counteracts the management issue, the energy issue and it's something that people can really have control of and there's not a health risk there, say, for example, you have to use rinse water from the washing machine so that's my comment.

Ms Melissa Fyfe

Yes, that's my system of greywater actually, me and my three buckets and I find it's good for the arms as well.

Ms Rachel
Olivier

Hi there, Rachel Olivier from the ATA [Alternative Technology Association]. I'm actually, I just wanted to step back a bit because what people tell us a lot is that actually they're passionate about water in a way they haven't been with other environmental issues. So with energy, for example, it's much harder to talk to people about it. And you alluded to us Eric that people like to tinker in their gardens, it's actually a really important way to engage them on a broader range of things. How important is it and how do we capture that aspect of greywater and water conservation that actually leads people to look at their whole house? How do you integrate that so that it can actually drive that much broader agenda?

Professor
Peter Cullen

I think that's the next step as far I'm concerned. All of the demand impacts that we've had have been with dual flush toilets and shower heads and a bit of education but none of it's focused on the outdoor use, on the gardens where there's 35% in Melbourne, 50% in some other suburbs. And yet you come into a drought and most utilities, and I don't know quite what happened here, but most utilities suggest you have an odds and evens watering. So they tell people to water every second day. Now no irrigator would water every second day, especially when water was scarce so we create some quite perverse understandings of water. You tell people to have a shallow watering every two days, which probably maximises the loss of water. So I'm hoping that in the Federal National Water Initiative there's quite an emphasis on a water smart gardens type element that, and Wendy's book's just come out so I think we're going to be building materials now to let people think about their outdoor water use and they're going to be able to make quite a lot of savings in there when they start to think about it and understand what they're doing. So I reckon that's what you're going to see over the next five years in the demand management thing.

Question from

Just a question about the desirability of raising fees on water. I can see why that



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audience

might create an incentive to use less water but perhaps planning a less optimistic view of the future and prices going up a lot. What problems does that pose in terms of people's access to water from a socio-economic perspective? You know, are they going to be forced to use these perhaps potentially dangerous greywater systems without the knowledge of how to do that properly or the ability financially?

Mr Tony Kelly

The new structure of the pricing in Melbourne is a three step tariff as I mentioned before. The top level is \$1.30 a kilolitre, the middle level is 88 cents and the lowest level is 75 cents, which is cheaper than the current flat rate of 79 cents. So there's a protection element built in there recognising that there's a non-discretionary element of water usage, which is fundamental to public health and that it's going to be cheaper in the future than it has been in the past. Where the penalties kick in is where the use becomes discretionary.

Ms Melissa Fyfe

In other words, if you have a big garden and a pool.

Professor

Yeah, I mean, I think we've had that. We keep hearing the social welfare issue and

Peter Cullen

that's why the stepped tariffs have been developed. Perth has a seven stepped tariff I think, so a much greater range. But I think we can protect the disadvantaged through that strategy. At the moment with uniform pricing, well we keep getting told its social welfare and we can't use price, those people tend not to be big water users. They don't have spas, pools or big gardens. And at the moment the poor are subsidising the rich and I'm sure some people would like to keep it that way but it seems to me the stepped tariff is the way to go to get more equity into the pricing.

Comment from audience

Hi, just on the issue of the rising block tariffs. I know it's a good incentive to not use as much water for the higher economical people but then it doesn't take into account the large families or communal living. So when you're looking at the ecological footprint, which is reduced by living amongst lots of people, that doesn't quite balance out. I was just wondering if you had any comments?

Mr Tony Kelly

For large households that are really struggling to pay the new charges, there is a special assistance program in place. For larger families normally, I guess, who are not struggling they end up actually paying a lower cost per head than a smaller household under the new pricing structure the way it works. So I think it's pretty good. We've also got very good hardship programs for customers who are really struggling and the essential services commission has recognised them as best practice. We don't cut anybody's water if they cannot afford to pay, we never cut the water off. It's only when there are customers out there who refuse to pay and can afford, that's where we start to get tough. But for those genuine cases, they never are without water.

