M:nex

design for the food energy water nexus

M-NEX design charrette in Sydney: creative participation in regional Food-Energy-Water design for Western Sydney development area

International Workshop - 3-8 November 2019

Rob Roggema & Stewart Monti, February 2020

1 Introduction

Between 3 – 8 November 2019 the M-NEX team held its bi-annual workshop in Sydney. The Sydney theme within the project is to investigate design-led solutions for the regional scale in an intensive development area constrained by multiple climate impacts of which extreme heat in the Australian summer is the most significant.

2 International team reporting

2.1 Amsterdam, the Netherlands

The Amsterdam Living Lab is being led by researchers from TU Delft. Delft has 102,253 residents; the University has 24,703 students and 5,421 staff. The carbon footprint of the University is 47,957 tonne CO_2eq/year; this is equivalent to 3,552 ha of forest to compensate carbon capture. The team will be using a similar methodology to calculate carbon capture for their target area. The target area within Amsterdam is the Kattenburg district. Near the Amsterdam harbour and a former marine base it is now an area of mainly social housing. The team have a series of workshops planned with local stakeholders throughout 2020. Part of their work will explore the effect different types of urban farming will have on carbon emissions.

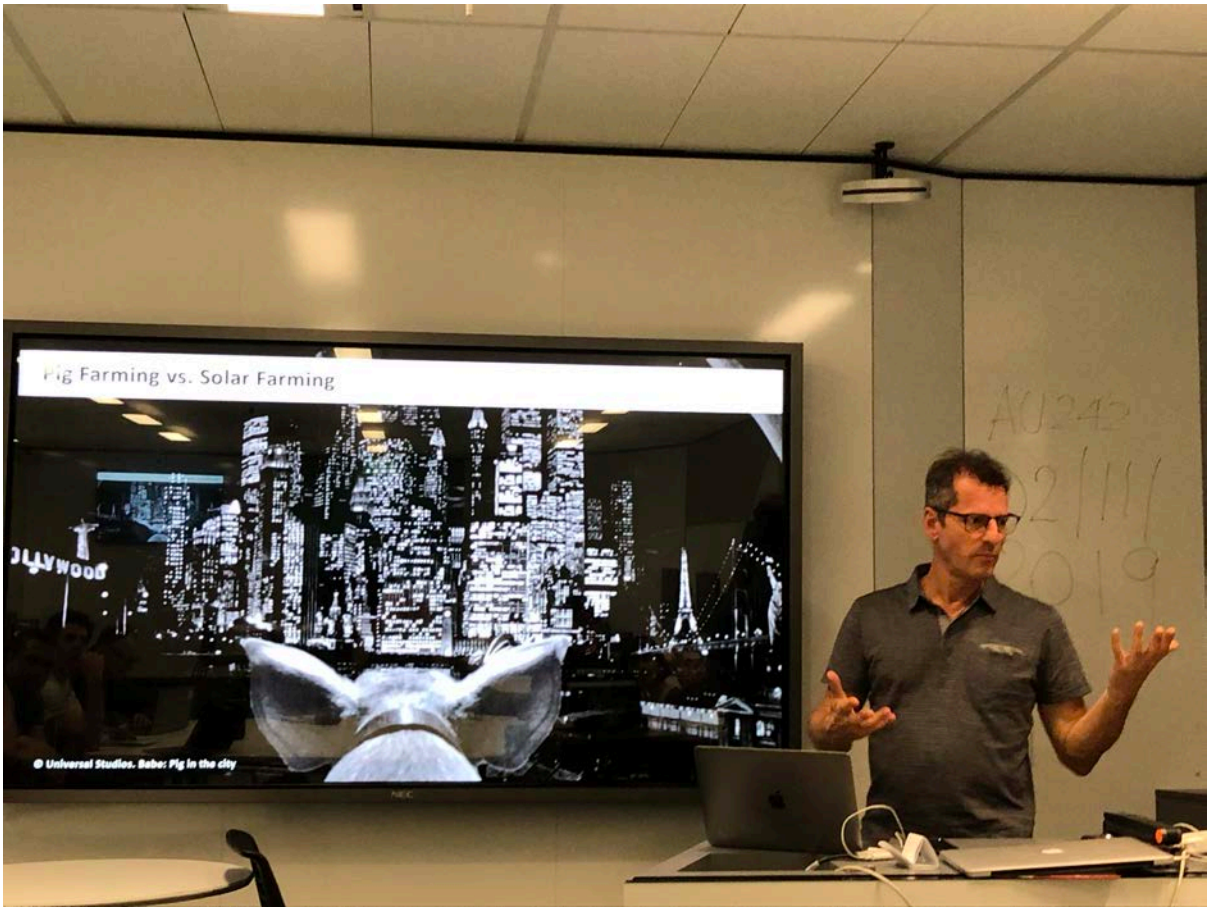


Figure 1. Prof. Van den Dobbelsteen presenting the progress of the Dutch team

2.2 Detroit United States

The Detroit Living Lab is being led by researchers from the University of Michigan, Ann Arbor. Detroit is situated in the Great Lakes mega-region. The city itself is highly distributed. It is built on an industrial legacy centred on automobile production. It is also challenged by fundamental issues of race and race-based bifurcation. In 2013 the city declared bankruptcy with creditors owing $US18.5 billion. Its population has declined from a high of 1.85 million residents in 1950 to only 685,293 at present. Food access is a priority in the city as much of it is classified as food desert. The Detroit Living Lab is exploring four main proposals: distributed food access infrastructure, bottom-up farming, mixed-use FEW housing, technical food systems, and a linear city.

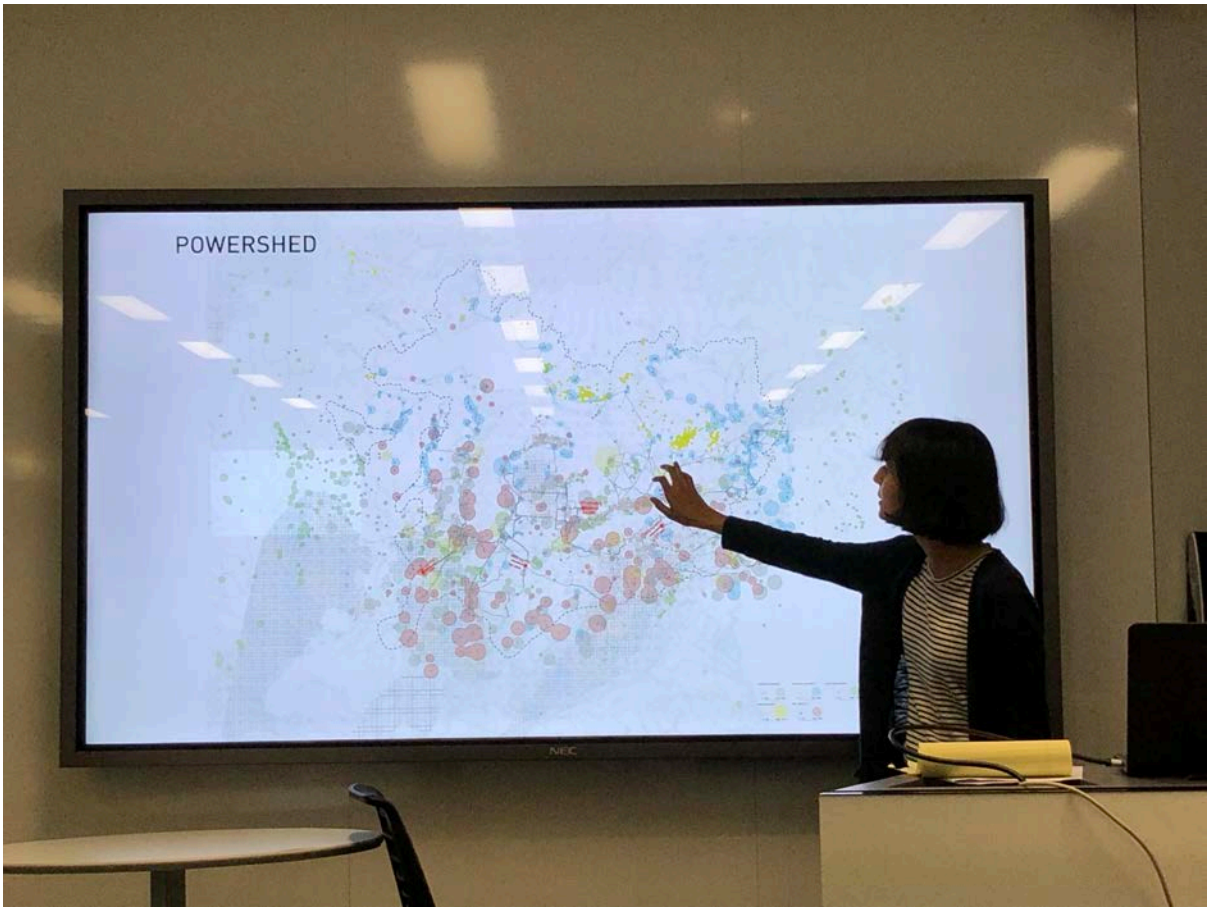


Figure 2. Tithi Sagnal presents the Detroit team results to date

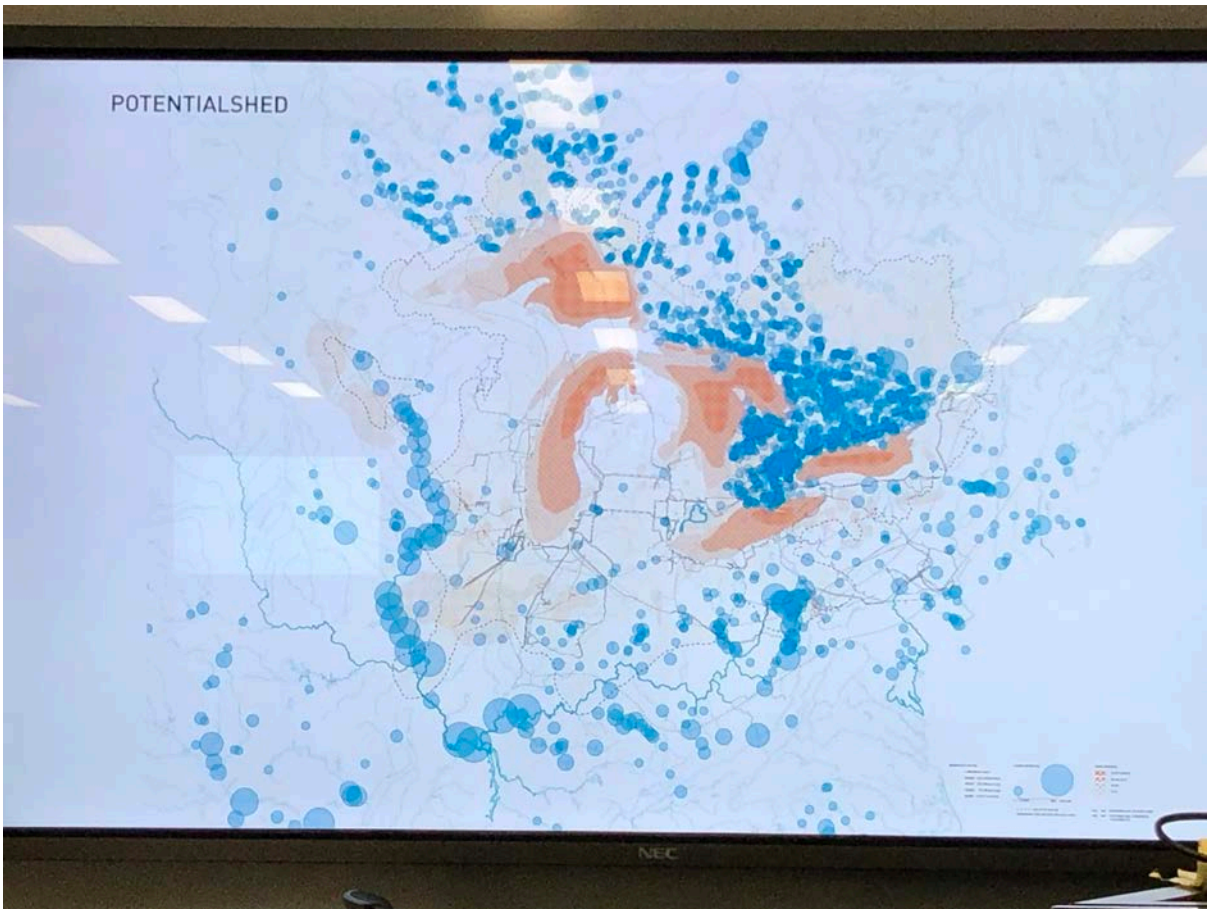


Figure 3. One of the mappings carried out by the Detroit team

2.3 Belfast, Northern Ireland

Northern Ireland is mostly rural and has an economy that relies on agriculture. This agricultural production evolved significantly over the last decade to focus mainly on livestock, occupying 72% of Northern Ireland land use. The consequences of this are that the population has a large consumption of meat. Quantification and visualisation of resources required to produce the typical Northern Ireland diet results in 134-times the area of the typical Belfast terrace house. This includes the land area to produce the food, capture the water, and sequester the resulting carbon.

