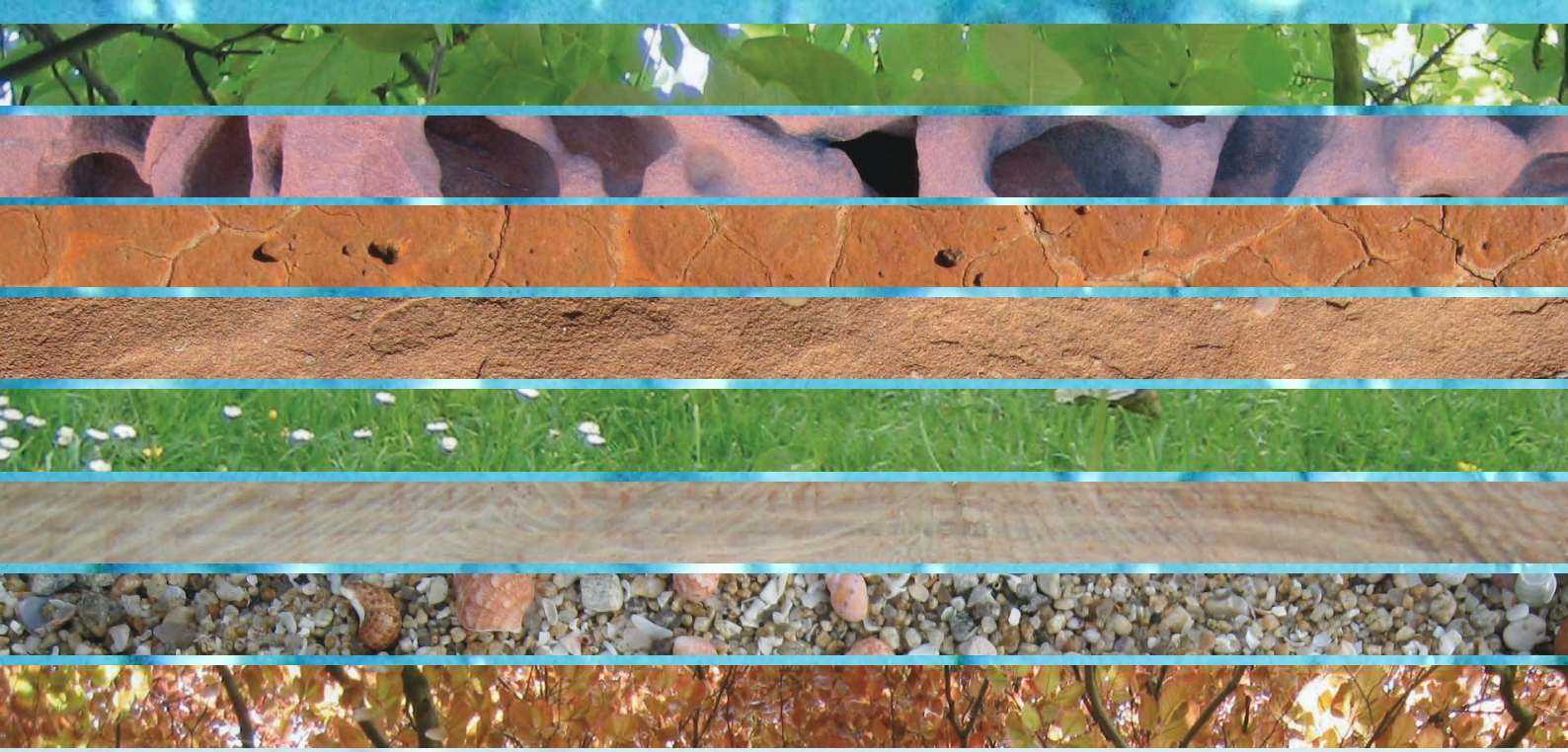
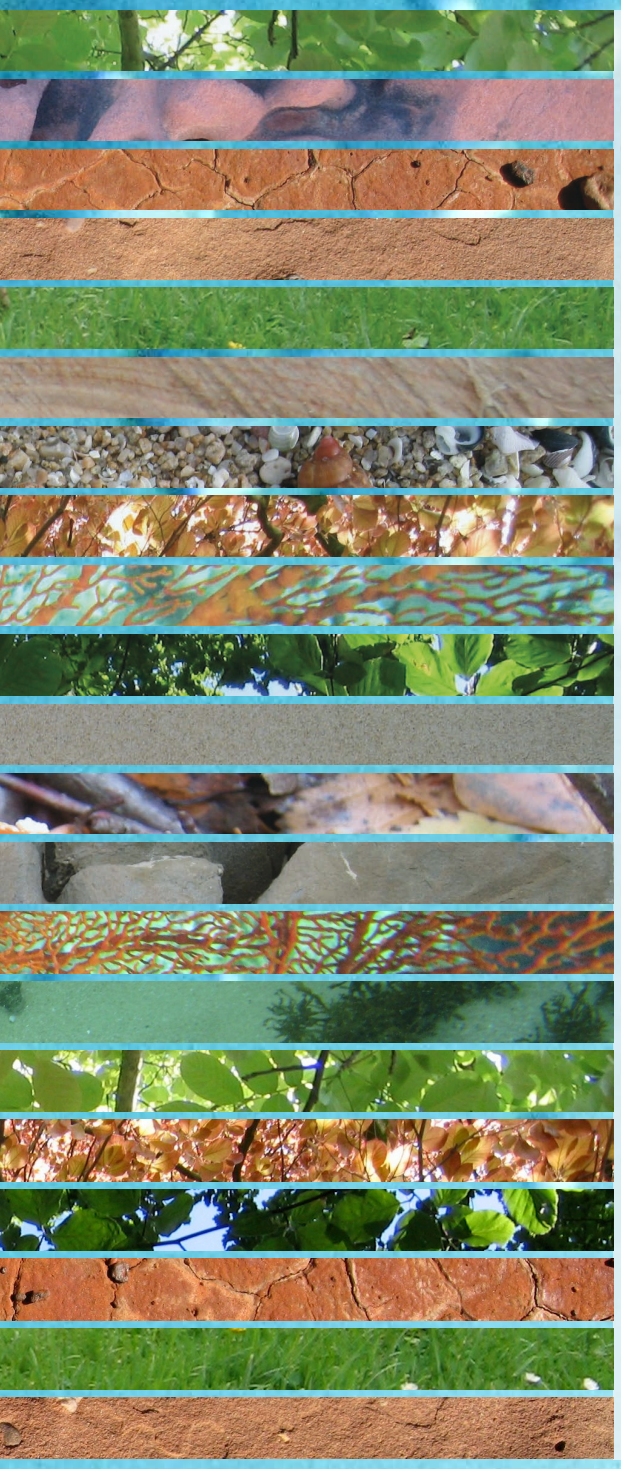


Rural HCI *Distributed Interaction on a landscape scale*

Full day Workshop at OzCHI, 29 November 2011, Canberra Australia

Bert Bongers, **Jon Pearce**, **Stuart Smith**, **Tarsha Finney** and **Elise van den Hoven**



Rural HCI

Distributed Interaction on a landscape scale

Full day Workshop at OzCHI, 29 November 2011, Canberra Australia

Rural HCI is about distributed interaction and the notion of UbiComp stretched to a rural and landscape scale. The workshop's aims are to investigate the implications of HCI on such a scale, and establish heuristics, insights and theoretical frameworks specific to this theme. Due to Australia's geography and particular inhabitation rural HCI is particularly relevant. Although the majority of Australia's population lives in urban areas, most of the country consists of rural areas and this is a defining element of the Australian culture. Applying design approaches of distributed interaction and UbiComp paradigms to rural situations can lead to many new insights and open up new solutions.

Organisers:
Bert Bongers (University of Technology Sydney, School of Design)
Jon Pearce (University of Melbourne, Dept. of Information Systems)
Stuart Smith (Neuroscience Research, Sydney, Australia)
Tarsha Finney (University of Technology Sydney, School of Architecture)
Elise van den Hoven (Eindhoven University of Technology, Dept. of Industrial Design)

Possible topics:
agriculture, distributed energy generation, perma-culture, sub-urban scale interaction, landscape design and art, remote presence, distributed energy storage, sustainability, pollution, tele-health, remote rehabilitation, social and cultural issues related to rural and outback, gardening, bushfire prevention, water management, remote sensing and actuating, multimodal interaction paradigms, social net-working, energy harvesting, technical factors: long range wireless and mesh networks, national broadband network (NBN), geographic information systems (GIS), navigation (including GPS), map-ping, information representation, indigenous cultures attitudes and knowledge relating to the land, artistic practices and responses to sustain-ability.

Workshop web site: www.educ.dab.uts.edu.au/interactivation/RuralHCI/

Contact: Bert Bongers: *bertbon@xs4all.nl*

Rural HCI - *Distributed Interaction on a landscape scale*

Workshop papers overview

Bert Bongers

Interactivation Studio, Faculty of Design, Architecture and Building, University of Technology Sydney

Rural HCI – Design and Distributed Interaction on a Landscape Scale

Jon Pearce

Interaction Design Group, Department of Information Systems, The University of Melbourne

SmartGardenWatering and Rural HCI

Francesca Veronesi

Faculty of Design, Architecture and Building, University of Technology, Sydney

Living Streams, The Making of Sydney's Georges River Augmented Reality

Marcus Foth, Christine Satchell and Greg Hearn

Urban Informatics Research Lab, and ARC Centre of Excellence for Creative Industries & Innovation, QUT

Urban Informatics for Rural Knowledge Economies

Morten Breinbjerg Rasmus Lunding, Tobias Ebsen & Morten S. Riis

Center of Digital Urban Living, University of Aarhus, Denmark

Interfacing CO_2, the villain of climate change

Stuart Smith, Jamie Lennox, Thomas Davies

Neuroscience Research Australia

Interactive, NBN-enabled telehealth technology: delivering health services to regional, rural and remote Australia.

Jacqueline Gothe

Visual Communication Design, University of Technology Sydney

Communicating Fire Building Relationships & Creating Change

Reading Country

Rural HCI – *Design and Distributed Interaction on a Landscape Scale*

Bert Bongers,
Interactivation Studio,
Faculty of Design, Architecture and Building
University of Technology Sydney
bertbon@xs4all.nl

Abstract
Rural HCI is about distributed interaction and the notion of ubicomp stretched to a rural and landscape scale. The workshop's aims are to investigate the implications of HCI (Human-Computer Interaction) on such a scale, and establish heuristics, insights and theoretical frameworks specific to this theme. In this paper a number of key themes are proposed, as starting points for discussion and development during the workshop's programme. Most of the themes are illustrated with submissions of the workshop participants.

