

ISSUE
03

December
2011

NEWSLETTER OF THE
LAKESWATER QUALITY SOCIETY
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LakesNews

Lakes**WATER**
QUALITYSociety

this issue

To "Fix a Lake and Grow a City" was the theme of our 2011 Symposium. Improved water quality for the Rotorua lakes is our 'reason to be' and changes to pastoral land use will likely be part of the solution. However, the Lakeswater Quality Society also recognises the huge contribution of agriculture to the local economy. Change will be required but as a community we all have an obligation to ensure that in the process we build and not deplete. Rotorua needs innovative, inspired and exciting leadership if we are to grow and prosper in a sustainable way. This issue of LakesNews updates the ongoing excellence in research and lake restoration work, but particularly highlights our Visions for the Future of Rotorua. We invite you to check out our website for the complete papers on these topics. *John Green, LWQS Chair*

Inspiration from Vaxjö, Sweden

Bo Frank is the proud Mayor of Vaxjö in southern Sweden. He has been a city councillor from 1976 at 20 years of age and Mayor more or less since 1991.

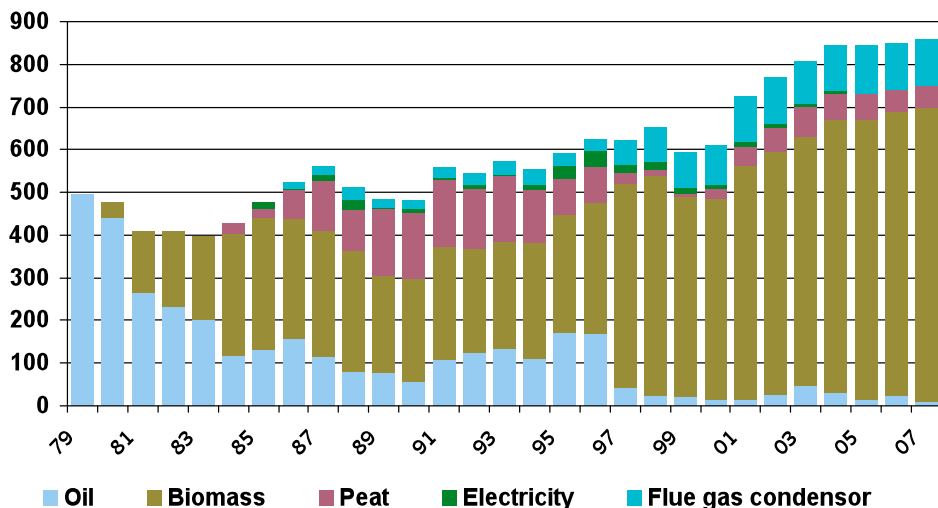
Compared to New Zealand the Mayor's job is more stable since in Vaxjö people vote for the party and civic leaders generally enjoy majority support. One of the reasons for the success of Vaxjö as the Greenest City in Europe is that all political parties over the last forty years have agreed on environmental issues.

Vaxjö is a small university city with 200 lakes (mostly small) and 83,000 people. Bo Frank's ambition is for all citizens to be

within walking distance of a beautiful lake where one can swim. In Vaxjö, all new homes must be wooden with triple-glazed windows.

The entire city is heated by bio-energy, and both heat and electricity are centrally produced. 58% of all energy consumed in the municipality is from renewables. The city's lakes were once as badly polluted as Rotorua's. In the 1960's Vaxjö began restoring them. In 1996 there was a unanimous political decision that Vaxjö would become a 'fossil fuel free city'. Their stated goal was that emissions of carbon dioxide from fossil fuels shall be reduced by at least 50% per capita by the year 2010, and 70% by 2025, when compared to emissions in 1993. By mid-2009 they had achieved a 34% reduction. At the same time, Vaxjö has enjoyed strong economic growth.

