Climate Change Action Workshop

Ideas Beyond Targets

Student Transition Engineers turn climate change risks into fossil freedom projects

University of Canterbury 2 October 2015

The build-up of greenhouse gases in the atmosphere will be curtailed by adoption of a standard for all engineers to eliminate fossil fuel use in every project they work on.

This amazing statement was the result of the first 20 minutes of brainstorming after a review of the science at the inaugural *Ideas Beyond Targets* workshop, convened at the University of Canterbury by Professor Susan Krumdieck on 2 Oct. The workshop was the first in a series to be held during October in New Zealand, Germany, the UK and France. Participants included 30 students from the Colleges of Engineering, Arts, Science and Law, plus 10 postgraduate students, several staff and professional engineers. In only a few minutes, the students turned the warnings of climate scientists into a clear engineering requirement.

The objective of the workshop is to develop briefs for at least four projects that could be started today and carried out at an acceptable cost with multiple benefits. Each project was developed using the Transition Engineering framework, and required brainstorming to develop ideas for how to eliminate fossil fuel use, and produce no net greenhouse gas emissions.

Recent studies show that students don't want to dwell on the science of climate change or the problems that business as usual are causing. Students also don't have time for a so-called debate. Young people want to be part of creating positive change.

The workshop began with a review of the IPCC 5th Assessment Report, and consensus development of the problem statement for eliminating fossil fuel use. Engineering students understand the meaning of safety margin and failure limit. The students adopted the RCP2.6 global emissions reduction trajectory, like a type of safety standard, as the engineering requirement for all engineers working on all systems in all fields,. The workshop provided brief tutorials on effective brainstorming, several ways to break out of "business as usual" thinking, and the Transition Engineering method for working on wicked problems. Two important ideas emerged; 1) Engineering is needed to change infrastructure, built environment, and technology, while politics, economics and consumer behaviour adapt to engineered changes; and 2) The RCP2.6 trajectory will be accomplished by individual re-design and re-development projects to eliminate fossil fuels at the most opportune point, rather than by gradual incremental reductions across all systems.

The participants chose working groups according to their interests and background. The historical data for four wicked problems had been prepared ahead of the workshop by the postgraduates in the UC AEMSLab.

- Personal Transportation – the use of oil, private motor vehicles, and accessibility, personal travel data for Christchurch.
- Buildings – the use of coal for heating large commercial buildings, use of coal in NZ and at UC.
- Land, Water and Forests – the nearly complete devestation of lowland forests, water pollution from rapid build up of dairy conversions, persistent and yet unknown ramifications of toxic chemicals in agriculture, soil loss, moisture stability, economic risks of mono-culture, and boom and bust land use in the Canterbury region.
- Aviation Transportation – the use of oil, heavy reliance on air travel for work, the 2014 data for air travel by UC staff.

A guided series of brainstorming steps was then carried out. The teams worked hard, discussed possibilities, and had creative fun. After a pizza dinner the groups presented their project briefs to the workshop for review. The results of the workshop, using the global requirement of fossil fuel freedom, local data and the transition methodology, were five projects that could be carried out now. The discussion after the project reviews was a reflection on the accomplishments that a group of interdisciplinary young people could achieve in just a few hours, and how the presentation to the wider community of the projects they identified could actually trigger a transition to a future that meets the requirements for steering clear of the climate failure limits.

Meet Me Here – The Option of Attending by Not Going

Meet Me Here is a revolutionary innovation in communications technology, conference and meeting organization, university operations and hospitality. The system hardware includes high definition AV communications installed in new “virtual conference” facilities in a major hotel chain. The Meet Me Here system offers live projections of 2-way discussions, and local conference session rooms. The hardware creates a new type of “low travel” venue offered by a major hotel chain for organizations that want to take advantage of the cost savings and socially responsible green conference option. The marketing and organization system is a data management and optimization application used by conference organizers to determine the economically efficient locations of conference venues from the registration interest. The new application developed for universities and other research institutions will be a cap-and-trade management system of staff inquiries about conference attendance. The searches for travel to meetings and conferences are matched with the MMH options and low travel options are suggested. Staff who choose the MMH options are offered incentives such as upgrades on their hotel room or preferred placement of their paper in the conference programme.