Introduction
Computer technology over the past decades has become increasingly small, and at the same time increasingly networked. Within the discipline of HCI, several fields are concerned with interaction with such a distributed computing environment, such as Ubiquitous Computing (UbiComp), Pervasive Computing (IBM's term), Ambient Intelligence (Philips' term), and The Disappearing Computer (EU Project).
Whereas most of the UbiComp research concentrates on the home and work environments in urban areas, more research is needed into the possibilities on the rural and landscape scale. Rural HCI is where the electronic ecology meets the natural ecology and human-made landscape. For instance, the ecological stance of permaculture is very much about distributed (rather than centralised) food production and consumption, and system design with shorter and more sustainable loops. The currently very relevant discussions around the de-centralised energy production follow this approach too. These are examples of approaches that lead to more efficiency, less waste and generally contribute to the sustainability of practices. Rural HCI aims to bring together these important social, cultural, technical and conceptual approaches with a structured response from the field of interactive technologies, a tendency of the OzCHI conferences in general. In this case it is specifically about matching the distributed approach of UbiComp technology to the distributed approach to larger problems in society.
In rural and landscape scale HCI, a number of issues are similar to those researched in the field of Ubicomp, but it also brings its own problematics and specific issues related to scale.
Due to Australia's geography and particular inhabitation rural HCI is particularly relevant. Although the majority of Australia's population lives in urban areas, most of the country consists of rural areas and this is a defining element of the Australian culture. Applying design approaches of distributed interaction and ubicomp paradigms to rural situations can lead to many new insights and open up new solutions. Examples are agricultural applications, or bush fire detection (early warning) systems using distributed sensing on a large scale, water management systems etc.
More importantly, this research field can (and should) be extended to situations in developing countries. Most technology seems to be developed with Western (particularly US) office and home workers in mind, but design disciplines and the HCI research field have already pushed the boundaries and many further opportunities and issues in designing technologies for developing countries need to be explored.
The workshop aims to bring together researchers and practitioners in the field of rural-scale interaction, in order to establish what these issues are, and how to approach the problematics. The objective is to establish new guidelines and heuristics, practical knowledge, and theoretical frameworks.

In the following section several themes are presented, most of which are reflected and discussed in the participants' papers. These themes are meant as a starting point for discussions in the Workshop programme.

Sustainability and the environment
Better interfaces can help people to use less energy, and better design can lead to less waste. Interactive Audiovisual installations can also contribute to the awareness of the public on environmental issues, as demonstrated by the piece *Atmosphere – the sound and sight of CO2* presented in a paper by Aarhus researchers Morten Breinbjerg et al, which represents CO2 levels in various urban locations (previously Copenhagen, and in November 2011 in Sydney). Another example are the interactive bins I recently made for the Total Environment Centre for the launch of their *Waste Not* documentary in April 2011 in Sydney, translating the movements of people around the bins to kaleidoscopic video patterns using audiovisual material from the documentary. The bins contain a computer, loudspeaker, interface and proximity sensors, and in some cases a battery and power convertor to have the whole installation run independently of the mains supply.

Distributed energy infrastructures are also a way of contributing to more efficient energy usage. In the current centralised energy generation a lot of loss is introduced due to the long distribution channels.

Tele-health
The paper by Stuart Smith et al from Neuroscience Research Australia gives a number of examples of how interactive technologies can be used to improve the connection between health practitioners and patients in remote areas. The new National Broadband Network, currently being implemented in Australia, is potentially a great catalyst in enabling these applications, such as remote support for physical rehabilitation, health monitoring, aged care and independent living. Stuart and I have contributed research position papers and demos at the SmarhHealth workshops and demos at OzCHI since 2009.
Another good example is the CSIRO and ANU project about tele-health technologies, the Remote Immersive Diagnostic Examination System, a fully integrated multi-stream video (incl. 3D) set-up between medical staff and patients.

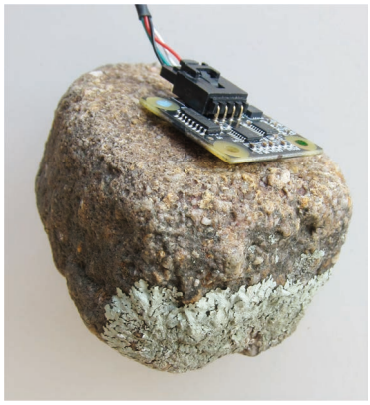
Agriculture
In the context of Rural HCI the agricultural practice of permaculture stands out, as it is a good example of a decentralised and sustainable approach. Among other things, permaculture emphasises decentralised food production, with much shorter links to food consumption. Distributed sensing could improved agricultural practices, by refining the farmer's knowledge of environmental parameters such as temperature and humidity, and possibly even chemical and biological situations of plant diseases occurrence, in gradients rather than course locations. A lot was learned during a visit to the Milkwood permaculture farm near Mudgee in rural NSW, and research issues identified such as the distributed sensing (and actuating, ideally). The contribution from Jon Pearce from the University of Melbourne about the SmartGardenWatering project is a good example of how sensing and improved information representation can be applied, albeit so far mainly in urban setting for various reasons but the potential for rural applications is explored.

Indigenous knowledge and culture
No exploration of Rural HCI in Australia can take place without attempting to understand and include aboriginal knowledge and attitudes towards the land. The workshop contributions by Jacqueline Gothe of the

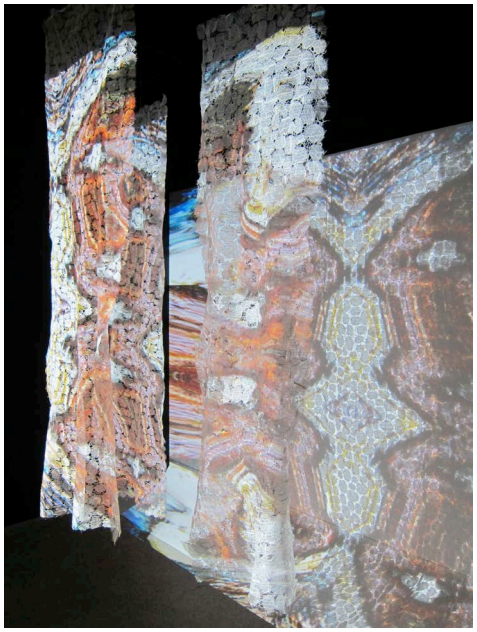
UTS School of Design are based on years of collaboration with aboriginal communities on preserving cultural knowledge, including the Traditional Knowledge Revival Pathways project with Victor Steffensen, who was present at OzcHI in Cairns in a panel discussion on *Indigenous Led Digital Enterprise*.

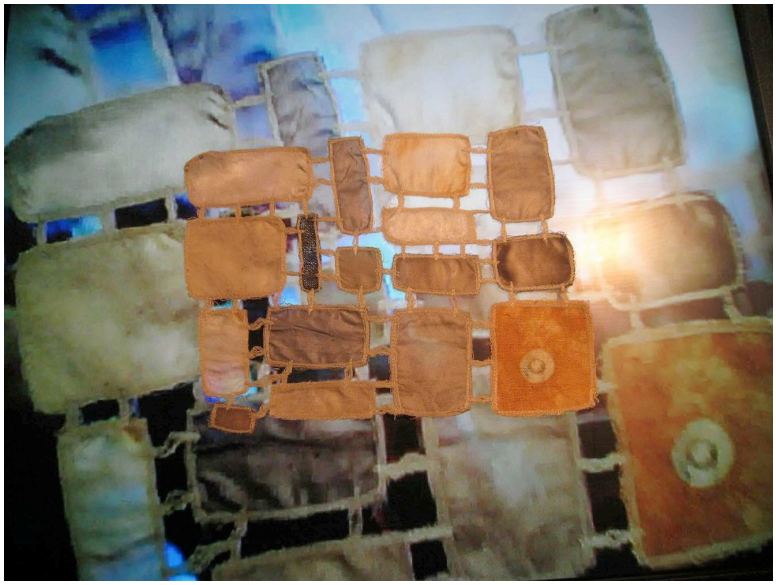
Landscape art

Another area of important views and attitudes towards the rural environment can be found in artistic explorations. Art generally has the potential to change the spectator's perceptions and concepts about the world, and land art is full of great examples that profoundly investigate the relationship between the man made and natural environment. Well known examples are Richard Long, Christo, Andy Goldsworthy, David Nash, Antony Gormley. and James Turrell. One aspect of land art is how the natural environment gets altered, and then how this can be translated back to an audience (if they can't be present in the first instance). Various strategies have been employed, from bringing driftwood into the gallery (Long), exhibiting structural elements of interventions in nature (Christo) and generally producing impressive photographs and video material. From my own earlier explorations of bringing live video projections to nature (in Catalunya, Spain in 2003) I know the relevance of good documentation. The *Facets* range of interactive kaleidoscopic video projection pieces I have developed since 2009 (and presented in this year's OzCHI conference in a demo and a short paper) always had a strong presence of the natural environment, the basic video material consists mostly of patterns and flows captured from nature. The physical interfaces also aim to connect to nature, by using mostly wooden objects. This approach is explored in more depth in recent projects that bring actual objects from nature, re-establishing the physical connection between objects and photographic or video material through the interface. This will be illustrated during the workshop.



A recent collaborative interactive work with Cecilia Heffer, textile artist and designer, InterLace, consisted of intricate lace panels which are projected on with video imagery. Both the lace patterns and the video footage are derived from the same sources of inspiration, the Australian landscape, in some cases down to the individual pebbles of a South Australian coastal region. This piece is part of the Love Lace exhibition at the Powerhouse Museum in Sydney until April 2012. Another piece we are developing takes Cecilia's Landscape small scale lace pieces and extends them with video feedback and manipulations.





The *In the Balance – Art for a Changing World* exhibition and publication from the MCA in Sydney in 2010 showed a number of artistic responses to landscape and the environmental dialogue.
Francesca Veronesi's contribution *Living Streams*, a paper about the representation of cultural heritage around George's River in the Sydney area, is a good example of the role of augmented reality as an extension of the land.

Conclusion
There are specific threats and opportunities related to rural applications of new technologies, which we hope to identify and discuss in more detail during the workshop. In rural Australia people are often very unconnected with digital technologies such as the internet and even mobile phone networks due to the long distances, relying instead on analogue (short wave) radio, and the 'bush telegraph' of actual real encounters between people. An opportunity however is the fact that digital wireless networks and radio signals (WiFi, Bluetooth, ZigBee) have a greater reach than in the urban environment, where there is much more interference due to the high density of electronic devices (WiFi and cordless phones operate in the same band, for instance). Rather than approaching the rural areas with a centralised approached, where one base station has to reach even the most remote locations (such as the mobile phone networks do), a distributed approach has a much greater efficiency and robustness. A good example of a distributed information network infrastructure is the Internet itself, indeed originally conceived this way for its robustness – data dynamically reroutes when a connection fails or is overloaded, and there is no central Internet computer. An extreme example of this approach is mesh networking, where data travels between the nodes of the network, in any topology not just a star-network. Every computer becomes an active node in a mesh network, passing on data from other nodes. In MIT Media Lab's One Laptop per Child project, mesh networking is used to connect all these laptop computers in an area by sharing their WiFi connections instead of relying on each computer connecting directly to a base station. This project is aimed at (and to an extend successfully implemented in) developing countries. This is an important application domain which has been addressed in previous OzCHI conferences quite consistently. For instance in 2008 by the keynote speaker Gary Marsden from South Africa, in his lecture both the urgency and the problematics as well as the opportunities were convincingly presented. The intention of this workshop is to firmly contribute to this important field of research, design, and application of wildly inclusive human-centred technology.
One of the technologically driven opportunities is the now widespread availability of geographic information systems (GIS) and the global positioning system (GPS).