The adjacent graph tracks a change from oil to biomass for the production of heat and electricity – and the city has much in common with Rotorua. It is surrounded by many small lakes, and much forestry; it has a population of 83,000 (Rotorua 65,901 at the 2006 census). The average temperature is lower than in Rotorua (6.6 vs 12.8 degrees), with an average minimum of minus 5 degrees (vs. Rotorua at 8 degrees), and an average high of 22 degrees (vs. 18 degrees). What else can Rotorua have in common with Vaxjö by the year 2050?



Dare to Dream

John Sax is creator of the *Treetops Lodge & Wilderness Park* in Rotorua, an internationally acclaimed wilderness retreat. His message is a ‘love story’ about people – we cannot love the lakes by ourselves or without our people. We must ‘become the spirit’.

- Grow a ‘Dream Team’
- Get the ‘right’ dreamers – not day dreamers, but rather people with passion and wisdom
- Create a ‘Can Do’ environment – particularly within district and regional councils
- Incentivise – look at ways of providing constructive incentives in your strategies, then encourage your team to ‘do it’
- JUST DO IT!!

What shall we be?

- A place of Inspiration
- A place of Relaxation
- A place of Rejuvenation
- A place of Great Memories
- A place of ‘Love, Joy and Peace’

A great story

- Geothermal
- Biofarming Trees
- A New Era of Land Use
- The World’s Greatest Living Communities

What about ...

- Lake hiking trails
- Glamping (glamour camping)
- The greatest mountain-biking trail in the world – Mamukus to the coast
- Eco-trekking – with the best eco-guides in the world

Tomorrow’s Tourist

Tony Marks was Air NZ’s international general commercial manager for nine years. He is current chair of Rotorua’s new Tourism Committee, and a guest presenter at the LWQS Symposium.

“The rise of the package holiday and the bucket and spade culture, has led us to believe that travel is about jetting off for two weeks to experience the four S’s – sun, sand, souvenirs and if you are lucky sex”.

(Justin Frances)

Tourism now involves ‘deep travel’ - getting under the skin of a place - the things that make a place unique and special. Tourism in the future will not be ‘watch and see’, it will be ‘participate, engage, and understand’. These days it is not the ‘where’ that is important, it is the ‘why’ and ‘how’.

We have already tried to seek out authenticity, real experiences rather than those fake culture packages for tourists, but travel in 2020 will go further. It will be about the appreciation of local distinctiveness, the idiosyncrasies and the detail, the things that make a place unique and special.



Soft and hard adventure, an emphasis on health and wellbeing and appreciation of the awesome power of nature, all overlaid with a physically impressive setting and infused with Maori culture. Rotorua has all the ingredients to meet these future tourism needs. All we need is to assemble the ingredients and make a very distinctive cake. We have the assets. We do not need to invent reasons for coming; we just need to play to our strengths.

Bath in England, was a famous hot water spa from AD 60. 1,700 years later, it was the pre-eminent social city in Europe, based on taking the waters. Bath is still very famous and attracts about 400,000 visitors a year. Rotorua has the potential to be the most famous hot water spa city in Australasia.

How do we do this?



Farming People - Exurban Development

Dr Elina Irwin is the Professor of Environmental and Development Economics, Ohio State University. Her paper engaged a new concept in rural growth known as ‘Rurbia’. “While much of the central USA is facing declining population, there is a trend for growth where there are natural amenities of lakes, mountains, coastlines and areas of natural beauty. The growth is not fuelled by people that are connected to any kind of employment in an urban area, rather people that are footloose and fancy free. Retirees make up a large proportion of the growth in these areas. Rurbia attracts a lot of residential upscale development, often second homes. Along with this kind of development comes the services to create the playground for wealthier families moving into these areas. Rural landscapes include golf courses, health and wellness spas, wineries etc. This rural landscape is not as ubiquitously developed as exurban areas, but is developed looking rural but with this hidden upscale development.”

Rural growth leads to increased rural-urban interdependence. The two factors that have tilted the favour towards Rurbia are the declining communication costs and the proximity of scenic amenities. “We no longer rely on face to face communication, instead we substitute it with

information technologies, which allow people to be much more mobile than they have been in the past”.