The Value Proposition: The main idea is that participants will receive the benefits of a conference; leave work for several days and stay at a hotel facility to engage in the focused thinking, presentation and discussion. However, the participants will reduce the costs, time and emissions by using a local venue. Registrations for important meetings and conferences will be increased, providing growth in hospitality revenues for the hotel chain, by offering numerous venues for international or national conferences, organizing the catering and activities to accommodate different time zones, and giving conference organizers and attending organizations the option of no-travel participation. The time and cost savings for participants in not traveling would provide the revenues for higher organization and facility costs.

Project Timeline: R&D support through the UC Innovation, with student projects working with local industry and an international hotel chain could develop the first demonstration system in 2 years.

UNICycle – The Legacy UC Student Lifestyle

UNICycle is a UC student cooperative based around the fossil-fuel free lifestyle and the innovation and development space that flourishes as it evolves. The initiation of the UNICycle project will be the enrollment of 100 students into the cooperative, engagement with UC the Christchurch City Council, sponsorship by a major cycle manufacturer and clothing brand, and enlistment of support from engineering and construction industries and ZEnergy. The project will produce a major commercial property development near UC which is designed for the post-oil lifestyle of students for the next 100 years, and ensure that the UC campus master plan development provides a legacy beyond fossil fuel. The property will be a mixed-use "high street" UNIVillage and will be owned and managed by the student cooperative trust. UNICycle will form teams to work with companies to co-design the new UNI village development. Teams will work with the council to map out dedicated cycle paths through the city, interconnectivity to public transport and activities and to develop the UNIVillage. On the campus, the UNICycle developments will include paths, parking, showers and lockers to accommodate the emerging active lifestyle. Other innovations include development of a pool car sharing system and organization of outdoor activities via train, ship and bus.

Value Proposition: UNICycle refers to any human powered transport, and the profound change in lifestyle that emerges with designs that understand the end of oil for personal transport. University students of today will live in that world. Today's students want to be the innovators, entrepreneurs, risk takers, and developers of this new world. The UNICycle project will put UC on a par with other international universities, like NTU in Singapore, that host the Future City Lab and work within the development and engineering space in their own city on multidisciplinary research projects.

Project Timeline: The project starts now, and with backing for the initiation phase from sponsors, donors and MBIE, the plans could be completed through a workshop process, the legal structures put in place, the investors secured, and the construction of the UNIVillage could break ground within a year.

UC Student Life – A Fossil Free Student Union Facility

The student union (UCSA facility) has been closed since the Feb 2011 earthquakes, and is slated for reconstruction. This project would see the facility designed and constructed not just as a "rebuild" or as a commercial opportunity to extract revenues from students, but as an essential asset to the student life and the community for the next 100 years. The design, construction and management of the facility would involve UC students and be integrated into coursework and learning across all disciplines, but particularly in engineering. The first design specification would be fossil fuel freedom. This is a major challenge, that would require adoption of the state of the art in building science and design from around the world. It would also require re-forestation or wetland restoration of university owned land to offset the construction and materials footprint. The construction should incorporate solid wood, natural, non-toxic materials, and as little concrete

as possible. The building should have facilities for bike riders (e.g. showers and lockers) and it should be the link between UC and the electric tram network of the future. There should be freely available spaces where vendors can provide low cost nutritious food for students (e.g. $3.00 vegetarian meal). There should be places for people to meet, lots of services, and places for people to meet and to learn beyond courses, like dance, fencing, meditation, cooking, gardening… There should be some "crash pad" facilities like a hostel. The outdoor spaces should be gardens with fruit and nut trees, and water conservation and storm water management should be world-class.