The themes, ideas, threats and opportunities presented in this paper, linked to the participants' contributions, form a starting point for further discussions and developments. It is important we build on earlier work in the field of Rural HCI, such as the panel discussion on *Urban Informatics Beyond The City* organised by Marcus Foth et al at the OzCHI in 2008, as discussed in their paper contributed to the workshop. We can see the 'sub-urban' as the area between rural and urban, generally in Australia nature has a much more prominent place in urban environments than many other big cities, the number of parks and trees in general, etc. The use of social media and on-line communities is also a topic from the paper by Marcus Foth et al. It is hoped that the Rural HCI workshop can contribute to the continuation of the development of ideas and research in this important emerging field.

SmartGardenWatering and Rural HCI

Jon Pearce, Interaction Design Group, The University of Melbourne

Some history

In the autumn of 2009, after 3 years of horticultural research and software development funded by the Smart Water Fund, we launched a small Flash app called "SmartGardenWatering" (Pearce et al, 2008; Pearce et al, 2009). Its aim was to allow gardeners in the Melbourne/Geelong regions to model their gardens and be provided with a yearly watering schedule as well as view the performance of a water tank supplying their garden areas. You can still play with this early version at http://disweb.dis.unimelb.edu.au/smartwater. Soon after the launch we had a comment from a rural resident saying "why do you people always think that Australia stops at the outer suburbs and ignore us rural folk?". That raised our sensitivity a little to the feelings of people in country Victoria, but unfortunately our project was funded by Melbourne water retailers and was based on a unique database of plants restricted to suburban Melbourne.

During 2010 we re-wrote the software to allow gardeners to register online and save their garden models 'in the cloud' as well as engage in community interactions via integration with Facebook (Pearce & Murphy, 2010). Regrettably we still ignored the rural community – again limited by funding. This software was launched at the Melbourne International Flower and Garden Show in April 2011 and is accessible at http://www.smartgardenwatering.org.au/.

A focus of this second release of the software was 'community'. Aware that behaviour change would not come simply by providing 'cool' software, we wanted to establish a community of gardeners modelling gardens, sharing their models, and talking about water saving strategies. The software launch (end of the 2009/10 summer) was dampened somewhat by an extraordinary wet summer (!) and we will have to wait until the summer of 2011/12 to measure our success.

More recently – mobile and remote sensing

An important aspect of this work, encouraging behaviour change amongst gardeners, has been the role of social networking and community interactions. During 2010, Varan Pathmanathan, a masters student from Aalborg University, Denmark, explored the role of mobile devices (iPhones) in this space focussing in particular on what kind of information needs gardeners are likely to have in this context. His study considered information from three sources – an expert advisor, the Bureau of Meteorology and the local community – and compared the different ways in which people responded to and trusted the information provided. A paper on his study is presented at this conference (Pathmanathan et al, 2011).

One of the information types in Pathmanathan's study was weather data from the Bureau of Meteorology; that is, objective, scientific data. To follow up what role such data could play in this field, we have designed and built a device that sits in a domestic garden and monitors various parameters, transmitting them to a server via the mobile phone network (pictured). Using this device we can monitor ambient temperature and humidity, soil temperature and moisture, ambient light levels, as well as the GPS location of the device. Our longer-term goal is to explore what value a network of such devices would be in providing local information about garden conditions to the general community. Could we 'crowdsource' such data and derive useful quantities to help advise gardeners? How could we incorporate the opinions of people in the community to augment such information using a mobile device?

As part of this investigation we are producing an iPhone app that incorporates data from these devices with recent rainfall data (see images below). The app will extract garden data from the user's SmartGardenWatering model and display rainfall data, watering reminders, as well as sensor data.

Finally – what about rural Australia?

We are still exploring ways to extend these ideas into our rural community. There are several impediments to this. SmartGardenWatering uses postcodes to determine weather and soil conditions, but in rural areas a postcode region can be very large and have changing conditions. Data linked to GPS location might return more reliable results.

Our plant database has unique data on plants specific to Melbourne (only) and the software relies on having accurate information about the requirements of the plants in a garden. This is important not just for the water demand calculations but also to support users in designing a garden that will thrive in their particular area. We need to extend the database – this is a non-trivial task given the hundreds of plants involved, each needing data on nomenclature, flower colour, type, as well as images. One approach we

have considered is to crowdsource the information from interested parties, but introduces all sorts of problems regarding authenticity of data, quality of data, and so on. Hence we have not pursued this approach yet. A simpler alternative is to add extra fields to our database that might allow the user to specify plants to omit from their selection (e.g. frost sensitive, not suitable for the area, etc.). We are working towards this.

Conclusion

We have described a programme of activities that we have undertaken in support of water conservation in metropolitan Victoria. We are hopeful that we can find a way to extend these to rural Victoria. In the workshop we will demonstrate some of these ideas.

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Living Streams
Making of Sydney's Georges River Augmented Reality

Francesca Veronesi
Faculty of Design, Architecture and Building University of Technology Sydney
PO Box 123, Broadway NSW 2007, Australia +61 2 9514 8932
francescaveronesi@gmail.com

INTRODUCTION
Living Streams is an augmented reality project in the making. Founded by the Western Sydney Regional Organisation of Councils (WSROC) under the 'Water in the Landscape' funding scheme, the project aims to raise awareness about water as an environmental resource and living heritage in Liverpool, a municipality within the Greater Sydney Metropolitan Area. *Living Streams* develops an exciting new way of connecting to the Georges River's unique landscape and multicultural heritage. The project 'augments' water and sites of significance with a wide range of media such as oral and visual historical records, people's life histories, artworks, music and environmental data.
A series of creative workshops run by artists and creative producers engage local schools and culturally diverse local communities in the production of a 'mobile augmented reality' of the river and its catchment area. Augmented reality enables the display of real time digital information, such as audio, photographs, video and texts, on top of reality. Using the river and its historical and natural heritage as a playground, participants will engage with a wide range of activities such as walking tours, creative mapping, digital storytelling, online documentary and music productions. Once the stories and media have been produces, people will be able to experience all rivers' stories coming alive as they visit places of interest, take a walk and a boat ride along the river.

MAKING LOCALITY
Living Streams explores the relationship between place, technology and culture renegotiated by ubiquitous computing and digital technologies. It proposes new ways of mapping, hearing, sensing and experiencing place that are intrinsic to mobile and wireless media, reflecting on the notion of locality being augmented and distributed by the pervasiveness of open data and wireless networks. The project delves into the interplay between the ubiquity of the digital world and the locality of the river's social and cultural environment by engaging people in telling and passing on their stories.
Questions on mapping are at the core of the project. What is the purpose of using maps? How can maps change our relations with the river? Mapping space and using maps to navigate space are ways of knowing not only about a place and its geography, but also about our position in relation to that place. Every place, landmark and geographical feature has a story to tell. The river flowing through the Liverpool Local Government Area is of great cultural and ecological significance. With over 150 languages spoken in the local area the Georges river is one of richest and most complex cultural landscapes in Sydney. Here themes of environment, settlement, dispossession, economics and industry can be interpreted. The Aboriginal links to the river are of particular importance, as is the role of the river as social environment for both Aboriginal and non-Aboriginal settlers. Significant is the migration heritage, so too is the concept of 'working water' together with its industrial heritage. The river has always been a precious resource in the economical, social, cultural and environmental history of the country.
Practices of heritage preservation operate within two different realms: the geophysical domain, through land management, natural preservation and heritage site conservation, and the cultural domain through archiving and maintenance of material cultural records. *Living Streams* proposes new possibilities of heritage preservation at the intersection between these two domains. Aggregating content now spread around public and private archives as well as people's personal memories, the project develops a collaborative engagement platform for communities and citizens to creatively engage with this heritage. It enables new ways of knowing that are situated and experiential. Stories from indigenous elders and senior migrants about the role of the river in recent history, its significance as a resource for previous and future generations not only can be heard, abut also they can be located spatially within the environment. How does this affect our perception of place? We anticipate a large numbers of individuals and groups to be involved such as primary and secondary school students, cultural and linguistically diverse and indigenous communities, environment and conservation groups in Liverpool, local Historic Society and Friends of the Library and Friends of the Liverpool Museum, Library and Museum users, visitors and local community members.
COLLABORATION The design of participatory interfaces is a collaborative process shaped by the dynamics, mutual influences and interactions between the project's partners and the collaborations that emerge. We are interested in exploring this relational aspect of design for its potential to generate connections and create imaginative partnerships between local authorities and the local creative capital. In the paragraphs that follow we present the current partners and their role in the project.

Liverpool Council, Living Streets
In 1997 the Department of Urban Affairs and Planning, through its Western Sydney Area Assistance Scheme, funded Liverpool Council for a community and cultural development program. The program focuses on the inner city residents of

Liverpool, and has become known as the Living Streets Program. Coordinated with passion and enthusiasm by Cinzia Guaraldi, Living Streets creates community gardens to promote livability, safety and urban renewal and at the same time lessen food miles and social tensions. Over the years the program developed a sustainable model of engaging communities with the gardens' concept development, consultation, design, planting and construction, horticulture training and ongoing maintenance. As a partner to the project, Living Streets brings in its long-term experience with this comprehensive approach to place-making, whose strength relies on the community taking ownership of the work and ensuring maintenance once the project funding has ceased.

Liverpool Library and Regional Museum
The Museum was established in 1989 with the aim of preserving and promoting Liverpool's history and cultural heritage through historical collections, exhibitions and public programs. The collection comprises artefacts from working life, modes of transport, industry, domestic and everyday life, agricultural development, migration and settlement. As partner to the project the Museum and Library are looking at ways for their collection to become more accessible, smart, mobile, and flexible to integrate constantly growing acquisitions of crafts, photographs and oral history from the local community.