The new economy is very different and service based. Information and creation of knowledge are the drivers of growth. It is important to note that it is not only that households follow firms, but firms follow households, which explains a big part of the rural growth. Households look for quality of life, high quality amenities and public goods, and these can be found in the rural areas.

“In the USA, a primary reason why Rurbia has been growing is because the number of retirees in the USA has grown tremendously in the last decade and will continue to grow for the next decade.”

Dr Irwin also noted that the water quality of Lake Erie has significant effects on housing values and households are willing to pay for improved water quality. “From a planning perspective it is absolutely critical that development allowed to occur in these areas is both selective and protective. It is not any type of growth because it is essential to preserve the rural nature and natural amenities, the very assets that have attracted the growth in the first place.”

Rurbia



Rurbia is a combination of rural, urban and suburban, located in places with high quality environmental or rural amenities, not next to, or adjacent to an urban area. It could perhaps be the revival of a rural town or region, ‘located far away from urban and suburban development’.

Exurbia



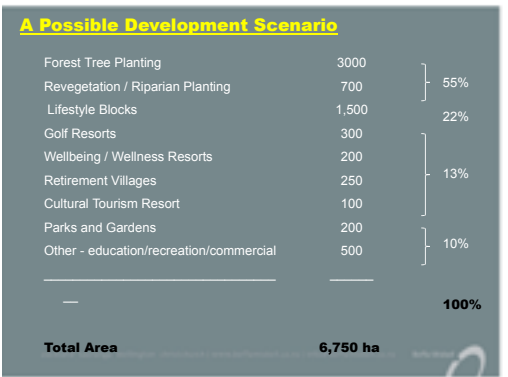
Exurbia, or exurban development, are regions on the outskirts of urban and suburban areas but within the commuter-shed of a metropolitan area.

A Possible Development Scenario for the Rotorua District

Frank Boffa is a landscape architect, thinks spatially, and has a dynamic interest in how rural residential and lifestyle developments might be promoted and developed within the Rotorua catchment. Some land use change is widely regarded as a critical component of meeting water quality targets for Lake Rotorua – perhaps 30% of the pastoral area of the catchment may need to be retired, equating to about 6,750 hectares, which is not an inconsiderable amount of land.

Adjacent is just one ‘what if’ development scenario. If half of the 6,750 hectares went into forestry planting and 700 hectares was re-vegetation and riparian planting, we could market 1,500 rural residential blocks in ten years, some of which could be incorporated within golf resorts, wellbeing and wellness resorts.

These seem to be all the rage overseas and there is no reason why Rotorua cannot capitalise too. People pay thousands of dollars to plaster their body with mud, so there is a market – but it must be done in a very sophisticated and profitable way. It is a way of growing the district; it creates jobs and opportunities.



How to grow the Rotorua District

- visionary and innovative planning
- focus on outcomes that achieve environmental goals
- leadership at all levels
- public support and commitment
- greater flexibility and certainty in regional and district plans
- simplification of consent procedures and processes
- innovative economic incentives and funding, an important one in this instance



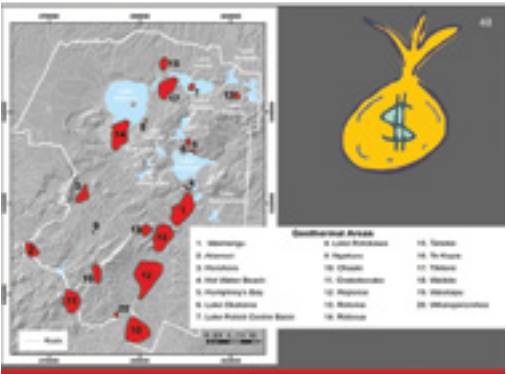
Huge Potential

New Zealand is endowed with significant geothermal resources which are sought to be further developed under a New Zealand Energy Strategy (NZES) to 2050 seeking to increase the nation's use of renewable low carbon energy sources. The Rotorua area is particularly well endowed. As part of the NZES, there is potential to increase the use of lower temperature geothermal resources. By 2025 a target of 12 PJ per annum of direct use has been suggested. This represents an increase of 2 PJ per annum from the estimated 10 PJ per annum usage in 2005. The understanding across the New Zealand public on low temperature geothermal resources is however generally poor.