Figure 4. Sean Cullen presenting the results of the Belfast team

2.4 Tokyo, Japan

The Tokyo Living Lab is being led by researchers from Keio University. They have three main study sites: Keio University Shonan Fujisawa Campus, Tama-Plaza, and Futako-Tamagawa. Each of these sites operates in different socio-cultural contexts but with the same target – to improve resident's quality of life. Futako-Tamagawa is a low-lying area approximately 15km from central Tokyo. It was severely flooded in 2019 by Typhoon Hagibis. Tama-Plaza is approximately 25km from central Tokyo and is a very steeply hilled area with an ageing population. One of the main focus areas for the Living Lab is also food access because the ageing population has difficulty negotiating the terrain.

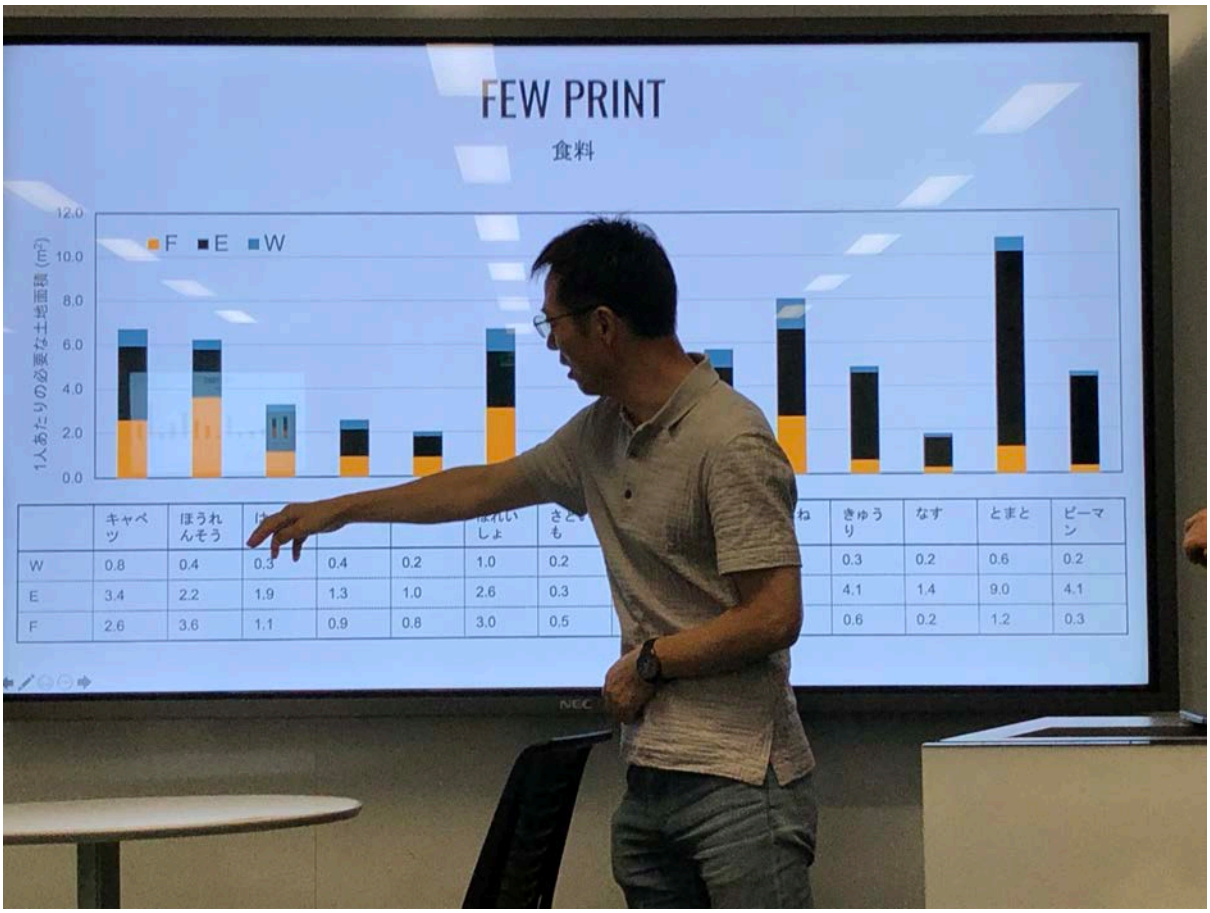


Figure 5. Porf. Wanglin Yan presenting the reults of the Tokyo team

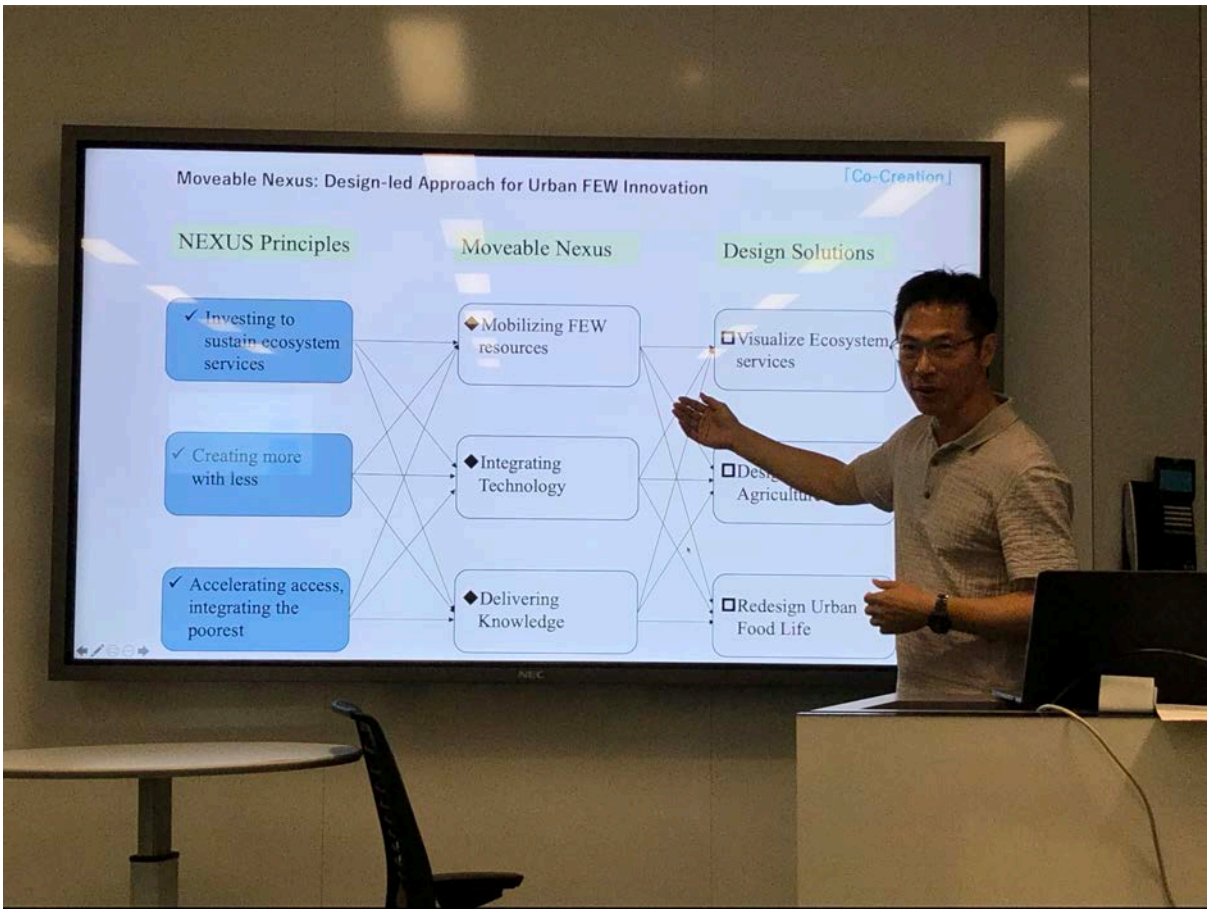


Figure 6. Prof. Wanglin Yan presenting the Japanese results to date

2.5 Sydney Australia

In earlier workshops Sydney-participants visualised at decreasing spatial scales three scenarios – high intensive integrated production, networked emergence, regeneration of the commons – and a resilient amalgamation. Aside from the mapped scenarios at two scales a series of design principles for future development in Western Sydney were also proposed.