Interactivation Studio, Faculty of Design Architecture and Building, University of Technology Sydney
The studio/laboratory/workshop was set up by Bert Bongers in 2007 to facilitate research and design of interfaces, instruments, and interactive environments. The Interactivation Studio is conceived as a flexible reconfigurable workshop space and infrastructure, facilitating multiple scenarios of use such as teaching, researching, performing and playing. The research and design focuses on the interaction between people and technological environment, developing new interface prototypes and demonstrating new ways of interacting with computer environments. Such environments, or electronic ecologies range from the intimate scale of musical instruments, wearable interfaces, handheld networked devices, to the spatial scale of rooms, buildings and, for the first time in Liverpool, of landscapes. The research approach is deliberately hands-on, mixing practical experiments with theoretical frameworks. To engage with Liverpool municipality and its diverse communities is an opportunity for researchers at the Interactivation Studio to experiment with intervention methodologies in urban and environmental computing.

Curious Works
Curious Works is a not for profit organization working at the intersection between art, new media and communities. Its mission is to subtly reshape the systems of cultural production in Australia deploying a best practice model of utilising new media for the long-term benefit of communities. Since 2007 Curious Works engaged intensively with communities in Western Sydney and in the Pilbara, remote Western Australia focusing on capacity building, empowerment, professionalism and sustainability. C.W. brings to he project its technical skills and field experience on media training from the grassroots up.

Casula Powerhouse
The Powerhouse is a vibrant arts centre involved with the exhibition and production of contemporary visual and performing art and community based practices. The Liverpool Collection, managed by Casula Powerhouse and Liverpool Regional Museum, comprises an extensive collection of over 30,000 artworks and heritage objects, which reflect the great diversity of cultures of the City of Liverpool. Together with its co-managed art collection, the Powerhouse brings its network and links to creative industries and practitioners in the field of new media arts and creative media production.
Collaboration have also been established with Liverpool Migrant Resource Centre, Liverpool and District Historical Society, Hoxton Park and Miller Technology High schools, Liverpool public primary school, a number of professionals from historians to environmental scientists for their interests and long-term involvement with Liverpool's environmental, colonial and Aboriginal heritage, local sound and visual artists, creative producers and performers.

A LOCATIVE PARTICIPATORY MEDIA PLATFORM
Living Streams creates a collaborative platform that is centred on the user's experience of the river and its heritage. 'DYI Georges River Augmented Realities' are workshops with local artists, musicians and creative producers that engage communities with the production of media works that is focused on, or inspired by, the following themes:
Places: sites of historical, cultural and environmental significance; Cultures: artworks, cultural practices, languages of the Georges River; People: life stories from former migrants, the elderly, Aboriginal and CALD communities; Environment: Water, Flora and Fauna, Life, Sound of the River; Water and Music;
Participants can choose to develop a theme using a wide range of mixed media techniques and tools – from drawing, to painting, collage, photograph, video, performing arts, sound, music and creative writing. *Living Streams* also provides technical training to artists, teachers and workshops' coordinators on the use of the technical platform.

HOW DOES IT WORK?
Firstly key-participants, workshop coordinators and cultural producers are trained on the use of the technology. Curious Works brings to the project its long-term experience on new media training, having worked intensively on the ground with communities in Western Sydney and in the Pilbara, remote Western Australia. Training is shaped on Curious Works' best practice of transferring skills and ownership of the project to the community through a set training program. This empowers all groups involved to take over the program to their community once the project's funding has ceased. In Newman, remote Western Australia for instance, Curious Works managed to transfer skills to school teachers, youth workers and cultural

development officers at councils so that they are now capable not only of making films, but also of putting on film festival themselves, finding equipment and all necessary resources to keep the project running. Curious works training model has shown over the years that training is successful when it is embedded in strategic ways in the community.
Living Streams training involve cultural producers from the local community such as council officers, museum curators, artists groups, migrant centres and youth groups cultural producers. As key producers of Living Streams, trainees are offered a unique opportunity to learn how to create a multimedia experience and to pass on skills to their groups. Training involves online publishing and posting to the project's website as well as managing submissions' different formats. It teaches how to post various types of content to Google Map and then to update and maintain journeys using Augmented Reality.
Feedback on what participants have achieved on the training session, including issues that might have come up during the training and/or new possible applications for the technology, will be presented at the Rural HCI workshop.

Who is involved?
As the word is spreading out fast, Living Streams has already several groups involved and ready to start. These include Liverpool Historic District Society, Liverpool Poetry Alive, Liverpool Arts Society, one local high school and one primary school, Street University music youth group and Made on the Kitchen table, a group of local Aboriginal women. To many, the words 'Augmented Reality' or 'digital experience' are quite unfamiliar and rather intimidating. Most of the elderly members of the Historical and Arts society as well as the Aboriginal Women group have little computer competency. In fact, one of the challenges of the project is to make the technology accessible in order to serve the community creative capital. This translated in to the technology adapting to the needs, proficiency and expectations of the community, rather than people trying to fit in a set of technical constraints.

Create a story
Public workshops are structured around a topic or theme, which will be chosen by the workshop's coordinators. Each workshop invites a guest with a specific expertise on the topic, or develops within an existing cultural program. The structure closely follows the workshops' aims, which is to: 1. Inspire a creative response in the participants. 2.Teach skills. 3. Create original works. 4. Publish the work. 5. Transfer skills.
Participants will produce multimedia works using photographs, artworks, music, videos or texts, or simply record their personal memories and stories about the river. Workshops' coordinators will assist with submission to *Living Streams* blog post. Posts from participants will then be embedded in google maps so that each entry will be associated to a specific location. Workshop coordinators are also moderators of blog entries. This allows each group to take ownership of a 'journey' or experience that they want to share with the broader community.

Locative Interaction: experience the stories in place
To minimize costs while at the same time maximizing accessibility, we opted to use an existing free Augmented Reality application for smart phones. Among the many ones available, we decided to use 'Wikitude', which allows to superimpose digital information on top of reality based on the user's location by embedding media content in google maps. A Web browser allows to search for specific point of interests based on the user's location and to view the relevant information on a map, list, and on an Augmented Reality (AR) camera view.

Image showing an application of Augmented Reality. As people walk along the river, they will see 'bubbles' appearing on their screens. When the bubbles are selected a short text appears. Links will open images and play videos or sound. Source, www.wikitude.com/en/ Accessed 20/10/2011

The workshops' different themes will generate different 'worlds' or journeys for people to explore with a smart phone. People walking in the environment will see 'bubbles' appearing on their screens. When a bubble is selected a short text appears. Links will open images and play videos or sound, and that's how the river's stories will come alive.

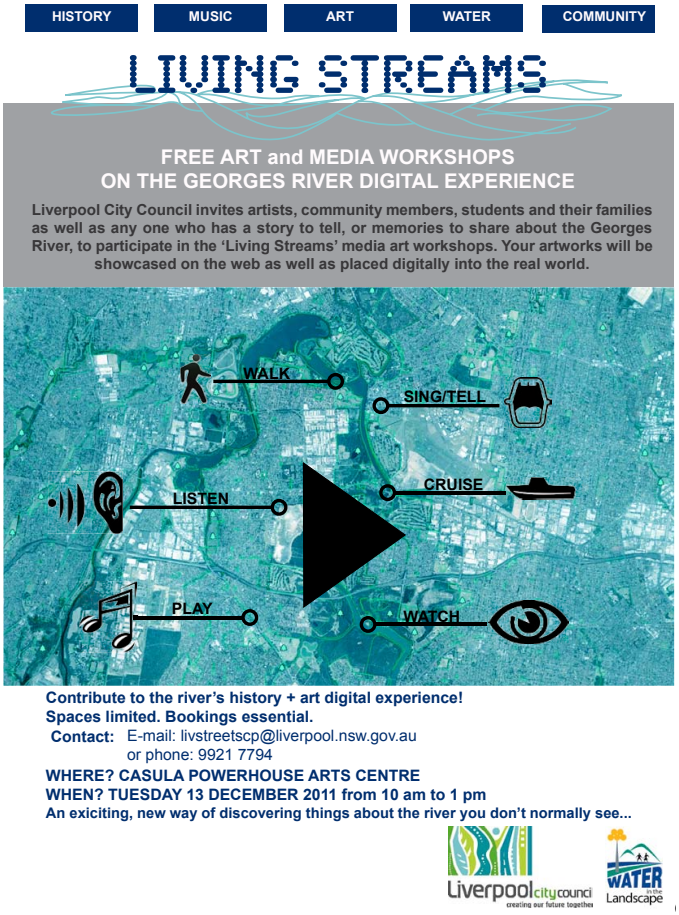
QR codes
Codes will tag point of interest within sites of significance and can be scanned using a smart phone. QR codes contain a small text, and/or a URL to images or videos. Printed maps of QR codes will be available at different locations. Maps will be then published on *Living Streams* blog. Participants can create their own QR codes to involve people in a treasure hunt (geocaching) of their artworks.
Joining a boat tour at the project's launch (May 2012), will allow to experience Living Streams' stories without using a phone,

as the boat will journey through a landscape full of sounds and stories for people to be immersed in, through a surround sound experience on board. We expect very different outcomes from the workshops, as participants are very diverse in terms of experience, interests, age and background.

EVERYDAY PRACTICES OF THE RIVER

Liverpool's original inhabitants were the Cabrogal people who spoke the Darug language. The Georges River defined a natural boundary between the Darug and the Tharawal tribes. In traditional times, prior to the invasion cultural practices used features of the landscape to preserve myth and history to memorialise in natural landmarks not only the myth stories of the Dreaming, but also historical facts. These inscriptive practices provide modes for orientation through present space and past times. We can look at the new practices enabled by the project as new ways of knowing, as participants produce, share and retrieve stories from the environment. The river becomes therefore a medium for transferring memories, such as those of a migrant telling of her life journey to a new country or an Aboriginal elder remembering places and ways of living by river that no longer exist, to the experience of the listener, who experiences the story in place. This can foster new ways of performing, playing with, and sensing a 'layered' cultural landscape. Acting as local guides for a day for instance, school children can involve their families in thematic river tours, or high–tech treasure hunts of caches hidden in the environment. Sense-maps can be created and used to discover the sensory component of places, for instance the river's soft and hard edges. We imagine local artists and students involved in a collaborative online documentary addressing a wide range of themes such as for instance the strength of nature and its resilience, the memory of water, the languages of the river... The participants' unique interpretation of history and landscape will build a living archive of artworks and stories that use the landscape in an inscriptive as well as imaginative way.

Location-based augmented reality is applied in this project as an inscriptive and interpretive tool that has the potential of merging the old language of orality and storytelling with the language of new media, together with walking and moving through the landscape. Using the river-scape as an alternate media source for stories and music to be heard, and artworks to be seen, Living Streams aims to deliver to the audience a compelling experience of place, art and history. Mixing and matching storytelling, artworks and music with physical locations, it creates a network of permanent, yet invisible traces. Mobile phones are used here as lenses to excavate those traces and to start a dialogue with the place's living custodians. We envisage the project to contribute to the enhancement of the place's connectivity by connecting old and young generations, the natural landscape and the artificial space of Wifi networks, the past, present and future by providing a space where to accommodate an ever changing and growing collection of artworks and stories, which can reflect the ongoing transformations occurring to Liverpool, its population and territory.