Geothermal Opportunities

What can be done with geothermal energy? We are on a massive growth path which is projected to continue. Some can be converted to electricity given the right circumstances, but it can also be used directly as heat energy. This is growing in popularity, both in New Zealand and around the world. There is another aspect which people have not really caught onto so much in New Zealand but its growing in the world rapidly. Sweden has taken a massive lead in the field of ground-source heat pumps, and ground energy. The term GSHP applies to ground source heat pumps: or GHP, meaning ground heat pumps. This may be new for some because it is a different way of thinking, in terms of where energy is, how we can access it and how we can use it.

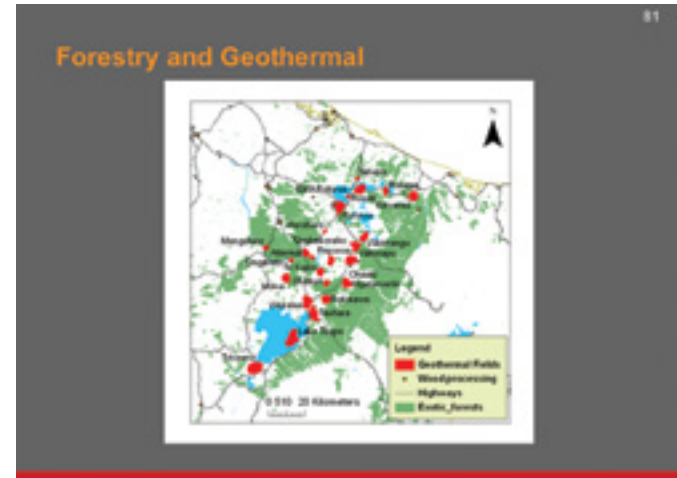
Where will we be in the future? Will heat be produced as we do today and then just thrown away to flow into the atmosphere? Or will the heat sources be connected, and heat pumped back to a place where it can be used again? Will this store and recovery mode be achieved? New Zealand is now wasteful in its approach to energy: we use and lose it.



The above image indicates that the Rotorua district is well-endowed with geothermal energy - it is extraordinarily lucky. Few places in the world have as much. There are twenty fields of known geothermal resources in the area. In addition there is the 'regular old land' as well and a lot of water.

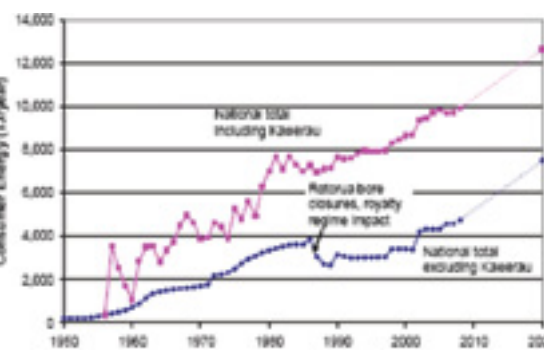
Terms and Units

In energy we talk about capacity, which is basically the size of something. At home you may have a two kilowatt heater. The units are kilowatts. With power generation megawatts and gigawatts are involved, and on the world scene the units are terawatts. These are all a factor of a thousand bigger than the next lower on the scale.



There are synergies for forestry and geothermal because of the co-location of geothermal resources and New Zealand's largest plantation forest area (adjacent image). Within a 75 kilometre radius of Reporoa in the centre of the Taupo volcanic zone is a potential sustainable harvest of 5 to 10 million cubic metres per year, about 24 to 30% of New Zealand's total harvest. The green on the map is forestry, and the red geothermal - it is obvious that there has to be some way that they can be put together. Direct heat has been used at Kawerau since the 1950's, work is going on in Tenon, and there are some kilns at Ohaaki.