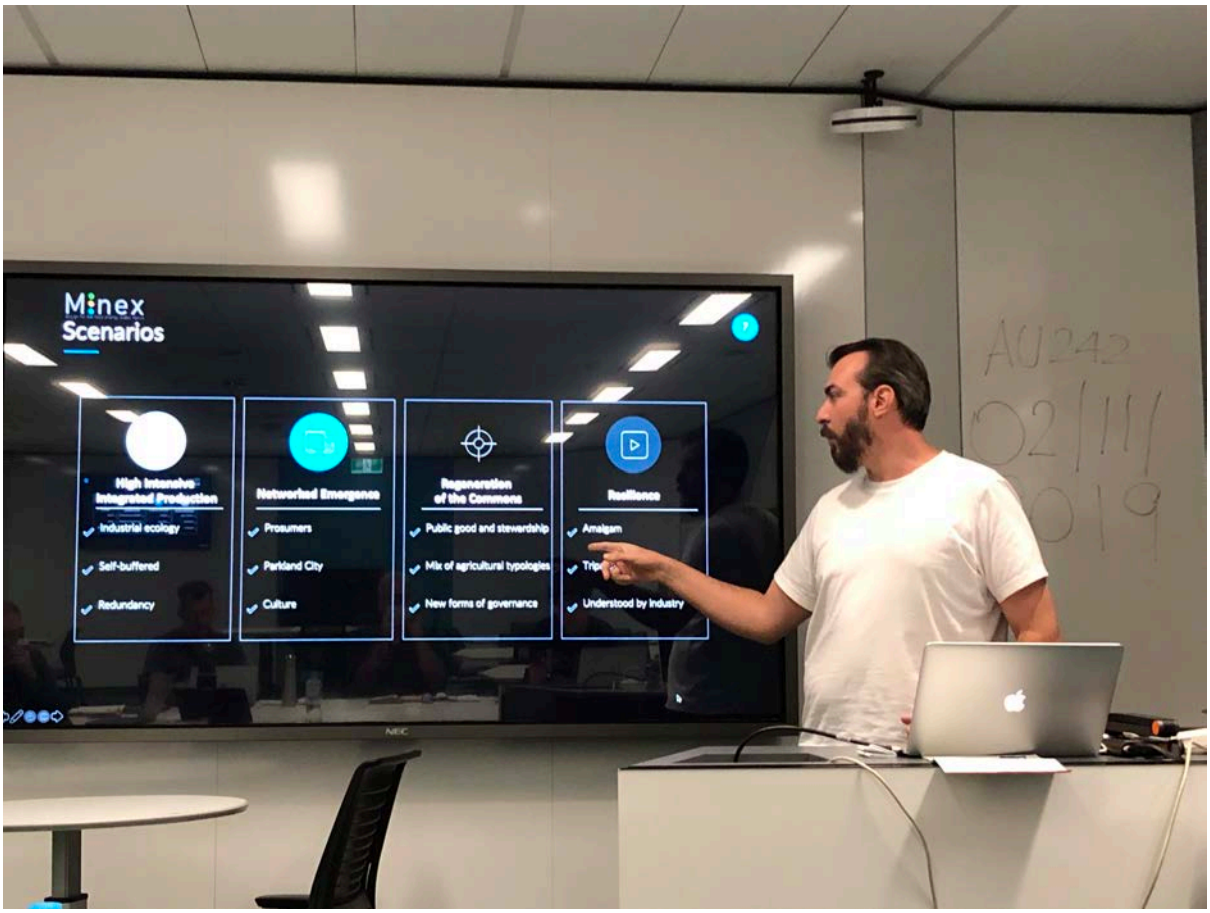


Figure 7. Stewart Monti explaining the results of the Sydney team

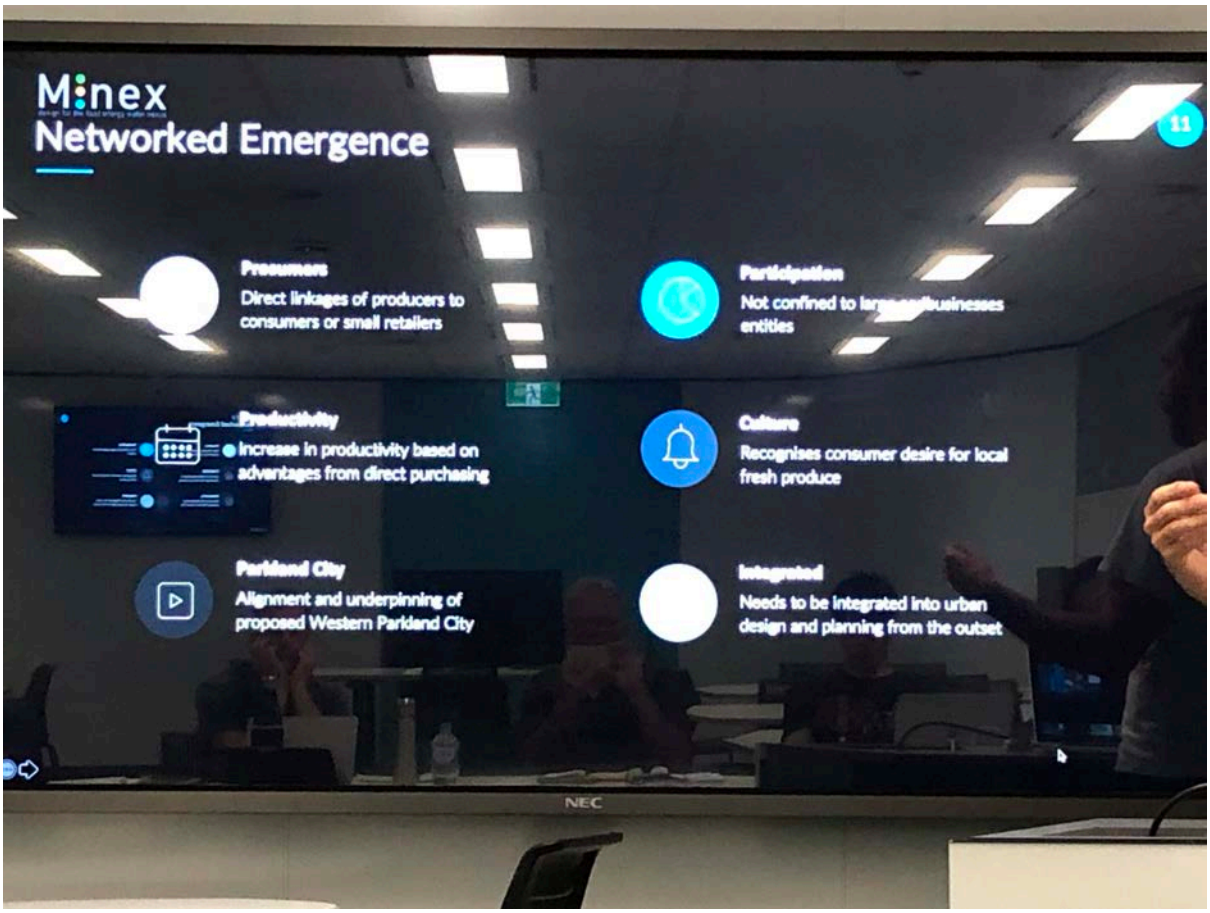


Figure 8. One of the developed scenarios in detail

3. Western Sydney Parklands, case study

The M-NEX case study area in Sydney Metropolitan area is the so-called Third City of the Western Parklands. Here, a new 'Badgerys Creek' Airport will be constructed, and this gives reason to project a large agri-business complex, 100-thousend of jobs and new residents in the area. This all needs to happen in a landscape that is dominated by a fine system of gullies, creeks and waterways, tied together in a hilly landscape of the Cumberland plain. This gave the M-NEX team reason to start the design with the systems that formed the landscape in the first place: water, ecology, soil.

4. The design charrette process

The process during the workshop was led by consideration how to facilitate spatial design in the best possible way, whilst engaging local stakeholders in a creative way.

3 and 4 November, the international M-NEX team therefore started with a mini design workshop in which local and regional knowledge was used to conceptualize the first spatial propositions how to create a cooling landscape for the new urban precincts. These propositions were then presented on 5 November to the local stakeholder group that participated in the design charrette and functioned as an inspiration for the design process that

followed. In a two-day charrette (5 and 6 November) the M-NEX team worked with local stakeholders in a creative and stimulating way to find spatial solutions to localize FEW-systems, and meanwhile developing a cooling strategy for the city. In four groups the participants started brainstorming possible ideas on four themes: food, energy, water and cooling. The generated ideas were then collectively rated in three categories: easy to realize (blue), challenging to realize (red) and dreams, or hardly imaginable to realize (yellow). The top-ranked red ideas were then taken back into the groups to be enriched by the best supporting and most resonating ideas from the other two categories. Together these were then transformed into design projects, which were designed at regional and local scale. After the final design exercises, the groups worked on building a plasticine model of the two most relevant integral proposal at a local site. The design charrette ended with presenting the work in a comprehensive and concise way. The way this process was organized stimulated creativity, out-of-the-box thinking and collaboration between stakeholders and professional experts of the M-NEX team. New insights emerged in the form of concrete spatial proposals that can be applied and used in the current urban development process for the Western Sydney Parklands.

5. Stakeholder engagement design workshop

The M-NEX Sydney Living Lab local stakeholder workshop was held 5-6 November 2019 at Western Sydney University's Hawkesbury Campus, Richmond.

Figure 8. WSU Hawskbury campus

The main aims of this third workshop were twofold:

1. Build upon the activities of formerly organized workshops and begin amalgamating strategies at the regional, precinct and building scale.

2. Provide a platform for knowledge sharing and peer review with members of the visiting international partners.

The workshop was convened by M-NEX Sydney Chair Dr Rob Roggema, Professor of Spatial Transformations – Sustainability at Hanze University of Applied Sciences, Groningen, the Netherlands and Stewart Monti, Research Associate for M-NEX Sydney. Professor Juan Francisco Salazar, School of Humanities & Communication Arts, Research Director - Institute for Culture and Society and Research Theme Champion (Environment & Sustainability) Office of the DVC Research and Innovation at Western Sydney University, provided significant support to the project by hosting the workshop and inviting many WSU researchers to attend.

Participants included local stakeholders along with visiting international partners (a full list of participants can be found in the appendix).

Activities during the workshop took three forms:

a. Presentations from M-NEX international teams.
b. Collaborative workshop sessions.
c. Collaborative design charrette sessions.

Collaborative workshop sessions focused on one main activity: COCD Box methodology of creativity exploring and prioritising feasibility of proposals from both local stakeholders and international partners. This is set out in section 6.1.

Building on the strategies proposed in the workshop session participants then used them as the basis for the first design charrette session on day 1. Following on from this day 2 continued the collaborative design charettes by extending and expanding these ideas. These are set out in section 6.2 and 6.3.

An appendix is attached to the end of this report which provides greater details of the day's conduct. This includes a full list of participants, the day's program and discussion notes.

6 Workshop results

6.1 COCD Box

The first of the collaborative workshop sessions revolved around the COCD-Box. The session began with a brief introduction to the aims of the exercise and intended outcomes by Rob Roggema. The COCD-box helps you to select the most promising ideas from a brainstorm with less restraints from their feasibility. The Box has two axes: the originality of the idea and its ease of implementation. Original but not (yet) feasible are placed in the yellow square, original and feasible are placed in the red square, the feasible and already known ideas should be placed in the blue square. Ideally participants should be encouraged to think about unfeasible ideas connected to their dreams or future possibilities in the idea generation taking place before the selection process. This allows new "out of the box" ideas to blossom.

Figure 9. results of the COCD-box workshop

Four posters were set on individual tables each with a different title – food, energy, water and heat (fridge city). Participants were then split into four groups and given five minutes at each sheet to write down as many ideas as possible related to the theme. After five minutes teams rotated until all groups had contributed to each theme. These sheets, replete with ideas, were then posted to the walls and participants given a series of coloured sticky notes each corresponding with a quadrant of the COCD box. Participants affixed these to the various sheets until they had used them all. At this point the sheets had a number of proposals with a variety of sticky notes determining the attractiveness of each. The top proposals with the highest number of sticky notes were then transposed onto a sheet with the COCD box. The most supported ideas were:

	Yellow Ideas: 1. Zero water systems for manufacturing (water) 2. Water in the landscape (heat) 3. Vertical farm 2.0 (food) 4. Optimal nutrition and taste (food) 5. Leak fixes and system upgrades (water) 6. Biogeneration using perceived waste (energy)
Blue Ideas: 1. Regenerative agriculture (water) 2. Add a lot of green (heat) 3. Heat pump systems (heat) 4. Microgrid (energy) 5. Tropical typology 6. Vegan future	**Red Ideas:** 1. Native food (food) 2. Make urban surfaces heat collectors (heat) 3. Restaurant development – closed loop systems (food) 4. Algae plantations to treat water (water) 5. Grow novel alternatives for proteins (food) 6. Storage capacity (energy)

Figure 10. The COCD-box filled with ideas

Following this, individual groups then created their own COCD-Box and chose a single red idea to explore along with a number of supporting blue ideas and potential yellow ideas that could eventuate. These would become the basis for the first design charrette as groups explored the amalgamation of these ideas within the context of Western Sydney.

6.2 Design Charrette

The first collaborative design charrette of the international workshop took place following lunch on day 1. The exercise took the combined top ideas from the COCD Box methodology and sought to explore these in physical form in the context of Western Sydney. Four groups worked for the afternoon and prepared a series of drawings and diagram to explore them. A summary of them is below.

Group A: CircularStreaming

Chris Gantt, Jason Lu, Geoffrey Thün and Nico Tillie

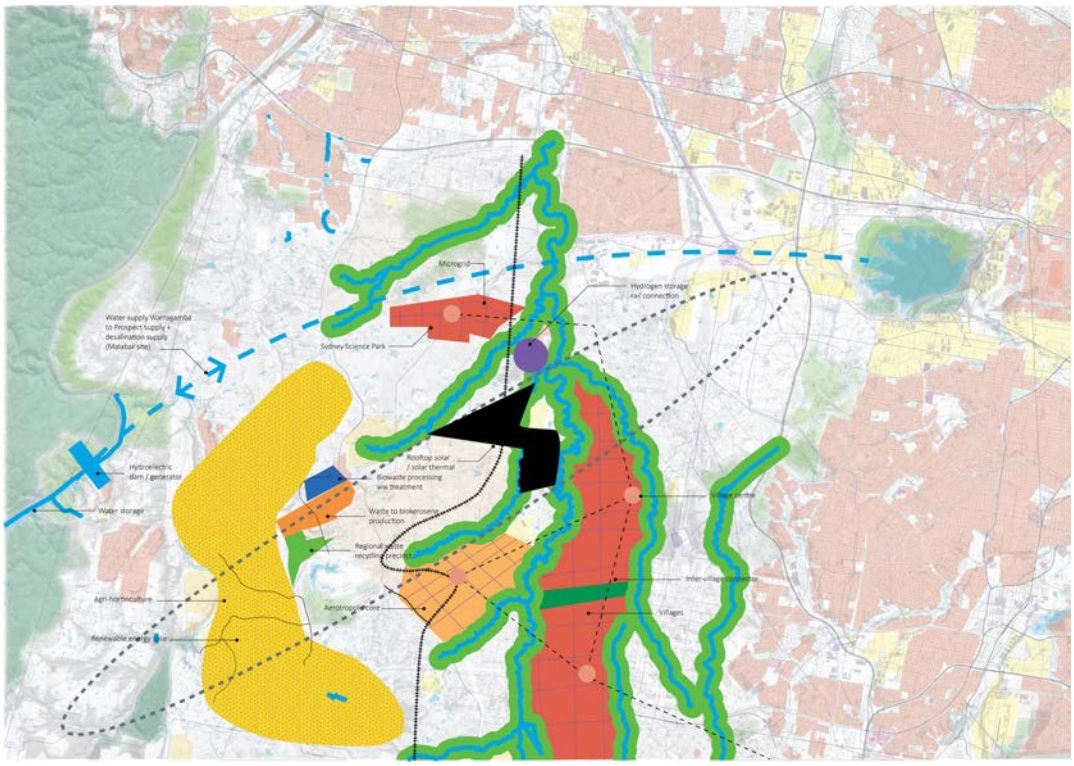


Figure 11. Large scale landscape design

This group focused on energy storage and circular economy related to food. They explored which ideas scale well and synergise. Food stock close to the end of its shelf life is transported to a water treatment facility and using it to create biokerosene. This in turn feeds directly into an adjacent large-scale agricultural/horticultural facility. The scenario explores tensions between ideas that work well at the scale of a village and others which are better suited to a larger network scale. These food-centric ideas tied well with energy generation to create a successful nexus.