Urban Informatics for Rural Knowledge Economies

Marcus Foth
Urban Informatics Research Lab
School of Design
QLD University of Technology
m.foth@qut.edu.au

Christine Satchell
Urban Informatics Research Lab
School of Design
QLD University of Technology
christine.satchell@qut.edu.au

Greg Hearn
ARC Centre of Excellence for
Creative Industries & Innovation
QLD University of Technology
g.hearn@qut.edu.au

ABSTRACT
This position paper provides an overview of a proposed study that seeks to design and develop tools, methods and applications of urban informatics to promote an innovation culture and knowledge economy in regional Queensland. The National Broadband Network has the potential to leapfrog regional Queensland to join the knowledge economy, but effective applications and content strategies are required. The Edge is the Queensland Government's Digital Culture Centre to engage young people in the technology/culture nexus. This position paper provides an overview of a proposed study that will set up Living Labs at The Edge and in a new precinct in rural Queensland (Goondiwindi) as sites to trial strategies and applications that engage people in entrepreneurial thinking, sustainability initiatives, and new creative practices across the urban and rural boundaries.

Author Keywords
Urban Informatics, creativity, innovation, engagement, knowledge economy, rural, regional, libraries, Queensland

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

PREAMBLE
At OZCHI 2008, Foth organised and introduced a panel discussion on "Urban Informatics Beyond The City" that was MC'ed by Michael Arnold (University of Melbourne) including panel members Bharat Dave (University of Melbourne); Ann Light (Sheffield Hallam University, UK); Nancy Odendaal (University of KwaZulu-Natal, South Africa); and Monica Whitty (Nottingham Trent University, UK). The panel's abstract provides some context to the following position paper:

Urban informatics research and development is positioned at the intersection of people, place and technology with a focus on cities, locative media and mobile technology. In seeking interdisciplinarity an undifferentiated attention on the 'urban' may segregate rather than connect. This panel hopes to help critically analyse the specificities of particular cities across the world and their residents, and a city's contextual embeddedness with a view to establish a hightened awareness of the assumptions behind urban informatics. Urban residents need to be appreciated as differentiated individuals that are situated in a variety of time and place settings attached to a historical context of personal experiences. Social networks form between these residents and commuters and visitors that move in and out of cities. These connections nurture symbiotic relationships and exchanges between urban, rural and remote areas. This panel will challenge and debate the 'urban' focus and ask, how this research contributes to address issues and opportunities 'beyond the urban.' We want to unpack 'the city' in order to appreciate its role in a broader and global context, as a node in a network of flows, as a centre of a region, or as a capital of a nation-state.

OzCHI '11, November 28 - December 02 2011, Canberra, Australia

The panel discussion that unfolded was fascinating and insightful, and ever since then we have played with the thought of conceiving of a research project that would tie together urban and rural, city and country aspects and interests of HCI in a meaningful way. The motive for doing so is to challenge and debate the 'urban' focus and ask, how this research contributes to address issues and opportunities 'beyond the urban.' In leading into this discussion, we assume that the realm of urban informatics [6] comprises not just the physical city. Rather, these inquiries touch upon other conceptual compounds that spill over beyond the urban in complex ways.

We present the following research proposal with two goals in mind: First, as a position statement to introduce our thinking in the context of the workshop's theme of Rural HCI, and second, to invite constructive feedback.

INTRODUCTION
According to Quiggin [10], around half of all people in Australia are employed in the exchange and processing of information (e.g. education, entertainment, business services, management, and many aspects of health). In addition, many more are engaged in the non-monetised creation and exchange of information. In modern knowledge economies, knowledge intensive services in education, information services, the creative industries, and business services represent approximately 25% of GDP, which is even more than the new science sector (e.g. agricultural biotech, fibre, construction materials, energy and pharmaceuticals) which accounts for only about 15% of these economies [11].

The end users for this proposed research are local government authorities, city and regional councils, libraries and other parts of the cultural industries sector, especially in regional Queensland. These entities will be able to use this research to engage their clients, constituents, and citizens in critical thinking, green

programs, creative practices, and entrepreneurial initiatives. This study will trial technology innovations in a Living Lab setup to explore the new role of cultural institutions in the knowledge economy with a specific focus on regional Queensland.

Effective participation and community engagement in decision making about the future requires informed choice. Choice requires literacy. Libraries and other parts of the cultural and creative industries sector have a role to play therefore in:

- building capacity to increase literacies to interpret local knowledge and implications of global affairs;
- disseminating information and facilitating support in a peer to peer fashion;
- building scale to engage in conversations, be heard and take action, and;
- raising public interest in the global-local nexus of issues that affect our ability to create and shape a sustainable and prosperous future.

These are the benefits of the research to the end users that will be developed in an iterative approach with work-in-progress being released in half-yearly cycles.

THE EDGE

The Edge (http://edgeqld.org.au) is a particularly relevant and insightful case study for this program of research, because it allows to test theoretical and conceptual points in a real-world environment. The Edge is the Queensland Government's flagship Digital Culture Centre – a prototype concept of the State Library of Queensland to explore new technology and new technological practice and their applicability to libraries in the 21st century, in the knowledge economy, and in the Queensland innovation system. The Edge underlines the library's claim to become a cultural and knowledge destination. Although open to all, The Edge has been predominantly designated as a place for young Queenslanders for experimentation and creativity, giving them contemporary tools to explore critical ideas, sustainability initiatives, new design practices, and media making. As a cornerstone of the Queensland Government's *arts culture + me Children and Young People in Arts* Action Plan 2008 – 2011 [1], The Edge is guided by an explicit focus on participation, engagement and collaboration with and through young people.

We want to explore new engagement activities that are strategically positioned to assess the added value that The Edge can provide to the Queensland society as a new prototype library space. The project will benefit The Edge by expanding its outreach beyond Brisbane and increasing the scope and scale of its programming by offering stimulus events and recruiting visitors and students with promise as catalysts or residents. It will help The Edge to meet their goal of moving from an "engagement for" to an "engagement through young people" model. Additionally, The Edge subscribes to a whole-of-state remit, and so exploring opportunities that reach into Queensland's regional centres and rural areas is of great interest to them.

RESEARCH OBJECTIVES

The following research objectives were discussed in more detail at the Healthy Cities conference 2011 [5].

Objective #1: People, and the Challenge of Creativity

This study will explore the opportunities of urban informatics to design and develop tools, methods and applications that foster participation, the democratisation of knowledge, and new creative practices. Targeting social inclusion and systemic disadvantage, one of the study's goals is to explore new ways to increase access to these applications and associated literacy skills for all, in order to enable more people to bring about significant changes in society, specifically to employ human creativity to address concerns relating to regional development and economic prosperity.

Objective #2: Technology, and the Challenge of Innovation

This study will examine how methods and applications of urban informatics can be designed and combined to develop and test tools and resources that support user-led innovation with a view to promote an innovation culture and knowledge economy in regional centres and areas of Queensland.

Objective #3: Place, and the Challenge of Engagement

This study will establish and test the creation of sites within library spaces that are dedicated to place-based applications of urban informatics with a view to deliver community and civic engagement strategies. Embracing both new technology and new technological practice, these library spaces may be better described as 'ideas stores,' 'digital culture hubs,' 'knowledge clearinghouses,' or 'innovation incubators.' The study will evaluate how these sites can enable libraries to add value to new stakeholder groups that may previously not have considered libraries to offer much for them, such as future prospects and pathways for people experiencing systemic disadvantage, and new sources and outlets of commercial innovation for local businesses.

APPROACH

The research methodology comprises an initial ethnographic phase of immersion (A); three iterative action research cycles which involve design studios utilising use scenarios and human-centred design methods (B) as well as rapid prototyping and testing (C); and a final evaluation (D). Each of the three action research cycles is dedicated to one of the three aims of the study on Creativity, Innovation, and Engagement. Data collected will include visitor observations during regular activities at The Edge and in Goondiwindi (as part of a new RDA funded infrastructure development project, see Fig. 1) as well as during workshop activities, in-depth and group interviews, creative outcomes from the design studios and workshops, usability test results, and usage log files from servers hosting web or mobile applications developed as part of the study.

PHASE A: Immersion and Living Labs Setup

The centrepiece of the proposed study's methodology will be the setup of 'Living Labs' both at The Edge and in Goondiwindi which aim to involve visitors, users and students as public actors rather than passive receivers.

Participants in these new Creativity & Science Labs will be able to work on real-life problems through projects and workshops that are aligned with the thematic focus of combining design, science and technology. These labs will become a hive for the spread of ideas and technologies into the wider community. A similar approach was successfully trialled by Prof. Carlo Ratti during his stay as inaugural Queensland Innovator in Residence 2009, a program jointly led by the Queensland Government, the State Library, and QUT. "Living Laboratories are environments for innovation and development where users are exposed to new solutions in (semi)realistic contexts, as part of medium or long-term studies targeting evaluation of new design solutions and discovery of innovation opportunities." [2]. Before The Edge was officially opened on 26 Feb 2010, Ratti and Foth already successfully trialled a Living Lab setup at an adjacent space of SLQ, called The Studio. The Edge lends itself to adopt this approach for the purpose of the proposed study (Fig. 2). The labs will be set up in Year 1 and continue throughout Years 2 and 3 with a view to turn the labs into what has earlier been described as 'ideas store,' or 'innovation incubator.'

PHASE B: User Studies

Study participants will be recruited from the pool of visitors via a combined approach guided by Patton [9] and Dillman [3] that includes both online / social media channels and printed media in order to recruit a mix of both users and non-users of social media, as well as visitors and non-visitors [12]. A basic questionnaire will be administered as a screening instrument in order to recruit study participants for diversity of demographic factors and social media / digital technology exposure using maximum variation sampling [9]. The study aims for a sample of 20 study participants in semi-structured interviews and focus groups.

PHASE C: Design Prototyping

Taking the form of prototypes exploring relationships between people, place and technology, the study's aims align closely with the Queensland Government's Toward Q2 strategy and its pioneering investment into The Edge as a new space to investigate the very same questions that the fellowship poses: *Design 1 focus:* participation, the democratisation of knowledge, and new creative practices. The design theme will be on environmental concerns, eg. the 'Flood of Ideas' collection recently held at The Edge (floodofideas.org.au) to encourage people's capacity to bring about change within their local community by networking people using the equipment, skillsets, human resources and opportunities afforded by a prototype digital culture centre. *Design 2 focus:* user-led innovation, e.g. data mash-ups comprising local government and library data, social media, and sensor network data, such as those presented at the national libraryhack.org competition. (Foth's PhD student Mark Bilandzic won the Digital Media mashup award.) *Design 3 focus:* place-based civic engagement, e.g. the 2010 Neogeography project at the Cooroy library as part of one of our previous ARC Linkage grants, however, here, specifically with a focus on new sources and outlets of commercial innovation for local businesses. This goal has been endorsed by the Director of The Edge, and in conversations that Foth had earlier this year with Bill Macnaught, the new National Librarian of NZ.