Andreas

Sederof,

Sunpower

Design

Andreas is my name, from Sunpower Design. We've been in this business for nearly 25 years. The thing that strikes me most about what I've heard tonight is that there's a place for everything. And what I think really needs to happen and what we do is to try and integrate the design, the facilities, the plumbing, everything so that each of these systems: greywater, rainwater, reuse, the demand side of it being controlled. In my view, the most effective way that I think we can make an impact is that if we impact on all of these features and use the facilities that we've got in sensible ways so that we can in fact make the greatest impact in a way that's integrated. I think one of the things that's tended to crucify the sustainable industry in a broader sense is that it has been treated too much like a bolt on facility. Stuff's been done in an ad



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hoc sort of a way, you know, rather than seeing it as a total package. We use recycled clean greywater, we can meet the 30/20/10 rule quite easily. We use it sensibly in toilets, we use it sensibly in subsoil irrigation in a very limited and controlled way. We capture rain water off the roof. On a drought our clients can be 66% self sufficient on a good year. Like we've just had this month, my clients can effectively be better than 85% self sufficient in water, including greywater recycling. So I think we need to look at the whole picture, the embodied energy situation, the resources, the financial aspects of it, the whole shooting match. And I think one of the encouraging things about these sorts of forums, it actually highlights what can be done and how effectively it can be done and I think the other interesting thing that was just mentioned before was that what we've noticed is that the culture's changing. People are now aware that it's actually raining to the extent that my wife would run out and tap the tank and say, wow, I just put in 3,000 litres worth of water today, isn't that great. Or, it's sunny so I think I'll go and do the washing at lunchtime so that my solar hot water will in fact give me hot water for the evening showers. So this sort of awareness of what's going on around us, this sort of consciousness of shift is also just as important as the technical aspects of it. In fact, in my view, it is *the* issue. You know, without that sense of awareness and that involvement and that sense of participation we're going to be struggling. And because it is such a critical area of our survival, as far as global warming is concerned, I think it's really important that forums like this help us understand the sort of, you know, integrated approach to this business.

Professor
Peter Cullen

Well I'd agree with that totally. I mean I think it's interesting that later this month there's an international conference in Adelaide looking at water sensitive urban developments. And I think five years ago we used to talk about what are sensitive urban designs but then we realised we've got to get people to actually build these things so lets start calling them developments, not just designs. But there has been a problem as far as I can see and these ideas have been around for a while and there was some good demonstration projects. And we probably haven't had really good third party tough evaluation of them to spread the good word and to learn from them. But the planners don't seem to have got to grips with it. They sort of draw suburbs with textas on a map and then people come in and have to sort of retrofit when the original design is perhaps the wrong shape. So I think one of the really exciting opportunities now which I'm hoping through the Victorian Water Trust we'll be able to explore, is to encourage developers to work with the water authorities and with councils to come up with some really smart subdivision and the Trust will be interested in looking at some of those to help them along. Because I think we know how to put all those bits together we're just not getting enough runs on the ground where we're actually doing it.

Mr Tony Kelly

Can I add to that, just quickly. I support everything you've said as well. I think integration is critically important. We've got down here David Hunter from Coomes Consulting who did the design work for Aurora and there we're putting in third pipe recycling back into every property to flush the toilet. There's also a proposal that we're working up at CERES to use the rainwater system to go back through the hot water service. Now those sort of ideas are far more viable if they're built in at the ground floor, much more viable. To try and retrofit is just too hard.



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Ms Melissa Fyfe
Mr David Hunter

A few more questions.

Thank, yes. I'm David Hunter, the one he's just referred to, so I thought I should say Hi Tony. Just one issue which has been a subject of mine for probably the last 15 years, and that is the timing for putting in place the alternative solutions that we've all been talking about. And I agree and acknowledge that the issue of greenhouse emissions for any recyclable water scheme has to take into account those issues and the embodied energy and all those other factors which relate to sustainability. But I think we should also put on the table the convergence of technologies which are influencing the long-term views about what might be the solutions for water supply. And I talk specifically about renewable energy sources, the delivery of renewable energy sources which do not produce greenhouse gas. They are becoming more and more viable as time moves on. And I agree with the other comments that the community is much more aware of those issues and is much more supportive of supporting those initiatives in the longer term. When we look at the cities and the way they grow, and as Tony said, another million people coming into Melbourne over the next 30 years is a lot of housing, that's a lot of land to be consumed. And unless we start to take the steps now of putting in place the things that we're doing at Aurora and other places for recycled water, having in mind what the future energy sources might be in order to counteract those greenhouse issues and to look at the long-term sustainability equations, I think we should be moving in those directions as well. So rather than looking at what's happening now, let's look at in 30 years time when we've had that opportunity to put those things in place that we could now put the whole thing together. And, for example, if we had of started recycling from treatment plants 15 years ago, which is what our company was interested in doing, we might have actually changed our current water position by about 4% or 5% in terms of total storage capacity, which is a fairly significant volume. So I'd like the panel perhaps to comment on those sorts of issues.