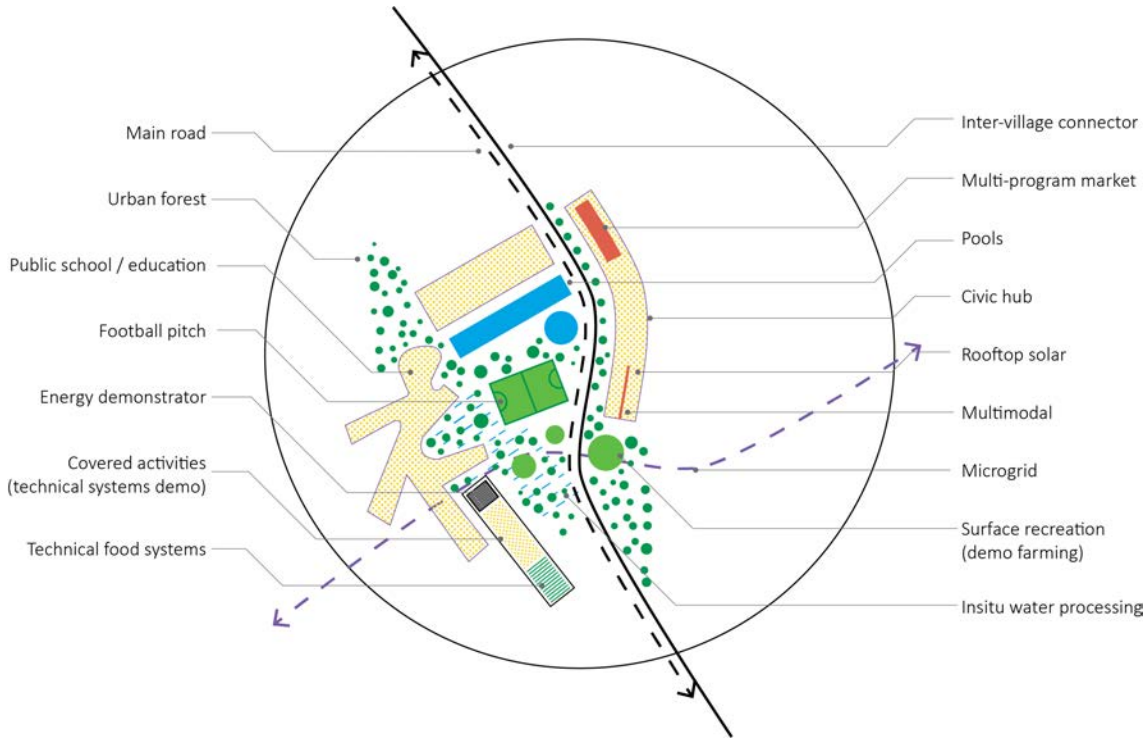


Figure 12. Urban design scale

At the smaller, village scale the process and outcomes are more urban design-based, rather than conceptual networks. Main circulation routes through the village are designed for both mobility and energy. Built form centres around a village green. This scheme is predominantly socially driven and focuses on transport, and the use and storage of energy onsite. Agriculture is eschewed to instead focus on the finer grain.

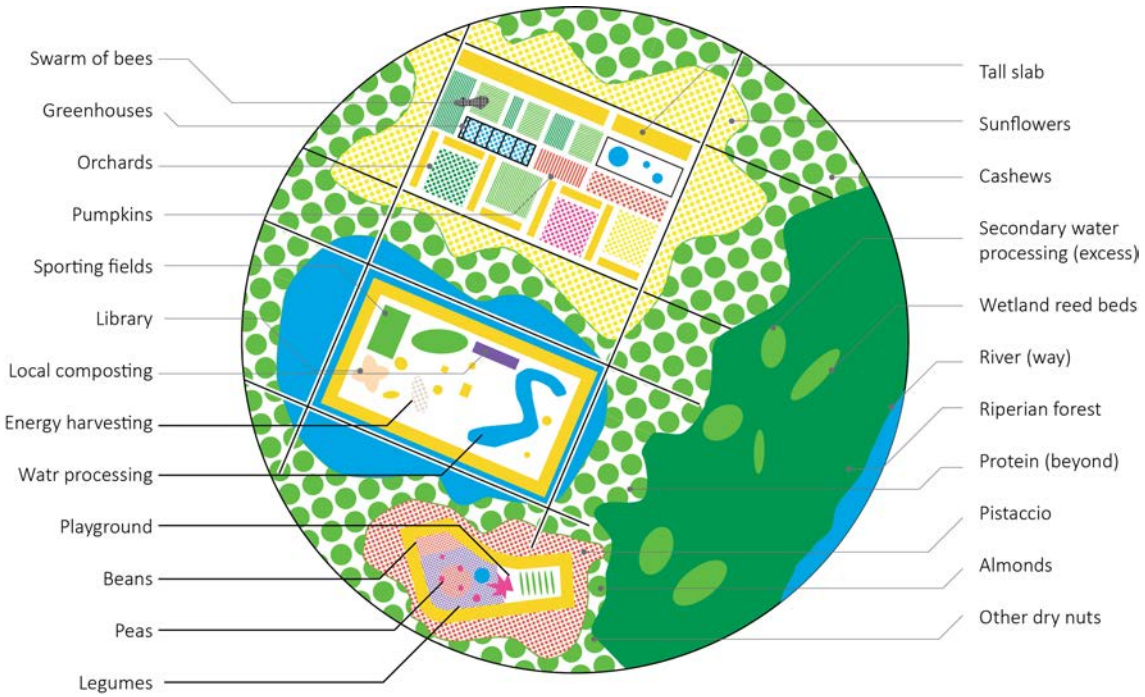


Figure 13. Built environment scale

The third proposition is a combination of two international projects: Haverleij, the Netherlands – a project which comprises seven 'castles' by seven different architects which sit within the landscape; and Lafayette Park, Detroit - residential district, with post-war modernist houses and high-rise buildings. This scheme includes three 'castles' in three different themes all of which focus on agriculture and circular economy on a village scale. An 'Adult' precinct, a 'Blue Water' precinct, and a 'Black Water' precinct each focuses on distinct residents and agricultural types. The castles are then connected together with a 'Protein Orchard'. Here tree-based nuts are grown which, despite potentially being water-intensive, could be viable based on an excess of wastewater being produced from the 'castles.' As water reaches the end of its useful life it is then filtered through a transitional green buffer before being released into the waterway.

Group B: RegenAgri

Susan McHattie, Lyndall Pickering, Sean Cullen and Jason Reynolds

Figure 14. Typical sites (L); example of land holder and land use variety

This group focused on the site of the future Sydney Science Park, specifically a smaller tributary leading into South Creek. The group explored what type of research project could be created to trial different types of regenerative agriculture to make an informed assessment about what strategies would be most effective. The overarching concept is that regenerative agriculture could be used as an economic way of restoring soil and water quality in what is currently a degraded area. It is best to begin this work at the start of the tributary. Given the fragmented ownership of the land this might need to happen in pockets. The group explored the potential for an overall governing mechanism and a set of methods that could be commonly used across the region. Imagining a series of individual landowners, a variety of different approaches could be trialled. The first approach was to leave the land to go wild, let the weeds grow, and return it to a version of Indigenous grassland and yams. Other concepts included flowering trees and hardwood forests for harvesting. These approaches were married to different methods of land ownership. Land could be 'banked', as in the case of Sydney Science Park, where the owner is interested in capital gain but is still prepared to experiment and innovate to lift value. Land could also be farmer owned, crown land leased by a farmer, or crown land without farming.

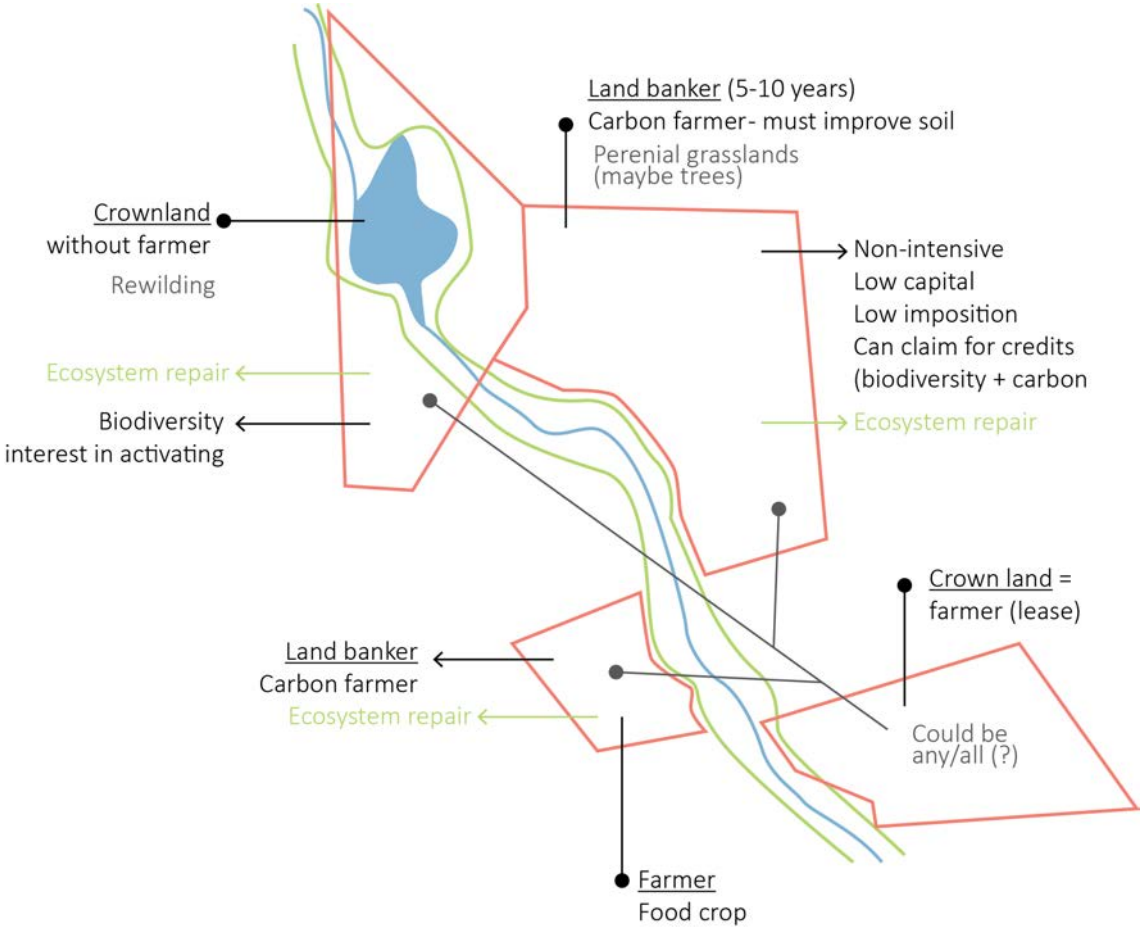


Figure 15. Potential land holder types

The group then explored the vested interests of each of these stakeholders and what would they bring to the project. What would they require from it and what could they contribute to? Also taking into account the inclusion of government planners and research centres that would make contributions. The outcome of the intersection of these distinct parties would be a handbook to guide work across the region.

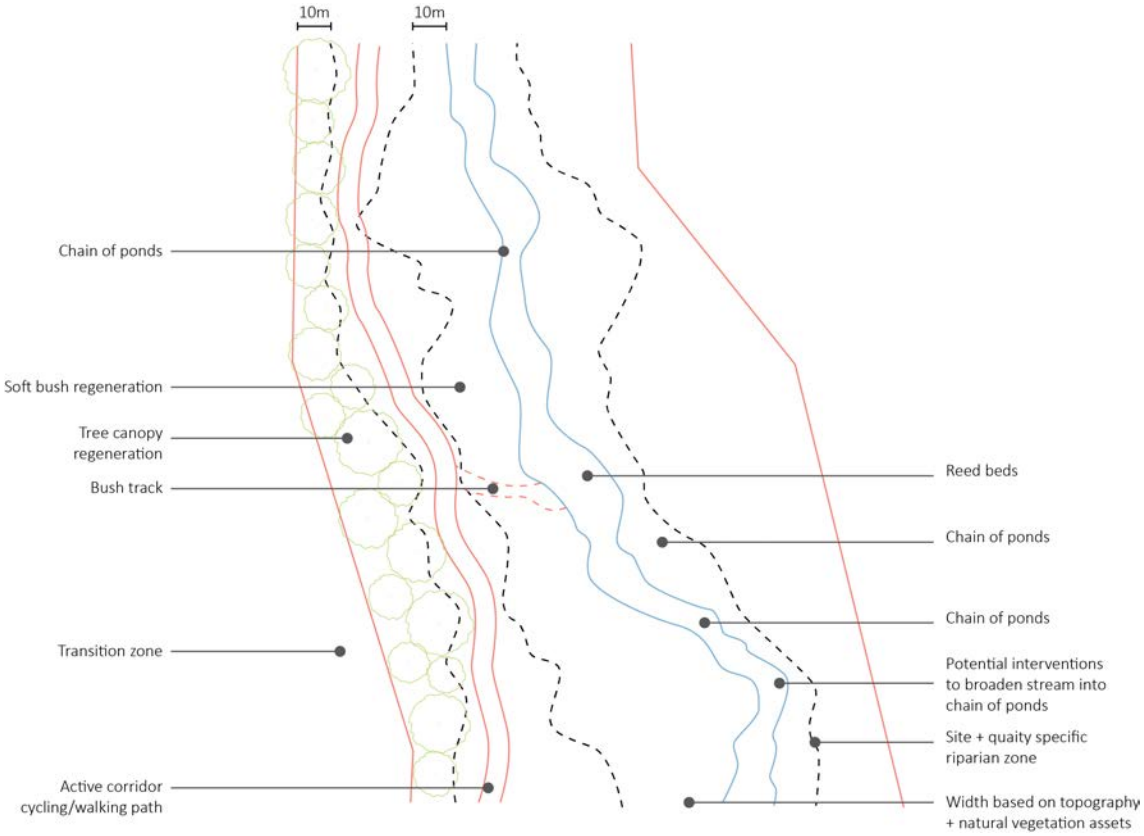


Figure 16. Typical plan showing landscape opportunities

Finally, the group explored what the ultimate asset would be at the end. Regenerative agriculture suggests that there is intervention in the tributary's riparian zone. The waterscape is broadened, and a chain of ponds is created. The riparian zone, normally a uniform 10 metres wide, would reform to follow the natural landscape. Outside of this would be recreation space for active transportation. This then becomes a part of the asset which is transferred to the future community. Along the boundary between regenerative agricultural land and development land is a canopy of trees.