PHASE D: Impact Evaluation

Although the action research approach already includes repeated stages of reflection and refinement, the last phase of the study calls for a final holistic evaluation. This impact evaluation will look specifically into how the experiments and findings at the case study sites (Brisbane and Goondiwindi) can inform best practice models for libraries and cultural institutions with regional and state-wide applicability and transferability. Participatory evaluation methodologies have long been effectively used in a diversity of fields, including education, social services, and health [4]. This study will use a variant developed specifically for ICT projects by Foth and colleagues [7, 8]. The final evaluation phase will be a continuation of the action research cycles already established but supplemented with ICT usage data and respondent interviews. The method will incorporate a critical reflection workshop, and will involve participants from The Edge's management team, visitors, the State Library of Queensland, Goondiwindi Regional Council and other relevant representatives. As per [7] the workshop will include an overall analytical framework for assembling and interrogating the above evidence base in terms of delivering the study's aims and to verify the study's claims about the impact of urban informatics tools and applications to support place-based creativity, innovation, and engagement in regional Queensland.

ACKNOWLEDGMENTS

We would like to thank our colleagues and supporters at QUT, the Australian Business Foundation, the Aurora Foundation, The Edge / State Library of Queensland, and particularly Robert Prestipino of vitalplaces.com.au.

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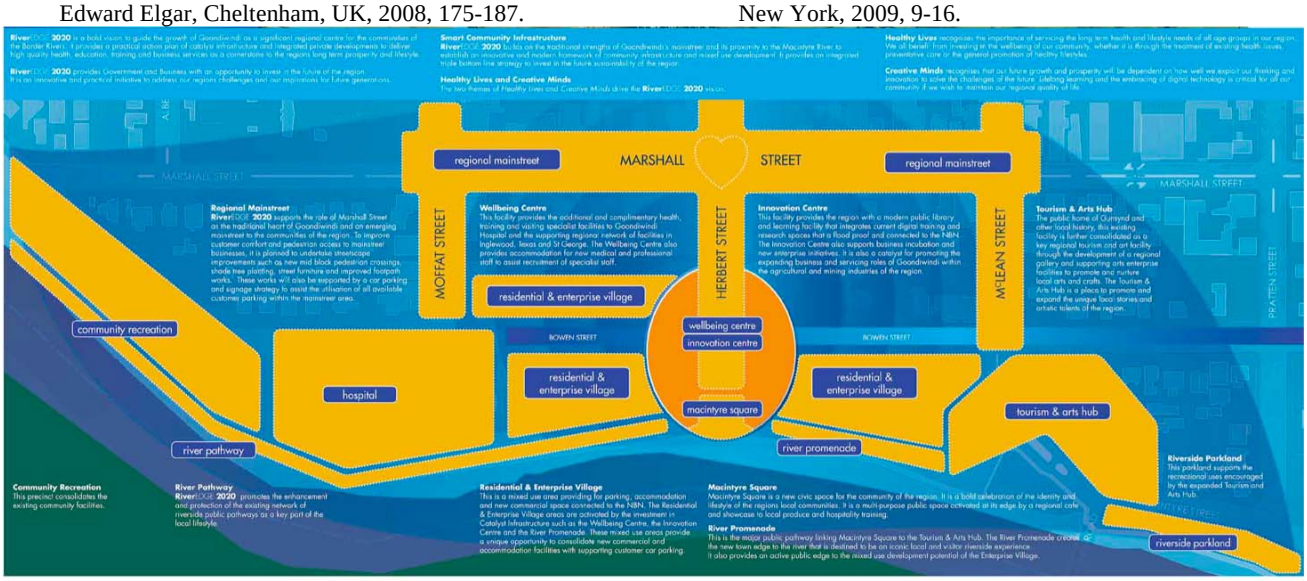


Figure 1: RiverEdge 2020 development proposal and community consultation draft by Goondiwindi Regional Council

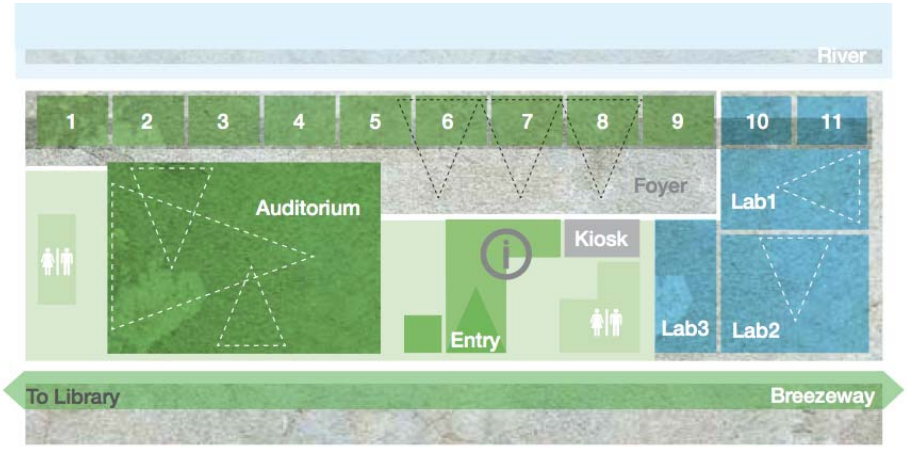


Figure 2: Floorplan of The Edge with the proposed Living Lab in Lab 2

Figure 3: Lab 2 at The Edge

Interfacing CO_2, the villain of climate change

Morten Breinbjerg, Rasmus Lunding, Tobias Ebsen & Morten S. Riis.

Center of Digital Urban Living, University of Aarhus, Denmark
mbrein@cs.au.dk

In November 2011, the art installation "Atmosphere- the Sound & Sight of CO_2" is put up in Sydney, Australia. The installation measures the variation of CO_2 in the air at three different locations in Sydney. The collected CO_2 data is converted into sound, composed in the genre of electronic glitch music and presented through headphones, and to an abstract visual imagery based on the RGB colour scheme. The visual imagery is presented on a 2-meter high, quadrant sculpture that function as a transparent, low resolution LED screen. [See Picture 1] The sculpture is placed in the old Customs House in Sydney allowing people to hear and see a normally non-sensuous phenomenon and to experience the symbolic villain of climate change: Carbon dioxide.
Intended as an interface that allows for new ways of recognizing and understanding environmental relations and issues of climate change, the installation immediately raises epistemological questions concerning the relation between measurement, representation and recognition, artistic and scientific modes of representation, and how and to what degree installations of such kinds allow for new ways of acting on climate change.

Picture 1. The sculpture seen from the outside of the pavilion during COP15, Dec. 2009.

Atmosphere – the sound & sight of CO_2

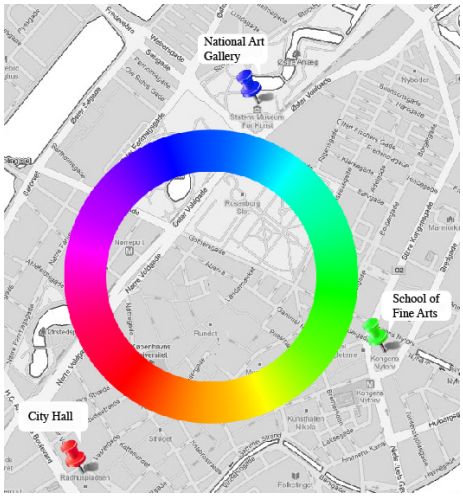
The goal of *Atmosphere – the sound & sight of CO_2* is on one side to provide information on the relative amount of CO_2 at the chosen locations and to show the variations throughout the day due to e.g. traffic density, warming/cooling of houses, humidity et cetera and on the other side to be a poetic expression in it self, holding a value of its own as an audio-visual sculpture.

In a first draft the installation was put up in the city of Aarhus in marts 2009 as part of the proclamation of the municipality's ambition of reducing the emission of greenhouse gasses by 50% in 2030. The installation at that point measured the CO_2 levels in a crossroad converting the data into harmonic timbres at low concentrations of CO_2 and more distorted and noise like sounds at high concentrations. The crossroad was overlooked by a web-camera and the image from the camera was distorted relative to the amount of CO_2 in the air. The installation was set up in a nearby exhibition space where people could enter a small booth, overlook the crossroad from a computer screen and listen to the sounds through headphones. [See Picture 2]

Picture 2: A first draft of the installation, Aarhus, Denmark, March 2009.

Later that year the installation was chosen to be part of COP15 related activities in Copenhagen during the COP15 climate summit meeting in Copenhagen. This time the installation was given its current design due to the ambition of comparing the relative variation of CO_2 at three chosen locations in Copenhagen. Rather than video monitoring the three chosen locations (which was also denied us by local authorities due to laws of surveillance) we wanted a more simple and abstract expression that in a single visual and audible form could express the relative CO_2 variations. We decided to use the RGB colour scheme and map the scheme to the three locations. The first location was given the colour red, the second the colour green and the third location the colour blue. At any time, the colour of the installation is a relative combination of the colours at the two locations where the concentration of CO_2 is highest, meaning that an orange colour would indicate highest concentrations of CO_2 at location one and two [Picture 3, The RGB colour scheme]. Likewise, the audible frequency range was divided in three with the first location represented by high pitch frequencies, the second location by middle tone frequencies and the third location by bass frequencies. Also, the over all noise level of the frequencies followed the relative concentration of CO_2.

While the first draft of the installation was more immediate in its visual expression due to the real world image of the web camera, it also was conceived more in line of a conventional information booth. At COP15 we needed the installation to be of a scale that could address larger audiences and attract attention from a distance. Also, we wanted it to be more autonomous (a poetic expression of its own) and as a result we chose a combination of glitch music and abstract visual imagery and deliberately avoided conventional forms of information visualization like graphs and diagrams. The installation is now put up in Sydney, with the same design as during COP15.



Picture 3. A map of Copenhagen showing the locations of the CO2 meters and the assigned colours of the sites, COP 15, 2009.

Interfacing climate change

Atmosphere – the sound & sight of CO_2 is inspired by artworks like *Nuage Vert* by Paris based art and design partnership HeHe, that illuminates the contour of clouds of vapour emitted from energy plants by the help of green laser beams [See Picture 4] and *Translator II, Grower 2004-06* by Chicago based artist Sabrina Raaf [See Picture 5], a robotic installation that creates grass like images by drawing vertical lines of green ink on gallery walls in response to measurements of CO_2 in the air of the gallery. As works of art and as aesthetic interfaces these works hold a value in that they present new representational forms that plays with the visual rhetoric of scientific imagery, and who as ambiguous, tentative and poetic expressions opens for other kinds of narratives than those told by images and interfaces that are normally presented to the public in climate debates. Images that are based on values like truth, precision and exactness and hereby the idea of scientific facts. As such, artworks like the above mentioned raises an epistemological concern about the complexity of the relationship between measurement, representation and reality and hereby the relationship between technology, perception and cognition, and in a wider perspective the complexity of the subject matter e.g. climate change. It is our belief that artworks/ aesthetic interfaces can help us reflect this complexity already at the level of the interface.