Growth in Direct Use of Geothermal Steam



Ground Source Heat Pumps

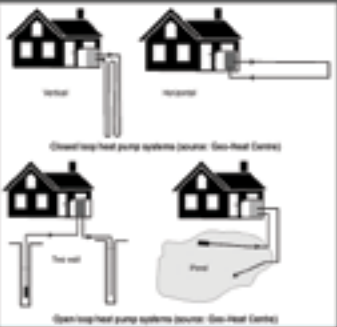
Ground can contribute to

- Space heating
- Space cooling
- Water heating

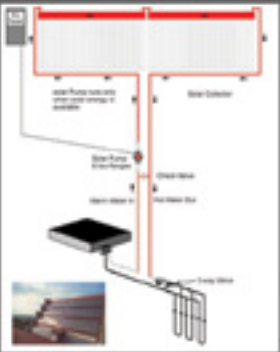


Heat Pumps

GSHP can be installed at any location



- Combined solar and GSHP
- Coefficients of performance of 6



Heat pumps can pump heat from the ground into a building. There is a loop arrangement in the ground, a heat distribution system in the building and fluid is circulated through the ground and back to a unit called a heat pump. Essentially it is a refrigeration device, with a refrigerant in it, driven through a compressor powered by electricity. It pumps heat from the ground, from a cooler source temperature, to an area where it is required at a hotter temperature. These systems work with the ground as an energy source. They can be used for space heating, space cooling and water heating. They can be installed in any location. Loops do not need to be horizontal: they can be vertical, drilled into wells, as is done in Sweden. A system which uses aquifers can be used, taking water from one and putting it into another, and using the heat in the water as the source of heat for ground source heat pumps. A pond can be used, as can the sea; they are just a source of energy.

Hybrid technology is also possible eg. combined solar and ground-sourced heat pump. The co-efficient or performance of this device (ie. the input of electrical energy compared to the output of heat energy) is from one kilowatt hour of electrical energy and six kilowatt hours of heat energy are produced. This is an arrangement which uses a combination of solar panels and a ground source heat pump. These systems are being developed, and in the UK there are examples running with a '6' co-efficient of performance.

Geothermal Energy

- Convert to electricity
- Use directly as heat energy
- Ground source heat pump (GSHP) or ground heat pump (GHP)

Releasing Potential Value

- Geothermal Heat used in a Bio refinery
- Releases lignin for higher value chemical products
- Produces biofuels for transportation

Three Research Programmes at GNS

- Low temperature geothermal
- Hotter and deeper bores
- Bioethanol from thermophilic bacteria

Why wait ?

- Find a bit of
 - hot water
 - biomass or
 - even a bit of regular old ground
- Enjoy the synergies
- Change the District

Geothermal Heat Releasing More Value

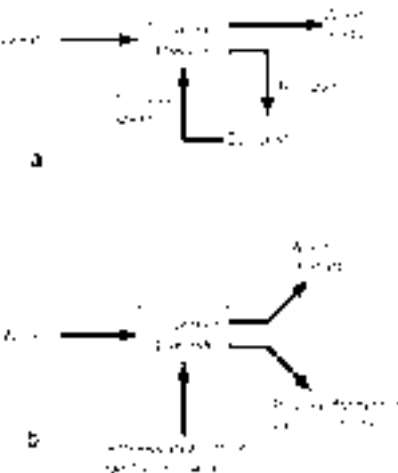


Figure 2.12) Conventional wood processing plants, run on slash are used to provide process heat for 1000 tonnes of wood from geothermal heat, allowing products to become available for higher value uses.

Earth Energy: accessible; reliable; renewable



will help New Zealand meet future energy demand.