Ultimately, the strategy is a system and a process which could potentially be gamified on the Sydney Science Park site as a way viewing how this could be developed across the whole of Western Sydney.

Group C: No Nuisance

Andy van den Dobbelsteen, Tithi Sanyal, Shun Nakayama and Kevin Logan

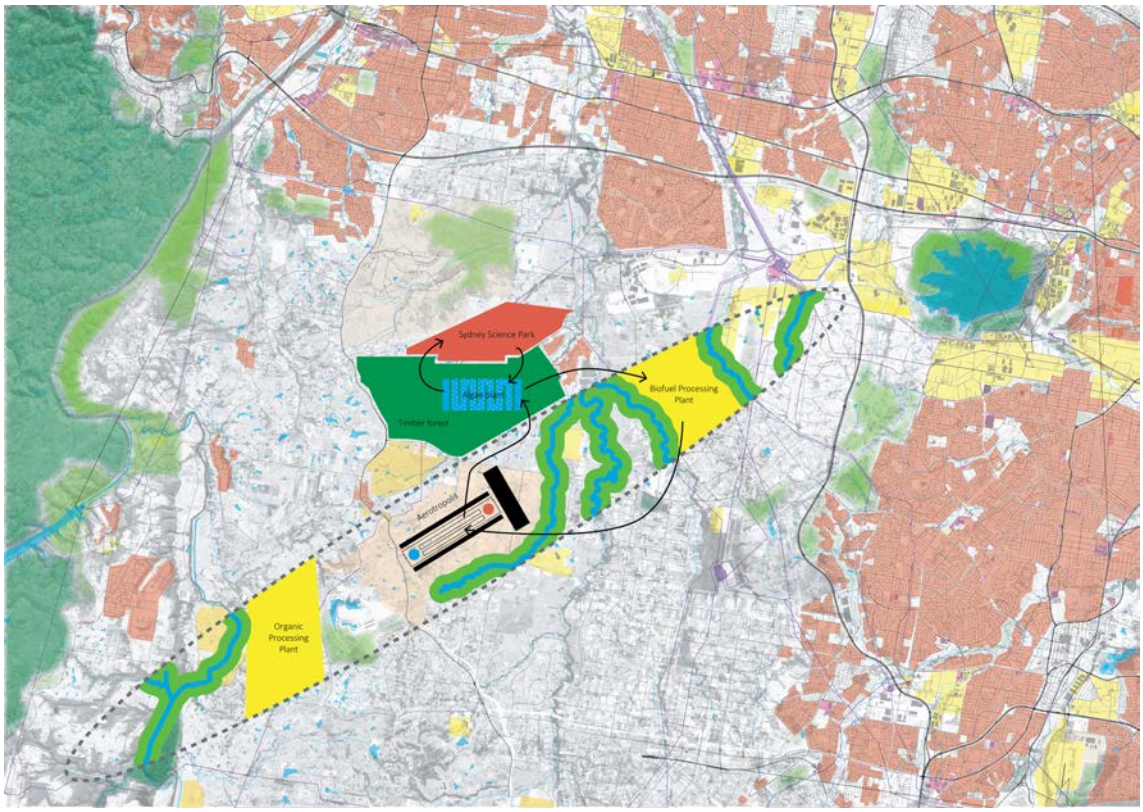


Figure 17. Regional plan

This group's work built upon the airport nuisance zone scenario, incorporating an algae-based circular system at the regional scale. This algae plant is bounded by the airport in the south, Sydney Science Park in the north, South Creek in the east, and The Northern Road in the west. Wastewater from both Sydney Science Park and the airport could be purified here with the algae then moving into a biofuel processing plant to the east of South Creek. This plant could produce biokerosene and synthetic kerosene. The western area of the nuisance zone now becomes an organic processing plant, where manure, anaerobic digestion, biogas production, compost production and fertiliser are produced. This scenario accepts all existing conditions as such could be delivered now.

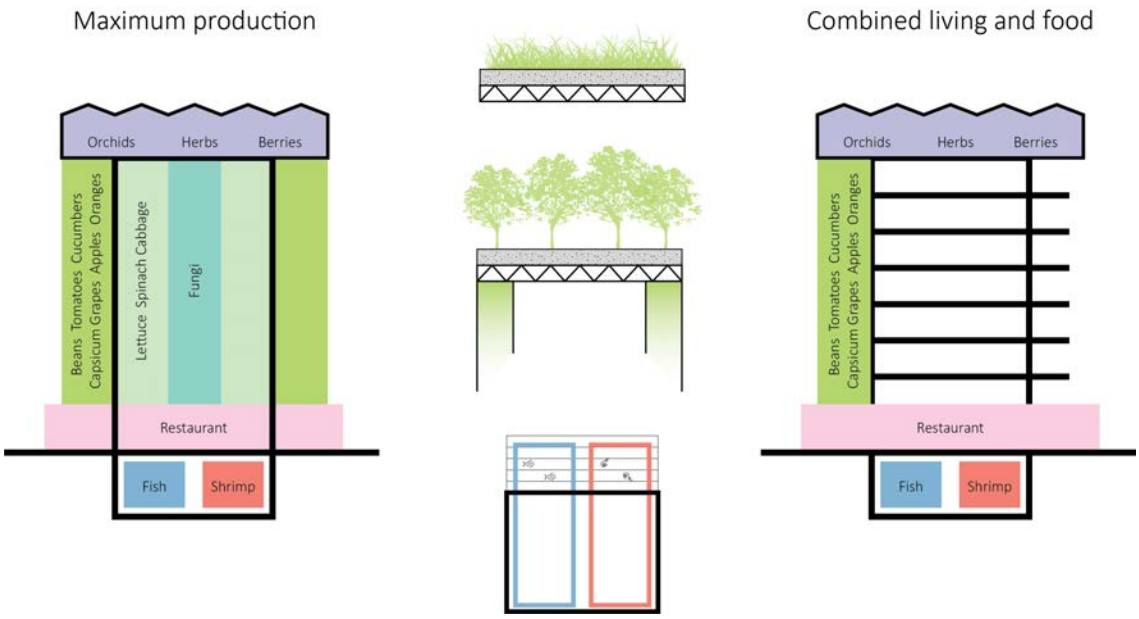


Figure 18. Processing waste streams and urban agriculture in combination with housing

At the local scale the group explored the design of a restaurant which is based completely on circular streams. This is centred around a building which a building which is fully designed around the theme of food-production . This building incorporates different zones: the roof for plants which need significant daylight, façade greenhouses for plants requiring height, an in between zone which requires daylight but little height, and in the middle a dark zone for fungi. Heat and cold storage could also be combined with aquaculture for fish and shrimp production. Two options were developed; the first devoted entirely to food production and a second combined with residential. In this scenario the north façade is used for food production and the south side reserved for residential balconies. A productive green roof could replace greenhouses on the roof and allow for both food production and leisure.

Figure 19. Building design

Group D: Bush-tucker Land

Greg Keeffe, Simon Toze and Stewart Monti

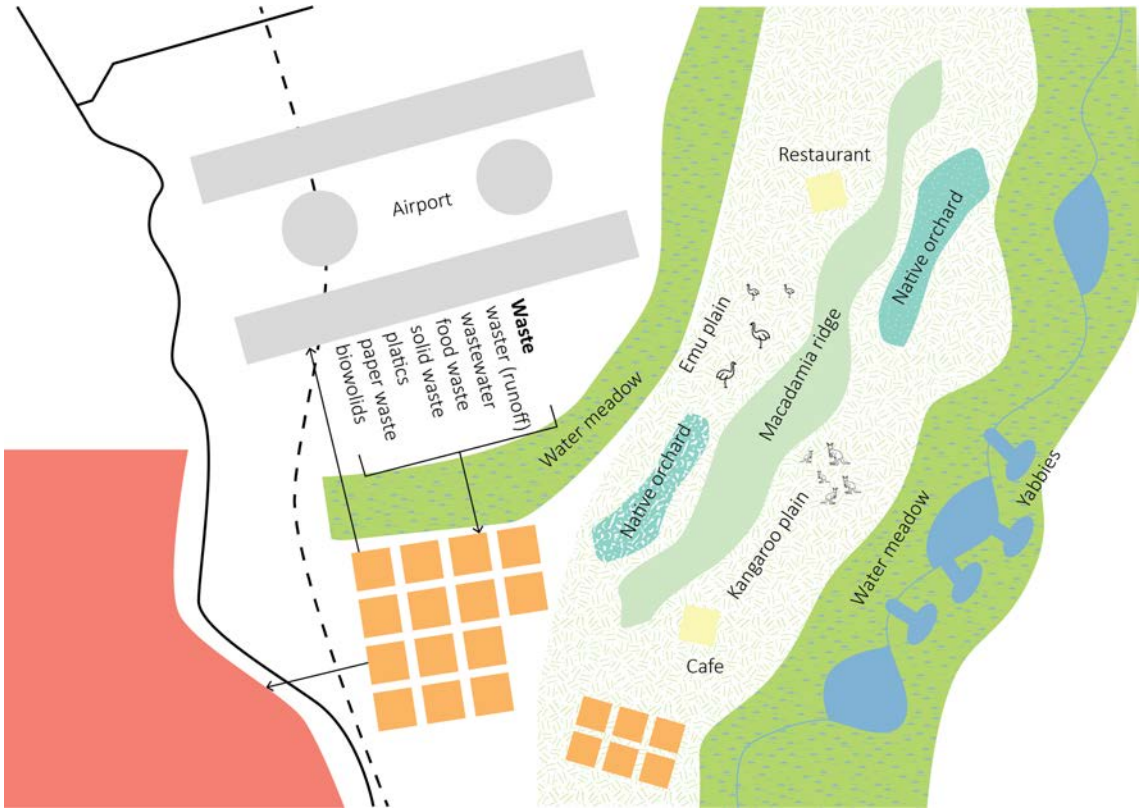


Figure 20. Regional design

This group focused on the production of native foods in the region surrounding the airport. The airport buffer zone becomes a bush tucker park, including a kangaroo plain, macadamia ridge and emu plain. Visitors could go on safari to become more accustomed to native Australian foods. Engaging with the landscape from which it is produced would encourage more interaction.

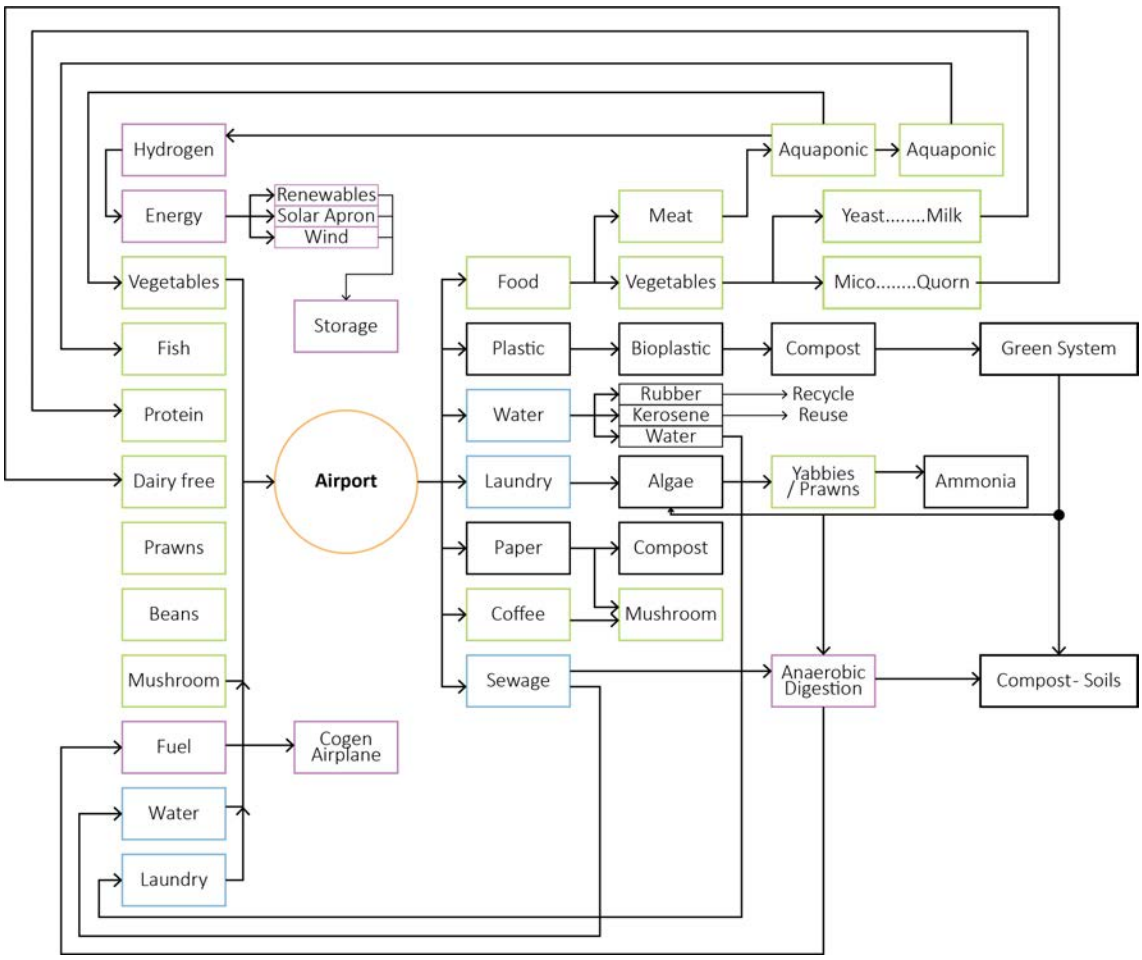


Figure 21 Diagram of flows

The group also focused on alternatives forms of proteins and did this by exploring the waste streams from the airport and surrounding Aerotropolis and Agribusiness precinct(s). These in turn were treated as resources for additional stocks which could then be reintroduced back into the landscape ultimately becoming inputs for the airport again in a circular way. These also feed the alternative proteins which focused on non-traditional native animals such as witchety grubs, Bogong moths, meal worms and mangrove worms. Ultimately, the cultural change encouraged by 'going on safari' will engage the public with these new types of foods. Food is cultural. You can't invent foods without engaging with culture. These technical foods systems are inevitably dense and small so a larger portion of the landscape is freed up for more interesting things.