Picture 4: *Nuage Vert , Helsinki, photo by HeHe*

Picture 5: Sabrina Raaf , *Translator II, Grower.*

Interfacing complexity

On a first level of complexity, reality is interpreted and the scientific fact constructed already at the level of the technological equipment involved, as Bruno Latour has explained in his studies of science (Latour, 1979). In our installation the physicality of the sensors used, and not least the fact that they were unable to represent concentration of CO_2 below 400 ppm, was already influencing the kind of "truth" of reality, we were able to represent. Also, since the data resulting from the technological measurements needed to be phenomenological interpreted into sound and images, questions of how to stage the object in relation to e.g. scale, form and colour, in short the semiotic encoding of reality, were immediately confronting us.

On a second level of complexity art works like the above-mentioned concerns the ambiguity of the subject matter and its symbols. As claimed above CO_2 is the symbolic villain of climate change but through the process of photosynthesis CO_2 is also a crucial element of life. About this Sabrina Raaf poetically reminds us in her work. Also *Nuage Vert* expresses the ambiguity of environmental sustainability in that the work not only visualizes levels of gas emission in a purely abstract and isolated way, but also relates it to ways of living. Hereby *Nuage Vert* recognizes climate changes as a cultural problem and calls for cultural solutions, not only for technological ones.

On a third level of complexity climate art in its mixed forms of scientific and artistic rhetoric unmistakably shows, how we have moved beyond modernity. As Bruno Latour has described it, modernity was defined by a separation between facts and values each belonging to separate domains of culture. Today, as in the case of global climate change, the discourse of science, art, politics and ethics etc. are all entangled (Latour 2010). Instead of seeing this as a dystopian situation we have to find new discursive ways of dealing with the complexity and works of art that challenge the visual imagery of science, politics and commerce can play a significant role in this.

Finally, we should remember that bringing about new ways of sonifying and visualizing environmental aspects of climate change is also a way of allowing for action. In order for us as citizens to act on climate change the problem needs to be visible and: "Here art can assist in confronting us with new ways of seeing […] perhaps leading also to new ways of acting (Pold, 2009, p. 31).

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Interactive, NBN-enabled telehealth technology: delivering health services to regional, rural and remote Australia.

Stuart T Smith, Jamie Lennox, Thomas Davies

Neuroscience Research Australia.
s.smith@neura.edu.au

Introduction

The majority of the world's increasingly older adult population requires some form of care due to loss of function following failing health and the costs associated with this care are steadily increasing. In Australia, more than a quarter of Australian government spending is currently directed to health, age-related pensions and aged care. Without an intervention to curtail the increasing financial impact of aged healthcare, the Australian government spending on these areas is projected to increase significantly, pushing total spending to almost half by 2049-50 [1].

Declines in physical or cognitive function are associated with age-related degeneration of, or injury to, the brain and nervous system. Neurodegeneration and neural injury contribute to parallel declines in self-confidence, social interactions and community involvement. A cycle is set up, where social isolation leads to further loss of confidence, leading to further isolation. The social circle contracts as friends age or pass away, and a greater emphasis on family is often a result. Fear of a major incident such as a stroke or a bone-breaking fall [2] can lead to the decision to move into a supported environment. Moving from an individual's private home into an aged care setting is then viewed as a major step in the loss of independence and quality of life.

Continued successful independent living is a high priority for older people and those who work with and for them [3]. Therefore monitoring the physical, cognitive and social markers of health, and comparing them to clinical models, enables us to draw conclusions about the current physical, cognitive and social health of the individual and their capacity to remain living independently. However, assessment of these variables usually depends on labour intensive and obtrusive manual assessment by clinical professionals that require the individual to travel to a central clinic or hospital facility. In remote and rural communities, especially in a country like Australia, the distance, inconvenience and expense of travel often make routine assessment of health very difficult. There is therefore a pressing need to develop automated or semi-automated measures of health status that can be gathered from peoples' home environments, especially for those living in regional, rural or remote Australia.

Daily, weekly or monthly home-based monitoring of health provides the ability to detect and act upon changes in these markers of health should they deviate significantly from an individual's history or accepted clinical models of good health [4]. Telehealth (or telemedicine) technology, which combines digital data acquisition, information and communication technologies and the internet to

monitor health status in the home, is gaining attention as a promising strategy for acquiring accurate, reliable and time critical health marker data [5], reducing healthcare costs [6], empowering patients and promoting disease self-management with resultant improved health care outcomes [7]. Furthermore, a recent systematic review of studies on telemonitoring of patients with congestive heart failure concluded, "patients were living longer without increasing their use of health-care facilities" [8]. For individuals who may be isolated, either by distance in regional, rural or remote Australia, or functional impairment following neurological damage or disease, broadband-enabled telehealth technologies will also be critical for researchers to fully understand the progression of disease course, or the effectiveness of intervention strategies, over the long term [9].

Design lead approach is crucial. While telehealth technologies can provide opportunities to significantly alleviate the burden of healthcare and facilitate continued independence of the elderly, implementation of technology also faces barriers related to acceptance and use by older adults, their family and clinical support networks. Barriers may include lack of awareness of available technologies, problems in use of technology amongst older adults, lack of financial incentive/capacity to use or invest in technology, lack of adequate training or support, lack of consensus on the value of the technology, cultural obstacles and absence of adequate technology infrastructure [10]. To overcome these barriers it will be important for designers of telehealth technologies to work closely with older adults throughout the design and development process in order to learn how their preferences, attitudes and capabilities relate to technology adoption and how products and services can be designed to promote their widespread and long-term use [11,12].

The dominant information and communication technology already adopted widely by older adults is the ubiquitous home television set. With the advent of digital television, apart from delivering news, information and entertainment, the television will soon also become the technology platform for delivery of health services to the homes of older adults [13]. In the following we will extend this concept one step further and consider ways in which devices that connect to the television, for example home theatre PCs (HTPC) or videogame consoles, can be leveraged as a telehealth technology. Videogames have already been proven to improve cognitive abilities of older adults [14 for review], shown to be a feasible alternative to more traditional aerobic exercise modalities for middle-aged and older adults [15]. In our group we are exploring ways in which interactive videogames can also be used to address one significant health issue that significantly impacts upon the continued independence of older adults: injury and disability resulting from falls.

What can be done? Falls can often be prevented if a person can make a corrective step fast enough to maintain their balance. Like any physical function, stepping ability can be trained. We also know that any exercise that specifically challenges balance is successful in reducing the risk of falls in older adults [16]. The challenge we face is to get people to adhere to step training exercise routines. We are therefore exploring use of a modified version of the popular

Dance Dance Revolution (DDR) video game to engage older adults in a step training program which can be done in the comfort of their own home, when ever they like.

Designing our fall prevention technology. The games involve "players" stepping onto panels of a flexible sensor mat in time with a visual stimulus presented on a display screen (Figure 1). The game can be programmed such that photos of grandchildren, favourite pets or any image of interest can appear on the screen. In addition, any music of the person's choice can be played in time with the stepping patterns. By engaging older people in the design of their own step training system, we hope to further promote adherence to their training.

Figure 1. Flexible dance mat for training stepping ability in older adults. Interactive game based on the popular Dance Dance Revolution

Figure 2. User interface for navigation through our Linux-based HTPC system for delivering step training program. Large, high contrast icons aid recognition for older adults with visual impairment. Dance mat arrows navigate left or right along menu items.

The Linux-based system we have developed to run the step training program is built on a modified Home Theatre PC attached to their television. Videogames can be selected and played through a user friendly interface (Figure 2) that does not require the player to learn complex computer commands, use a keyboard or mouse. Instead, navigation through the menu is performed by stepping onto an appropriate switch on the flexible dance mat.

Data from the home-based system can be sent back to researchers at Neuroscience Research Australia over the National Broadband Network for monitoring of fall risk. If an elevated risk for falls is detected a video consultation with one of our fall prevention experts can be initiated via a webcam attached to our system. We are currently n the early stages of deployment of our system into the homes of older adults in metropolitan (Sydney) and regional areas (Armidale, NSW and Smithton, Tasmania). The two regional centers will involve NBN connected households and will enable to explore more completely the possibilities of delivery of fall prevention training over a high speed broadband network.

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Reading Country

Speculation on the use of digital interactive media to create a shared networked practice to support the monitoring and evaluating of test sites for Indigenous cultural burning practices in Australia.

• Mediated representations through image and text, using video, photography and sound with the support of illustrations, maps, diagrams and typography to document country over time.

• Information and expression of cultural practices, located in specific places, to be shared between participating communities.

• Production of the content and management of any system needs to reside with participating communities.

• This system holds visual representations of places and practices to support knowledge sharing and enhance the recognition of Indigenous Ecological Knowledge in contemporary landscape management.

• Records and observations, gathered over time, shared locally, nationally and globally.

• Paramount is understanding the relation between effects and affects - the experiential and the observational - in order to maintain connections between the country, people and spirit.

Contact:
Jacqueline Gothe
Visual Communication Design
University of Technology Sydney
Jacqueline.Gothe@uts.edu.au
www.ccdp.uts.edu.au/www.tkrp.com.au

Firesticks

COMMUNICATING FIRE

BUILDING RELATIONSHIPS & CREATING CHANGE

KUKU THAYPAN FIRE MANAGEMENT RESEARCH PROJECT (KTFMRP) AND THE IMPORTANCE OF CAMPFIRES

Recognition Roles
Responsibility
Respect Reciprocity

The Fire Sticks Pilot Project holds a vision to support the use of Aboriginal knowledge in natural resource management by focusing on Traditional Aboriginal Fire Management Practices.

This Indigenous-led project is working with Traditional Knowledge Revival Pathways (TKRP), KTFMRP - The Importance of Campfires, University of Technology Sydney, Jumbunna and NSW NPWS Aboriginal Co-Management Unit through an Indigenous-led mentorship methodology that is respectful to the communities involved.

PEOPLE - LORE - COUNTRY

"Today fire is seen as a destructive force which most Australians fear. This fear disconnects society from the land and its people. Fire is a powerful natural element. Fire illuminates life and provides culture with ceremony, medicine, food, warmth and above all a lore that the land taught the people.

We must respect this as an inherited responsibility to be passed on in our changing world. The challenge today is to keep this respect alive, not only in terms of looking after the land but to heal the differences between people and their relationship to country."

Initiating Traditional Fire Practices through the Traditional Knowledge Revival Pathways (TKRP) methodology.

Stage 1 Negotiations and Planning with all stakeholders.

Stage 2 Getting to know Country – Recording the process and knowledge to establish first step for monitoring.