Fossil Free Performing Arts Centre, Lecture Hall and Theatre

UC needs a world-class venue for students and community for performances and for lectures. This venue could be part of the UCSA complex as it would be accessible by the community as well as students. The theatre should be a building project in its own right – and a famous, world-leading architect should be sought to provide a real legacy and iconic signature building for the campus (now that the Mushroom is gone in the earthquakes). In the USA, these buildings are often part of the *Memorial Union* which provides the hub for student services as well as the venue for concerts, gala events and graduations. A google image search on Memorial Union or University Great Hall gives some idea of the type of facility which is missing at UC.

Value Proposition: The university needs to take its place as a cultural centre of the city and the country. Architecture expresses the self-belief and aspirations of the people, as well as providing for their daily needs. This project aims to provide the context for a major philanthropic investment in the architecture of the university by initiating the student-driven proposition for a world-class student union which also showcases next-century science and engineering.

Project Timeline: The timeline on this project is urgent. We know all too well, that retrospective change to eliminate coal use in the student union complex will be costly and difficult. The students want to be involved from the start, setting the agenda for the design and use of the facility.

Clean, Green and Alive Again – The project of re-colonising the Canterbury Region

One hundred years ago people saw the natural environment of Canterbury's lowlands and hills as being in desperate need of massive change in order to be made productive. Less than 20 years ago, a few people saw a way to re-develop the land an increase profit by exporting dry milk powder. The environmental science is quite clear – the dairy boom has become counter-productive. Beware of simple solutions to complex problems and interrelated risks. This project proposes that with the latest science and modelling, the true optimization of potential for all of the multiple uses and objectives of the land and water and ecology of the region can be realized. The Clean, Green and Alive Again project aims to establish a Centre for Future and Transition engineering, environment and agriculture development. Researchers and students at the centre would bring together the most current science, GIS tools, UAV and data sampling capabilities, and agribusiness to map out the most prosperous, resilient, and GHG negative land use re-development of the Canterbury Region. The Centre would be set up by MBIE with DOC, Forest & Bird, Ag Research, Fontera, Federated Farmers and others. The first sub-project would be to discover and study exemplar farms, tourism areas and natural reserves to gather data and develop models for sustainable and integrated land use. The on-going work of the Centre would then be modelling and engineering the transition plans for the councils, ECAN, land owners and the Crown

to understand how to break out of the colonial boom and bust process and proceed as quickly as possible to an optimal land use pattern. The idea here is that these patterns emerged over very large stretches of time in Europe, the Americas and Asia and resulted in ostensibly sustainable land use patterns for the available productive land and woodlands in many places. In New Zealand, the pace of development has led to one environmental catastrophe after another as colonists sought to make their fortunes by extracting wealth from the land. Clean, Green and Alive Again will use modern science, local experience, data, and engineering modelling tools to create, in just a few years, the equivalent land use pattern that would be gained through thousands of years of trial and error and traditional knowledge. Optimization means a land use and activity pattern that enables a sustainable balance between intensity and wilderness, extraction and regeneration, production and recovery, individual profit and public real value creation. The results are not yet known, but the research will consider creating biodiversity and waterway corridors, regeneration of native bush on slopes and in poor soil areas, creating water reserves, modelling the wind and sun contours of the land and soils to optimize productivity while minimizing inputs.

Value Proposition: The reliance on mono-culture and the volatility of boom and bust have degraded the environment that we all depend on to crisis levels. Clean, Green and Alive Again will create real value in financial, environmental and social terms that will stabilize the economy of the region, and result, over the next decades, in the emergence of the sustainable patterns of land use and activities.

Project Timeline: This project must be launched immediately. There is an urgent need to provide a basis for dialoge and media coverage of a different vision of the future potential of the region than simply continued intensification of dairy as if there are no alternatives. Continued intensification of dairy – or any single land use for that matter – imposes risks on other values and eventually undermines the ability of the environment to support productivity. The proposal for this project could be developed by a concerted effort of UC staff and students and brought to the government with a case for funding of the initial research by 2017.

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