Map of Lake Rotonga showing Mean Water Residence Time (MWRT) for various catchments. The map includes a scale bar (0-20 Kilometers) and labels for eight streams with their respective MWRT values: Kaitohu Stream (41 Years), Hamurana Stream (130 Years), Waikato Stream (60 Years), Waikarewa Stream (40 Years), Ngongofana Stream (10 Years), Waikarehu Stream (42 Years), Uruhera Stream (45 Years), and Waingaithe Stream (127 Years). The map also shows land use categories: Urban built, Shrubland, Water, Exotic forest, and Indigenous forest. A legend at the bottom explains the symbols for Flowing Streams, Lake/Rotonga Catchment, and Stream Age.

A scenic view of Lake Rotorua under a clear blue sky. The water is a deep blue-green, and a small island is visible in the distance. Several small, dark objects, possibly birds or small boats, are scattered across the water's surface.

Lake Rotorua

- Partnership
- Target
- Science
- Technology
- Collaboration
- Regulatory framework
- Incentives



Lake Rotorua – TLI 4.7

- 2000 rural landowners
- 50,000 ha
- Travel times in decades
- Magnificent city
- Spiritual icon



Regional Policy Statement

- All lakes 'at risk'
- Limits N to 435 tonnes for Rotorua
- Policies to drive reductions
- Regional Land and Water Plan rules

What is the good news about Lake Rotorua?

Targets – nobody is really disputing the targets the way they were. A limit of 435 tonnes a year of Nitrogen discharging into Lake Rotorua is about

Incentives – we know policy and regulation will not work on its own. We are working with experts to develop at least three packages of actions to reduce nutrients, and the first off the blocks is a Nutrient Reduction Fund aimed at making funding available for land-based nutrient reductions for Rotorua land-owners.

Lake Operations Manager, BOP Regional Council

P locking plants

- Alum dosing
- In-stream
- 2 T per year P removal
- \$250K capital
- Puarenga/ Utuhina



They are relatively cheap plants to build, around \$250,000 capital, but relatively expensive to run at around \$400,000 to \$500,000 a year in chemicals. However alum seems to be the only product that we can buy now that is reducing in price. It was over \$400 per tonne last year, now \$330 per tonne, so that is good news for our programme. Alum is a very common lake treatment chemical overseas, particularly in North America and Europe. In many locations alum is dosed directly into the lake water to lock-up phosphorus in the water column and assist in locking up phosphorus released from lake bed sediments.



Tikitere

- Geothermal N input
- 30 T N per year
- Pilot plant
- Off-stream denitrification
- Long term treatment design



THE BOTORUA LAKE
Protection and Restoration Action Programme

Timber Value to the Region

- Sawn timber exports were up 16% for 2010 to \$842M
- 45% of all logs and timber goes through the Port of Tauranga

Engineered Timber

There are opportunities to go beyond our conventional light timber frame into commercial, industrial, government buildings and multi-story residential. We can make better use of our timber and add value.

Opportunities in Timber

Hugh Morris, Auckland University

Our industry is producing very good wood from an excellent sustainable resource that is widely used in New Zealand house construction but there are major opportunities for growth in commercial and multi-storey construction. The success of light timber framed housing in resisting earthquakes has been seen in Christchurch. The benefits of resilient light weight engineered timber are also significant for commercial buildings. To expand the New Zealand market and to add value, our sustainable timber needs to be used in more

commercial construction. Cross laminated technologies and new connection systems are used internationally and have real potential for New Zealand and Australia in rapid erection offices and multi-residential structures. The innovations of the Structural Timber Innovation Company have developed new local technology for long span and multi-purpose high rise construction as demonstrated in the first post-tensioned LVL NMIT building in Nelson. The future for NZ is bright if these technologies are applied.



What we are doing is exporting primarily at the low end of the value added spectrum. I would like to see us heading for that high value target right at the top of the apex. We are exporting \$4billion worth, but there is opportunity for \$10billion in added value, and Rotorua is in a prime position to get a good part of that.



LakesNews Issue No.3 December 2011

The Magic of Timber



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