Stage 3 First burn –recording, monitoring, observing.

LORE

PEOPLE

COUNTRY

Knowing what it does

Knowing how to do it

Knowing what it is

PLANTS

LAW

ANIMALS

MONITOR

PEOPLE

BIO-DIVERSITY

PLANTS

Kwern (Awu-Laya – Kuku Thaypan Language name)
Heteropogon contortus
Black spear grass

A tropical perennial tussock grass that is an important indicator species for a healthy understory in many ecosystems where it is present.

LAW

Dew is an important Traditional Ecological Knowledge indicator for early dry season burning. The moisture supplied by heavy winter dew provides conditions necessary for regeneration of species post fire and ensures that cool fires burn out over night.

ANIMALS

Nyemyra (Awu-Laya – Kuku Thaypan Language name)

Female Agile Wallaby
Macropus agilis.

Traditional Ecological Knowledge: Important food resource.

This species is considered in fire management law by ensuring that the animal is not trapped by fire, that areas remain unburnt and that it has access to new shoots post burns in order to assist the animal with successful breeding.

MONITOR

Placing the tools of western science in Indigenous hands to bring together Traditional Environmental Knowledge and contemporary environmental management practices.

Traditional owners learn GPS skills to assist in managing country during a western science fire monitoring workshop on Cape York.

PEOPLE

Digitally recording and supporting the transfer of Traditional Knowledge from the Elders to their young people based on the traditional methods as determined by the Elders ensures the survival of this Traditional Knowledge before it is lost forever.

BIODIVERSITY

The canopy is sacred in Kuku Thaypan lore. Culturally it is against management law to burn the canopy. A healthy canopy provides essential food, habitat resources and climate regulation that ultimately all biota rely on. TEK helps to ensure fire management is applied in the right place, at the right time for the right reasons to support resilient functioning ecosystems and maintain biodiversity.

Coming to know and understand fire requires guidance by Elders and fire knowledge holders through various stages of cultural learning on country. Learning the knowledge through a written or even a visual medium without that learning process on country means that components of the embedded nature of that knowledge in place and people can be misunderstood.

KUKU THAYPAN FIRE MANAGEMENT RESEARCH PROJECT (KTFMRP) & IMPORTANCE OF CAMPFIRES – PHD PROJECT 2004 - 2011

People
Dr. George Musgrave (Sadly deceased)
Dr. Tommy George Snr.
Victor Steffensen
Peta-Marie Standley
Christine Musgrave
Carole Musgrave
Elenor Musgrave
Dale Musgrave
Lewis Musgrave
Thomas George Jnr.
Lexie George (Sadly deceased)
Eileen George
Coralyn George
Michelle Wilson
Robert Ross
Bronwyn Ross
Alwyn Lyall
Charlie Leecheu
Francis Leecheu
Robert Leecheu
Elizabeth Lakefield
Nikita Lakefield
Jakita Lakefield
Les Harrigan
Ashley Lyall
William Lyall
Blade Omeenyo
Greg Omeenyo
Peter Accoome
Leroy Platt
Denise Claudie
Peter Fischer (Sadly deceased)
Polly Fischer (Sadly deceased)
Gail Fischer
Danny Fischer
Ruby Winkle
Marilyn Wallace
Peter Wallace
Errol Wallace
Brian Barry
Nickolas Woodley
Cecil Woodley
Peter Henry
Tegan Koster
Ben Jones
Bruce Rigsby
Noeleen Cole
Joel Ngallametta
Sharon Ngallametta
Daniel Bracegirdle
Stanley Kalkeeyorta

Language Groups
Kuku Thaypan
Olkolo
Lama Lama
Kuku Yalanji
Western Yalanji
Kuku Ngunkul
Wik-Mungkan

Organisations
James Cook University
CSIRO Ecosystem Sciences
The Cairns Institute
Australian Tropical Forest Research Institute
Northern Australian Environment Alliance
Northern Australia Grantmakers Network
Mullum Trust
Bush Heritage
Caring for Country Envirofund
Caring for Country Open Grants
Caring for Country Biodiversity Open Call
Working on Country
Perpetual
Department of Environment and Resource Management
Queensland Parks and Wildlife Service
Cape York Peninsula Development Association Fire Project
Monash University
University of California Davis
NOAA – National Oceanic and Atmospheric Administration
Charles Darwin University
Savannah Cooperative Research Centre
Peter McConchie
OZ Tours
Wik Media Pty Ltd

BIZANT WORKSHOP MAY 2010

People
Dr. Tommy George
Margaret Bassini and family
Alwyn Lyall
Den Barber
David King
Sharyn Halls
Chris Tobin
Lex Dadd
Tony Williams
Terry Hill
Jason Brown
Tom Brown
Hilton Naden
Ashley Moran
Robert Evitt
Dion Creek
Jenny Creek
Joyce Henderson
Clive Henderson
Roderick Doughboy
Jack Lowdown
Jimmy(JR)Richards
Gerraldine Mammoose
Craig Wheeler
Brendan Wheeler
Matt Gillis
Penelope Ivey
Cindy Togo
John Surha
Larry Leedie
Evelyn Ivey
Dynzie Smallwood
Bruce Reese
Albert Reese
Chris Muriata
Haydn Togo
Riki Archer
Isher Segboer
Ben Jones
Luke Burnett
Scott Burnett
Oliver Costello
Ben Jobson
Sandhya Sharma
Sam
Alex Ryan
Clement Girault
Paul
Stephen McCann
Ursula Stroh
Tony Burt
Liane Kluger
Victor Steffensen
Peta Standley
Djerami Callope
Danny Fischer
Joel Nullametta
Don DeBusch
Gail Fischer
Rod Bennett

Organisations
Lama Lama Land Trust
Kuku Thaypan
Traditional Knowledge Revival Pathways
Mulong
KTFMRP
The Importance of Campfires
James Cook University
Yuin Nation
University of Wollongong
Yirandali Nation
Lockhart River Rangers
Yuku-Baja-Muliku Landowner & Reserves Ltd
Mapoon Rangers
Kaanju Kulan Enterprises Thaypan Rangers
Kuku Yalanji
Ewamin
Wild River Rangers
Girringun Aboriginal Corporation Rangers
NGISG – Northern Gulf Indigenous Savanna Group
Cape York Sustainable Futures
Sunshine Coast University
NSW Department of Environment Climate Change & Water (DECCW)
- National Parks and Wildlife Service Aboriginal Co Management Unit
- National Parks and Wildlife Service
- Culture and Heritage Division
Climate Change Office
University of Technology Sydney
- Design
- UTS Media Lab
OZ Tours
Gudjuk Consultant
Working on Country Program

CHUULANGUN WORKSHOP JULY 2010

People
David Claudie
Dundee (Robert) Nelson
James Adams
Farren Port
Gordon Peter
Erica Liddy (Sadly deceased)
Robert Nelson.
Trevor Shane Gibson
Ivan Gibson
Oswald Gibson
Cyril McGreen
Veronica O'Sullivan.
Alison Liddy
Kevin Liddy
Karen Liddy
Hazel Peter
Robert Trugar
Jonathan Upton
Peter Liddy
Davinia Lakefield
Elaine Liddy
Seppi Bassani
Richard King
Dr. Tommy George
Tony O'Keefe
Charlie Hankin
David Amber
Emma Ignjic
Don DeBusch
Leslie Schultz
Amanda Hogbin
Ronald Harrigan
Nevelle Hutton
Rosie Harrigan
Preston Cope
Iris White
Shaun Stephens
Lana Polglase
Terry Hill
Rob Evitt
Leasie Felderholf
Oliver Costello
Layla Tan
Jali Rose Tan Costello
Ben Jones
Isher Segboer
Trish Butler
Mick Blackman
Alison Liddy
Alex Ryan
Eric Vanerduys
Stephen McCann
Don Hankin
Victor Steffensen
Peta-Marie Standley
Djerami Callope
Gail Fischer
Terry Steffensen
Kathy Gibson
Simon Kennedy
Peter Drahos
Luigi Palombi
Andrew Picone

Organisations
Kannju Ngaachi Chuulangun
Aboriginal Corporation
Chuulangun Rangers
Lama Lama Rangers
Mulong
TKRP
Kuku Thaypan Fire Management Research Project
Working on Country Program
Australian Conservation Foundation
TSRA Torres Strait Island Regional Council
Yuin Nation
Bush Heritage Australia/North Australian
Indigenous Land and Sea Management Alliance
Nyacha Kumopinta Aboriginal Corporation
James Cook University
University of Wollongong
California State University Chico
NSW Department of Environment
Climate Change & Water (DECCW)
- National Parks and Wildlife Service Aboriginal Co Management Unit
- National Parks and Wildlife Service
Yirandali Nation
Red Cross / Ngadju
Kuku Yalanji
Guugu Yimithirr
NSW Rural Fire Service
The Australian National University
Parks Victoria
Gudjuk Consulting
Firescape Science
CSIRO Biodiversity Project
Cape York Sustainable Futures
The E Robert Hayles & Alison L Hayles Charitable Trust, managed by Perpetual
IBM Secondee

FIRESTICKS INAUGURAL NSW MEETING AT UTS 7 FEBRUARY 2010

People
Mark Simon
Dennis Barber
Chris Tobin
Lenore Fraser
Russell Hill
Gillian Dunkerley
Terry Hill
Preston Cope
Daniel Chalker
Christine Eriksen
Lynn Baker
Greg Watts
David Harrington
Eric Claussen
Robert Evitt
Phil Butt
Sharyn Halls
Owen John Smith
Iris White
Deanna Davison
Lana Andrews
Waminda Parker
Rob McKinnon
Wayne Simms
Andrew Boleyn
Ron Riley
Jacinta Tobin
Sharon Riley
Michael Clancy
Tim Wilkins
Victor Steffensen
Oliver Costello
Peta Standley
Jacqueline Gothe
Daniel Bracegirdle
Miguel Valenzuela
Justin Harvey
Brendan Lloyd

Organisations
NSW Department of Environment
Climate Change & Water (DECCW)
- National Parks and Wildlife Service Aboriginal Co Management Unit
- Country Culture and Heritage Division
- Environment Protection and Regulation
University of Technology Sydney
- Jumbunna
- Design
- UTS Media Lab
Mulong
TKRP
Kuku Thaypan Fire Management Research Project
Macquarie University
Yuin
Dharug
Gundungurra
Dharrawal
Wirradjuri
Yirandali
Bundjalung
EPA
NSW Rural Fire Service
University of Wollongong
Hotspots Fire Project
Lachlan CMA
Land and Property Management Authority
The E Robert Hayles & Alison L Hayles Charitable Trust, managed by Perpetual

CARING FOR OUR COUNTRY

JCU JAMES COOK UNIVERSITY

UNIVERSITY OF TECHNOLOGY SYDNEY

Perpetual

The E Robert Hayles & Alison L Hayles Charitable Trust, managed by Perpetual