6.3 Collaborative Design Charrette

In four mixed groups participants further refined the proposals from the previous two days at varying scales.

Group A: Productive Nuisance

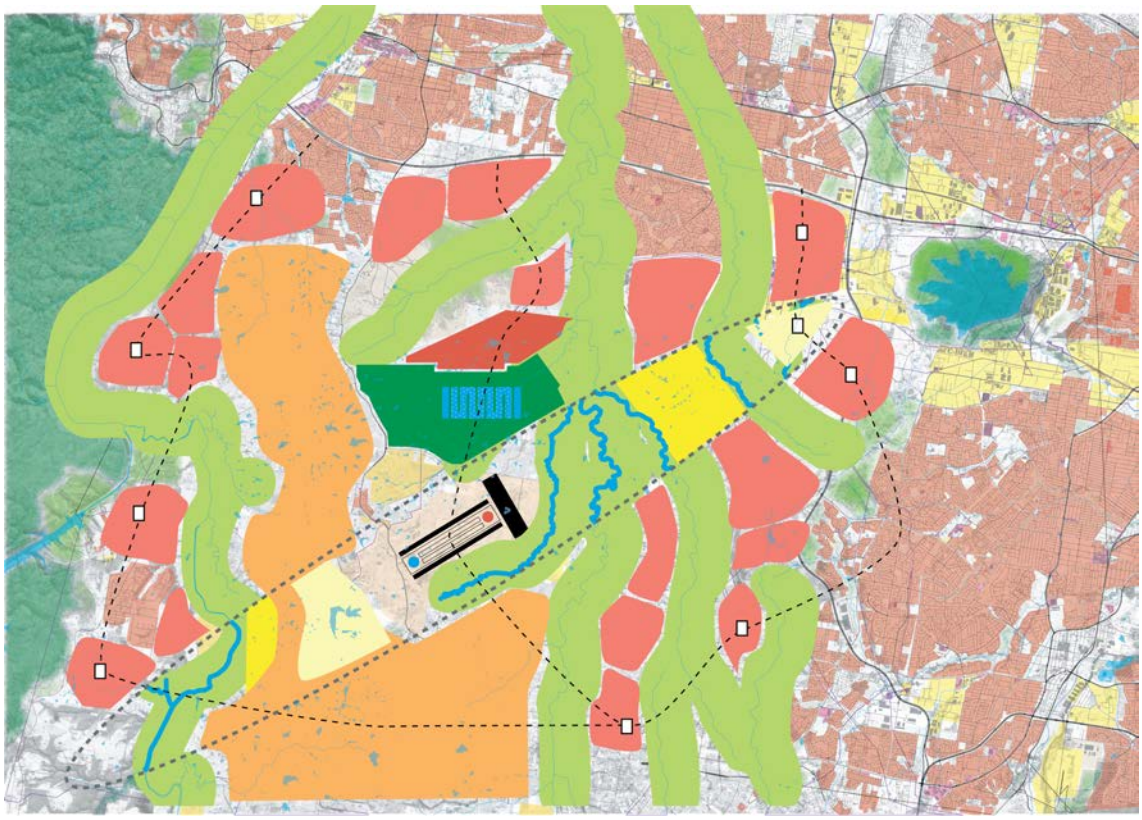


Figure 22. Productive Nuisance landscape design

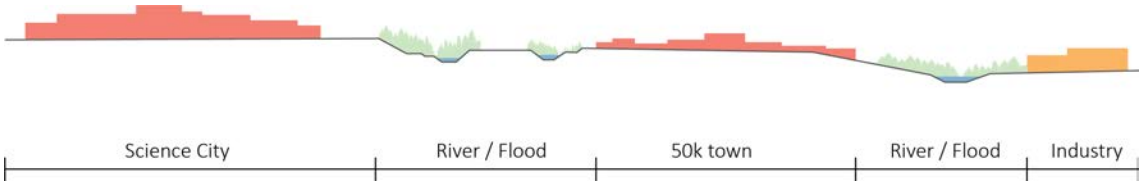


Figure 23. Cross sections of the landscape

This was a continuation with a regional scale plan and looked in more detail at the remaining Western Sydney development area surrounding the productive nuisance zone mapped out earlier. This exercise focused on how to integrate the projected one million future residents and FEW-nexus elements with the airport in operation and its nuisance zone. Continuing with a landscape-led approach it begins by prioritising the creeks, then the riparian zones and the floodplain. It is reimaging Sydney Science Park as a new Sydney Science 'City' – the new centre of the entire region. The remainder of the region is dotted with a series of villages each populated by 50,000 residents. These villages are 2km x 2km (400ha) large. These 'hamlets in the landscape' are of a size that makes them individually walkable. They are separated and surrounded by greenspace and are close enough to cycle between one another.

Group B: Food Forest

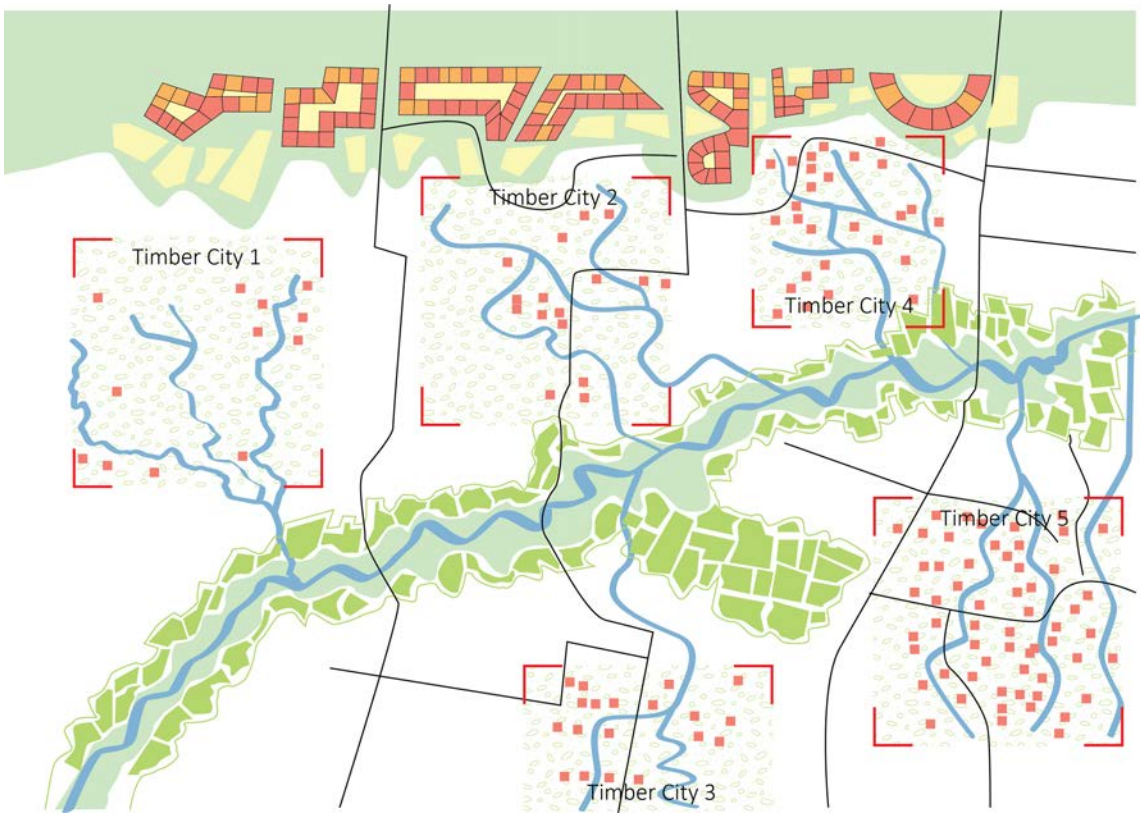


Figure 24. Food forest at precinct scale

This scheme was a continuation of the 'Food Forest' scenario (see section 7) focused on a smaller scale precinct example. Specifically, it was focused on an area of Badgerys Creek adjacent the future airport site to the east. The area is sparsely populated and contains mostly chicken farms at present. South Creek cuts directly across the site from south-west to north-east. The scheme explores how six forest typologies could be dispersed across an area of the region. Their integration with future residential areas is also importantly explored. Again, the scheme follows the landscape-led approach, prioritising the creek followed by the riparian zone. The minor streams flowing into South Creek are also restored and these become key focal points for a forest typology which integrates quick growing timber for housing and the housing itself. Adjacent the riparian and also following along the creek is a series of much more dense forest. High-density housing intermixed with commercial/industrial areas sits parallel the creek along the ridgeline; safely out of the flood zone. Building on the scheme of 'castles in the landscape' these mixed-use communities are distinct. They are separated and surrounded by a mix of formal agriculture, recreational green space and food forest at the same time protecting against noise from the airport.

Group C: Sydney Science Park

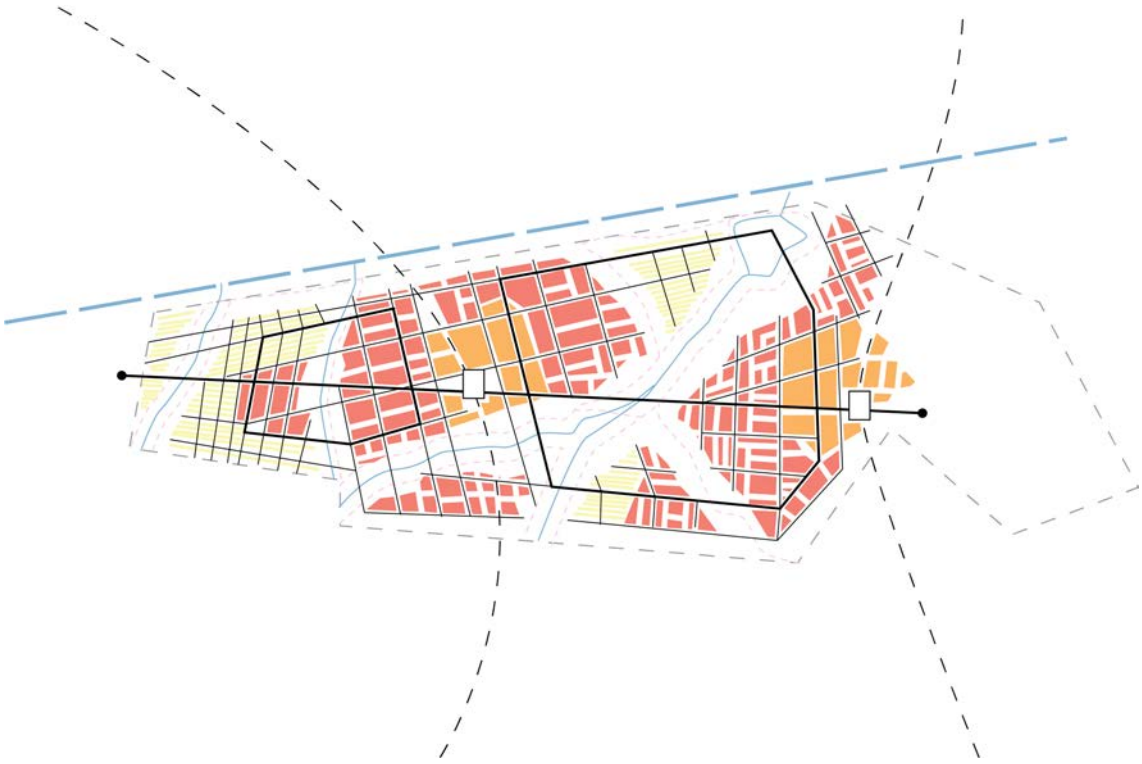


Figure 25. Walkable Sydney Science Park

This scheme builds on the prior work and is a smaller scale exploration of the mobility plan. Now having toured the region, visited Sydney Science Park and spent a day interacting with local stakeholders the visiting teams focus specifically on the existing Sydney Science Park footprint and attempted to design a walkable city. Again, as is customary the scheme begins with the landscape-led approach prioritising South Creek, minor streams and adjacent riparian zone. These become important active transport routes across the site. An additional greenway, that does not trace the path of an existing, known or visible stream. It mirrors the direction of South Creek across the site providing a crossing from south-east to north-west. The proposed metro line runs north to south along the eastern site boundary and an additional high-speed rail line is proposed. This line runs parallel north to south, further to the west, straight through the centre of site. The stations both serve as town centres. They are high-density and are the centre of a five-minute walkable zone. The height scale and bulk of the buildings diminishes as it recedes from the station toward the riparian.