Professor
Peter Cullen

Yeah, well you've raised a lot of very important points. Look, just the one I'll pick up has been, you know, we do run into the 'yuk' factor with any sort of recycling and when people's first reaction is, oh, it's alright for them but I don't want to do it. But the experience at Olympic Park for instance and in most of the other developments is people get accustomed to it and they become very comfortable with it. And Olympic Park's been a really interesting transition. They quite recently agreed as a community to have it in public open space fountains where kids are jumping in during the summer and dogs are jumping in and the community has decided that was a sensible and appropriate use of the water. And so I'm of the view that there's probably about a 10 year learning curve here as the community learns to accept some of these options. And whilst we're not in a critical shortage now as Tony says, we better start this bloody journey pretty quickly because there is that long lead time for people to get accustomed and learn how to use this stuff and for the design profession to learn how to do it safely and perhaps more cheaply than some of the earlier ones.

Mr Eric
Bottomley

Maybe if I could just add one thing too. Kelvin's here from the Innovation Commission and I mean, one of the great ways of disseminating these ideas is really through the schools. And there's a whole, you know, sustainable schools program developing around Australia which sees schools as demonstration centres of



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- environmental technologies, designers, behaviours, it's at the heart of the local community. So I think using established organisations like schools and sports clubs, churches, whatever, and particularly schools are centres to disseminate these things and getting investment in them, in water systems and energy systems and so on would really speed up the uptake of these ideas in the broader community.
- Professor Peter Cullen If I could just add to that. I mean the Federal Government in the last election did announce a \$200 million, a \$2 billion water fund of which \$200,000 is for \$50,000 grants to schools and community groups for water recycling, water reuse and these sorts of things. So that program's being designed at the moment and I'll guess we'll hear about it reasonably soon because there's quite a big spend expected this financial year, which I can't imagine how we're going to do everything.
- Ms Melissa Fyfe It's all happening. Okay, look, we're running a bit short of time. I'll just take one more question and you're quite welcome to come and ask us, the panel, questions at supper.
- Question from audience I've been involved with research for more effective use of water for many years and there's one system which just knocks everything else out in terms of a bang per buck and that's simply how we schedule our irrigation. On a household basis all you need is essentially an ice-cream container which you can use as a makeshift evaporation pan and when you irrigate to make sure the water goes around to, goes down to the right depth. Now the basic problem I see, these are such cheap technologies that anybody can adopt them but because they are so cheap there's no mechanics for getting the information of how to do this out to the general public. Has the team got any ideas of how we can educate people to schedule their irrigation better?
- Professor Peter Cullen Well as I indicated, I mean I think that's going to be the next thrust towards a public education demand management I think over the next five years because that's where all the savings are, as you say, teaching people how to do it and giving them smart technologies. And letting the automated systems actually do it. Some of those don't have the right time cycles to smart watering.
[end of audio]

Greywater Forum Panelists

Professor Peter Cullen, AO, Fellow of the Australian Academy of Technological Sciences and Engineering

Peter Cullen is Chair of the Victorian Water Trust Advisory Council, and a Director of Land and Water Australia. He is one of the Wentworth Group of Concerned Scientists who seek to raise public awareness of natural resource issues facing Australia.

Tony Kelly, Managing Director, Yarra Valley Water

He has spent nearly 30 years in the water industry. As a strategic planner he has been involved in major reforms in the water industry. He chairs WaterAid Australia, a charity which aims to provide clean, safe drinking water and sanitation services to developing countries.



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Dr Clare Diaper, Research Scientist with CSIRO Urban Water

Her work in the UK incorporated social and risk assessment of greywater and rainwater technologies. She is currently monitoring performance and assessing the risks of single house greywater treatment processes.

Eric Bottomley, CERES Sustainability Projects

Presently his major preoccupations are establishing a \$0.8 million water project at CERES (and a \$200 water program in his own house!) and designing and implementing the CERES/Gould League Sustainable Schools Program, which is a pilot for the whole of Australia.