Group D: Glen-Zhen

Figure 26. Glen-Zhen

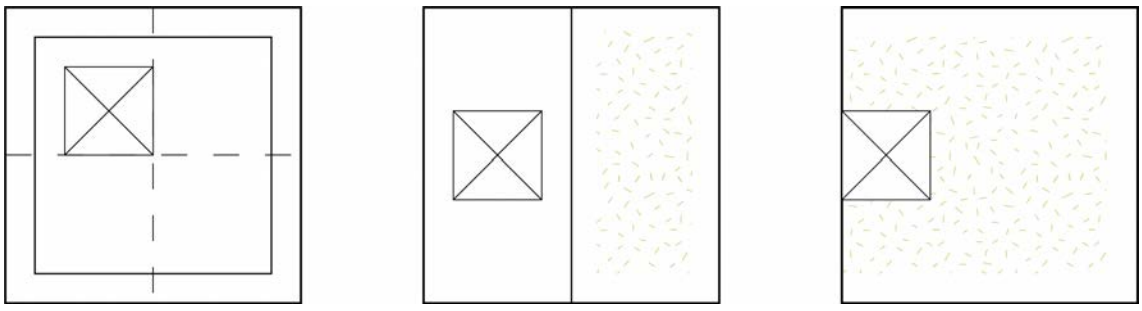


Figure 27. Explorations on densities and urban form

This scheme centres around the area to the west of Glenfield train station, between railway parade and the South Western Freeway. The site is all but empty except for several schools. It capitalises on Glenfield's position in the rail network and proposes it becomes a new Central Station for the west. At the junction of multiple rail lines already connecting east to west and north to south it is well positioned to link a new high-speed and/or metro line into the existing network. This scheme focuses on hyper-density; the densest in the world (or close to). With an area of approximately 100ha it is proposed that this new Glen-Zhen houses 100,000 residents. With Sydney's population growing by 2,000 people per week this scheme proposes to build apartments not for current residents but future ones, namely immigrants from Asia. Rather than the average Australian apartment size of 180m^2, Asians in particular, are used to much smaller. An apartment of 70m^2 would feel comparatively large.

7. Plasticine Exercise

The final collaborative workshop of the entire workshop involved using plasticine to begin viewing the final proposals in three dimensions. With all drawings until this point done to scale it was easily enough to translate this upwards. It was also an opportunity to begin understanding the three-dimensional effects of the proposed built forms in the context of one another. It's easy to get lost in diagrammatic plans and forget that they are designed to represent actual, interactive, real world environments. Beyond this the plasticine exercise was also an opportunity to once again let the creativity in the room flow.

The imperfect process of moulding the plasticine to fit what is ultimately meant to be very precise objects allows for some freedom. This in turn encourages participants to play with spatial interactions they might not otherwise if only dealing with the two-dimensional drawings. In some cases exaggerated forms were used to represent some programs – fruits and vegetables to represent farms, animals to represent wild forests. It is these charming depictions that make the detailed urban scale plans much more approachable.




Despite the plans being at two different scales and of very different approaches it is instantly clear from the plasticine models where and what they are. The first group continued to explore the airport and surrounding agribusiness/aerotropolis precincts. This is clear from the oversized airplanes and foods. The second group explored the high-density residential Glen-zhen area. This is evident in the collection of tall, thin, exuberant towers. Aside from being a short playful exercise in respite at the end of a long and detailed several days this

exercise is a very good example of the power of the physical model in communicating built form idea; whether it be architectural, landscape, or urban.

8. Spatial solutions for the FEW-Nexus at regional scale

As result of the design charrette several spatial strategies and solutions came to the fore.

Firstly, a food-forest strategy for supporting building of homes, increasing biodiversity and growing food was designed (figure 28). In this concept the spatial strategy consists of planting eight million trees in the Western Sydney Parklands, one for every Sydney Metro resident in 2045. By planting these trees from now onwards they can start growing already and provide a cooling canape for later urban infill. Also, using some forest areas to generate building materials for the construction of homes with the timber that grew in these areas. Trees capture carbon and nitrogen and hence can compensate for the emissions and health problems caused by regular building and infrastructure projects.

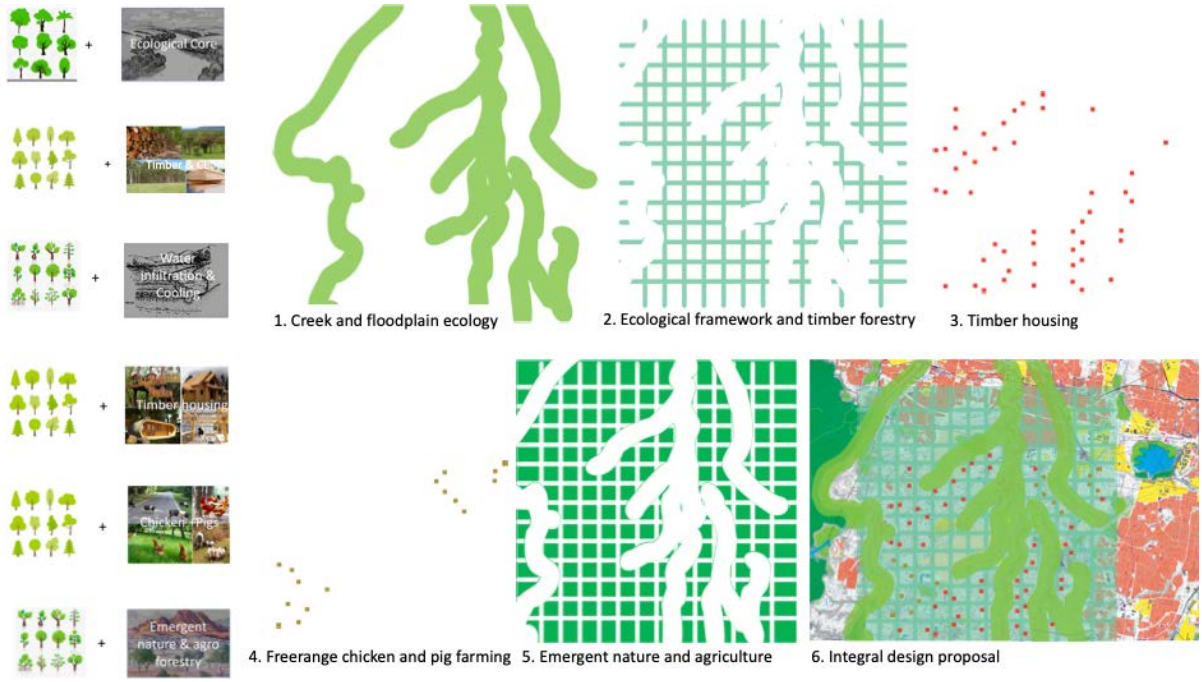


Figure 28. Step-by-step design realizing intense urban development based on food-forest strategy

The integrated spatial proposition consists of five main indigenous forest typologies, which can be realized in sequence.

1. Broadening of the creek banks. This would enhance the capacity for dealing with flooding in and around the creeks in the area, while it also increases biodiversity. At the same time the zones around the creeks provide a cooling landscape and water is able to infiltrate in the soil, which keeps the soils healthier and fertile. It finally provides the capacity to store surpluses of water for a prolonged period and purified household water can be used to keep water in the waterways in all seasons, which especially in summer contributes to cooling the city.

2. A second intervention is the introduction of a so-called ecological support frame. This grid of wood emphasizes the required connections between the creek zones and provides the gradients between the higher, nutrient poor and drier grounds and the nutrient richer soils of the lower grounds. Hence ecological exchange and capacity is supported.
3. Within this supportive ecological grid, compounds with timber suitable for construction are deployed. This timber, grown in one km^2 areas, provides the wood for building homes in high densities. These urban quadrants could host approximately 20,000 people. A total of 50 of these quadrants are planned on the higher elevated areas in the region and are sufficient to offer housing for an estimate of one million people.
4. The forest areas located under the flightpath of the new airport are used in similar sized compound for free-range chicken and pig farming. The animals can, within limits forage freely under and in between the trees and provide a high-quality product from local land.
5. The land that remains after these spatial interventions is redundant space, which may emerge as it comes. This way food can be grown and an ecological basis quality can develop over time.

Secondly, the zone under the flight path is generally a useless space in which most land-use is prohibited. The M-NEX design team proposes to think diametrically about this and turn the nuisance zone into a productive and supporting cooling and heating processing zone (figure 29 and 30).

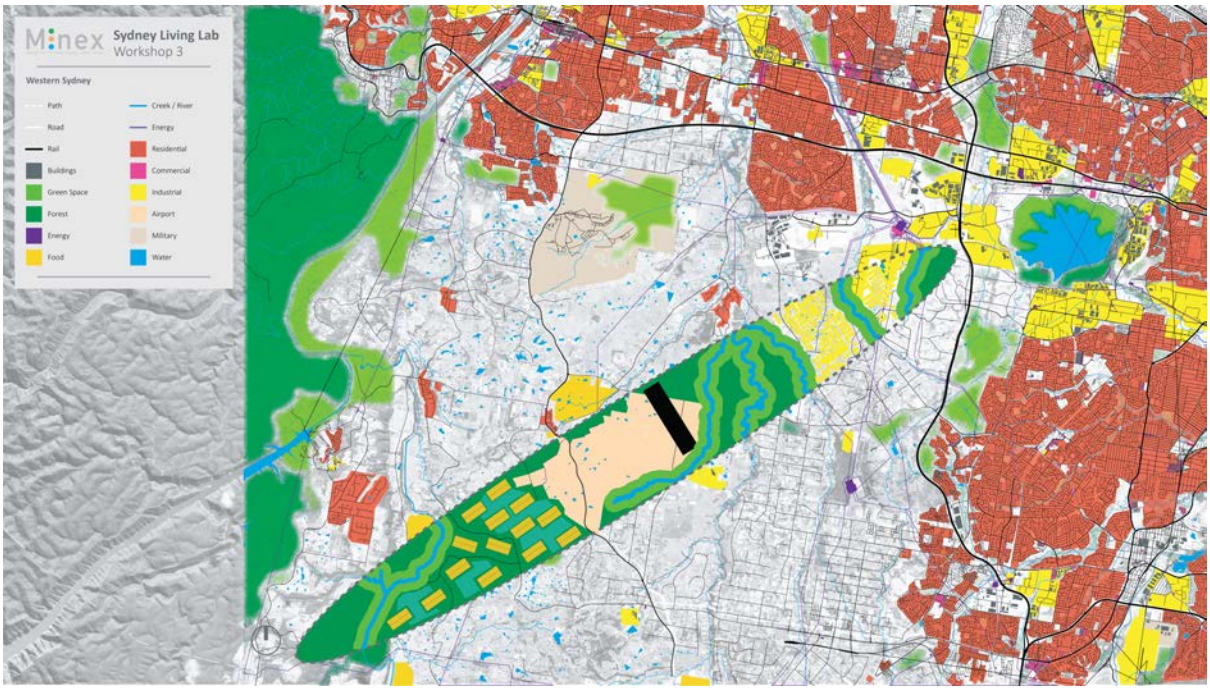


Figure 29. Turn the nuisance zone into a resource generating landscape, meanwhile helping aircrafts take off and land

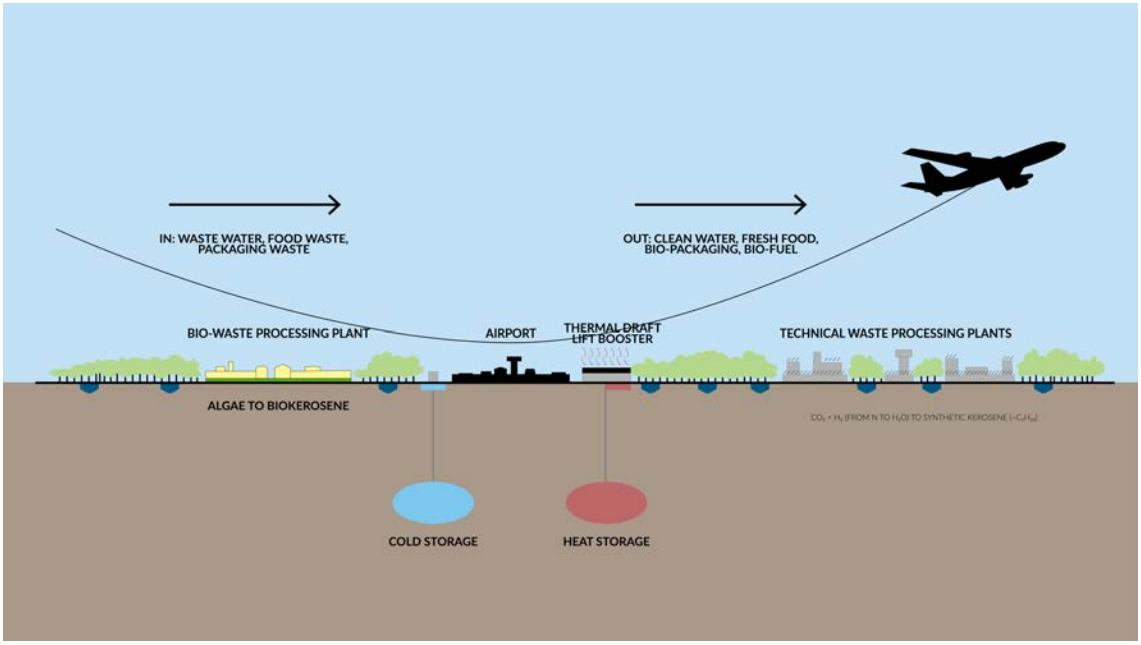
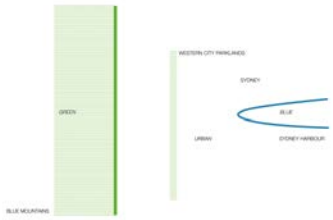


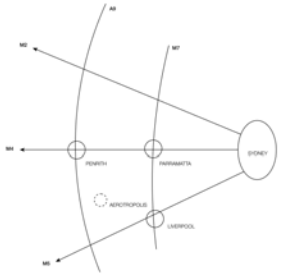
Figure 30. Cross section through the Nuisance landscape

In this zone the waste that an airport undoubtedly brings forward will be processed and turned into resources. At the same time a huge heat pump could store heat in summer hence cool the environment and release it in winter. Finally, playing around with the intense heat and the absorption or reflection from roof would make it possible to take-off and land with less effort, e.g. energy usage.

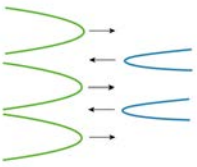
The third spatial solution is found in division of urban landscapes in order to intensify urbanity and leave large green spaces separating the conurbation. These green fingers, similar to the Copenhagen urban region design, make it possible fresh air from the Blue Mountains in the west ventilates deeply into the urban fabric of the new Parkland City. It also provides the spaces to grow urban food in high-tech systems within the built structures in the urban precincts and create low-tech agricultural landscapes locally. This makes it possible to connect and integrate local circular flows of food, energy and water systems.



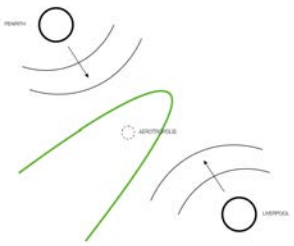
East-west split of green - urban - blue landscapes of wider Sydney region.



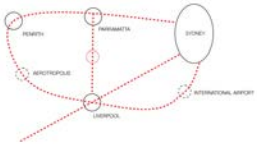
Existing motorway infrastructure and trunk routes in the greater Sydney region.



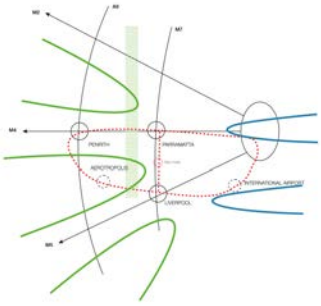
Concept for bridging green and blue landscapes - as 'fingers' - through the urban environment and puncturing the motorway trunk routes



Western Sydney concept of densifying existing urban areas of Penrith and Liverpool. Density decreases towards the Aerotropolis green 'finger'.



Connecting new Western Sydney and Aerotropolis with high speed rail loop to existing nodes in the city.



Interlinking of green and blue landscape with mobility infrastructure for Western Sydney and Aerotropolis.

Figure 31. Diagrammatic representation on connecting and separating green urban spaces at regional scale

Fourth, a range of design ideas were developed for small scale build systems that integrate food, energy and water at the building and street level. These solutions close loops at the lowest possible scale.

9. Design is Magical

On the basis of maps and local expertise, the M-NEX team advised to start with designing a conceptual spatial vision, then define knowledge gaps and ask for specific data and research, on the basis of which the design vision is adjusted, elaborated and detailed. This process is iterative and can be repeated several times in order to produce detailed and evidence-based design proposals for the site. Design is magical as it can create a whole new reality out of nothing.

1. This design-led process can be applied at every scale, from the regional landscape scale to the built urban form and built structures.
2. A long-term strategy should be developed for the Western Sydney Parklands in which indigenous knowledge and indigenous species are used to shape the far future now. A food-forest strategy could help to create a cooling landscape and provide local productivity and biodiversity.

3. Sydney should be extremely considerate of unconscious and ever-expanding sprawl. This is path-dependent and in the minds of the local stakeholders the 'normal' way of delivering new parts of the city. However, uncontrolled sprawl, and even if it is even controlled, has many negative impacts on resource depletion, the sustainability of local food, energy and water systems, as well as mobility and well-being of the residents, and only exaggerates climate to change and impact on the very same area.
4. Turn the airport into a productive and sustainable element which contributes to the resource provision and -generation in the regional landscape, provides the residents with a qualitative environment, and mitigates the waste, exhaust as well as the noise and risks of the airport. An ordinary airport which is only operating to let planes land and take-off, no matter how well-designed the terminal might be, does not contribute to the quality of the environment, does not generate the number of jobs expected, and only increases global and local problems.
5. Given the expected new residents in the Sydney region, a new city should not be designed to accommodate the desires of traditional Ozzies. Instead, new influx of, mainly, Asian people pose a new urban design question of higher densities, smaller homes, alternative cultural urban agriculture and tech-driven convenience to the area. The biggest mistake is probably to design the city for the old people not the new.
6. Work from the large, regional, scale towards the lower scale. Start with the landscape systems, such as elevation, topography, water, soil and ecology, which guide local scale designs that then need to fit within large-scale objectives and propositions. Parallel to this, work from the bottom up using local expertise and design a built form and structures that not only fit in the larger scale, but also shape and feedback into this larger scale, which the on its turn adjusts itself to the needs of the local design proposals.
7. Creativity and engagement of local stakeholders works best if the process is well-structured, tightly planned and includes short turnarounds and clear deadlines, as well as the need to present findings in a concise and clear way during the process and at the end.
8. To design the landscape first, use indigenous planting, prevent suburbian sprawl, and turn the nuisance of a flight path into a productive site and use the connected food-energy-water nexus as the local driver for increasing the resilience of a regional landscape under pressure of climatic impacts is an example the other partner cities, and other city-regions beyond these, can use and apply in their own contexts.
9. The design-oriented process using a creative step-by-step way of working towards integrated design projects at local and regional scales can also be used in the other M-NEX partner cities and other SUGI-projects.

Figure 32. M-NEX team wandering

The M-NEX workshop in Sydney was very successful, mainly because of the concrete spatial propositions the team could develop together with local participants. The next steps will be to report on the solutions and findings and present these to the Greater Sydney Commission, the Western Sydney Airport Authority, State Government, the local councils and local stakeholders.

Appendix

Workshop program

SATURDAY 2 NOVEMBER 2019	
	Teams arrive in Western Sydney
SUNDAY 3 NOVEMBER 2019	**INTERNATIONAL TEAM**
Western Sydney University Peter Shergold Campus Level 4 | Room 68 | Studio 2 169 Macquarie Street Parramatta NSW 2150	
1:00 PM	**Team Reporting**
2:00 PM	**Work Package Reporting**
3:00 PM	**Sydney Introduction**
4:00 PM	**'Fridge City'**
	Stay in Parramatta
MONDAY 4 NOVEMBER 2019	**INTERNATIONAL TEAM**
Western Sydney University Peter Shergold Campus Level 4 | Room 68 | Studio 2 Level 9, 169 Macquarie Street Parramatta NSW 2150	
9:00 AM	**Design Charrette**
10:30 AM	**Morning Tea**
11:00 AM	**Design Charrette**
1:00 PM	**Bus Tour** • 1:45 PM – Sydney Science Park • 3:00 PM – Gregory Blaxland Memorial, South Creek • 3:30 PM – Circle around future Aerotroplis and AgriBusiness Precinct

	• 4:00 PM – Yandhai Bridge, Penrith
5:00 PM	**Bus tour end at accommodation** Colonial Motel, Richmond **Stay in Richmond**

TUESDAY 5 NOVEMBER 2019	ROOM K12.G.37
9:00 AM	Introduction Activity since August workshop – Actor Network Map development; scenario building and mapping at regional and local scales; amalgamates resilient proposal.
9:30 AM	International team presentation International partners will present outputs from collaborative design charrette held on Monday 4 November focusing on Western Sydney.
10:30 AM	Morning tea
11:00 AM	Design workshop COCD Box methodology of creativity exploring and prioritising feasibility of proposals from both local stakeholders and international partners.
12:30 PM	Lunch
1:30 PM	Design workshop Integrated design solutions for each of the four COCD quadrants with a focus on relationship between elements of the FEW-nexus.
3:00 PM	Afternoon tea
3:30 PM	Design workshop Spatialising the integrated design proposals at a variety of locations across Western Sydney centred around the Aerotropolis and existing town centres.
5:00 PM	Close

WEDNESDAY 6 NOVEMBER 2019	ROOM L2.G.30
9:00 AM	Design workshop In three mixed groups further refine integrated design proposals from the previous day at a local scale with a focus on the design of a new town centre.

10:30 AM	Morning tea
11:00 AM	Design workshop Plasticine exercise – translating detailed town centre proposals into three-dimensional models exploring interactions with built form.
12:30 PM	Lunch
1:30 PM	Design workshop In three mixed groups again revisiting the previous plasticine exercise with new members provoking re-orientation based on previous proposals.
3:00 PM	Afternoon tea
3:30 PM	Prepare for presentations
4:00 PM	Presentations Short (15 minute) presentations from each group of individual scenarios exploring overall approach to the Sydney FEW-nexus and specific built form proposals.
5:00 PM	Close Summary of Workshop 3, plans for synthesising work completed during workshop, and discussion of potential additional work arising from 2019.

THURSDAY 7 NOVEMBER 2019 **FORUM**

Western Sydney University
Peter Shergold Campus
Level 9, 169 Macquarie Street
Parramatta NSW 2150

9:00 AM	**CatalystWest** Western Sydney University, Peter Shergold Campus, Parramatta Now in its second year, Western Sydney University's CatalystWest forum will see 350 collaborators from the community, government and industry come together at Parramatta Square to envisage the region's newest city at the Western Sydney Aerotropolis. https://www.westernsydney.edu.au/catalystwest.html **Stay in Parramatta**

FRIDAY 8 NOVEMBER 2019 **INTERNATIONAL TEAM**

Western Sydney University
Peter Shergold Campus

Level 4 | Room 68 | Studio 2
Level 9, 169 Macquarie Street
Parramatta NSW 2150

9:00 AM	**M-NEX management issues**
10:30 AM	**Morning tea**
11:00 AM	**Outlook 2020 and preparation for Tokyo**
1:00 PM	**Close**

Participants

Type	Entity	Name	Role
Institution	M-NEX Sydney Hanze University of Applied Sciences	Professor Rob Roggema	Chair, M-NEX Sydney Professor of Spatial Transformations - Sustainability
	M-NEX Sydney	Stewart Monti	Research Associate
	Western Sydney University	Associate Professor Juan Francisco Salazar	Research Director, Institute for Culture and Society Research Theme Champion (Environment & Sustainability) Office of the DVC Research and Innovation
		Dr Jason Reynolds	Lecturer and Academic Course Advisor, School of Science and Health
	TU Delft	Andy van den Dobbelsteen	Professor of Climate Design & Sustainability
		Nico Tillie	Lecturer, Landscape Architecture
	Queens University Belfast	Greg Keeffe	Professor of Architecture Head of School of Natural and Built Environment
		Sean Cullen	Lecturer, School of Natural & Built Environment
	Macreanor Lavington	Kevin Logan	Architect, Associate Director
	Keio University	Wanglin Yan	Professor, Faculty of Environmental Information Studies
		Shun Nakayama	PhD Candidate
	University of Michigan	Geoffrey Thün	Associate Professor of Architecture Associate Dean for Research and Creative Practice
		Tithi Sanyal	Research Associate
Government	CSIRO	Dr Simon Toze	Senior Principal Research Scientist, Liveable, Sustainable and Resilient Cities
	NSW Smart Sensing Network	Jimmy Tran	Electronics Engineer
	Sydney Water	Lyndall Pickering	City Shaping Analyst
		Chris Gantt	Manager, Developer Partnerships

Company	McGregor Coxall	Dajon Veldman	Associate Director, Urbanism
	Norton Crumlin	Susan McHattie	Consultant
	Endeavour Energy	Jason Lu	Capacity Planning Manager