

Visions and Pathways 2040

Transitions to Low-carbon and Resilient Futures in Australian Cities

The Digital Economy: Two Models of Peer-to-Peer Value Generation

Potential for Disruptive Contributions to
Urban Decarbonisation and Resilience

Expert Consultation Report

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Key messages

The expert consultation on “The Digital Economy: Potential for Disruptive Contributions to Urban Decarbonisation and Resilience” was organised as part of the [Visions and Pathways 2040](#) (VP2040) research project led by the University of Melbourne’s [Victorian Eco-Innovation Lab](#) (VEIL) and funded by the [CRC for Low Carbon Living](#) (CRC LCL).

The digital economy - with its associated technological, organisational and social innovations - is one of the key disruptive forces in transitioning to low-carbon and resilient futures in cities.

There are three value models competing for dominance in the digital economy: traditional proprietary capitalism; peer-to-peer exchange; and the peer-to-peer commons model. The latter two are particularly relevant to the digital economy and were therefore the focus of this expert consultation.

The direct socio-environmental impacts of the two peer-to-peer value models are similar. The main differences are indirect and structural and stem from the different implications of the two value models in business model development, product and service design and structure of wage-labour relationships.

A digital economy in which a set of companies own or control important city data poses a danger for cities as it creates the risk of ‘data feudalism’ as well as incentives for business models that undermine sustainability and resilience.

There are different options for how digital technologies can be deployed in cities depending on which technologies and business models are implemented. However, it is uncertain which options will yield to highest sustainability and resilience outcomes.

Key policy recommendations are grouped under four main topics:

- 1. Developing and Implementing Citizen-centric and Democratic Governance Models**
 - Understanding and leveraging institutional, organisational and cultural enablers for creating sharing cities
 - Developing and implementing models of governance for the physical and digital urban commons
 - Facilitating and widening the scope of public debate on urban data and peer-to-peer alternatives
 - Facilitating participatory decision-making and budgeting
- 2. Managing and Leveraging Urban Data**
 - Supporting the development of a digital open design commons and open information platforms
 - Establishing and supporting experimentation with data and technologies in cities
- 3. Developing and Supporting New Models of Business and Securing Finance**
 - Educating, empowering and collaborating with digital entrepreneurs to direct innovation efforts and resources towards decarbonisation projects
 - Identifying and developing financial enablers of the digital economy that will assist in radical decarbonisation
- 4. Maintaining Socio-economic Resilience**
 - Leveraging the expected changes in distribution and number of jobs across sectors by creating employment opportunities that will help shift to a decarbonised economy

1. Introduction

1.1 Background

The expert consultation on “The Digital Economy: Potential for Disruptive Contributions to Urban Decarbonisation and Resilience” was held in December 2015. This was organised as part of the work program for the [Visions and Pathways 2040 \(VP2040\)](#) research project led by the University of Melbourne’s [Victorian Eco-Innovation Lab](#) and funded by the [CRC for Low Carbon Living](#). VP2040 aims to define visions, scenarios and pathways for resilient Australian cities to achieve an 80% reduction in their CO2 emissions by 2040. In setting the parameters for the transformation of Australian cities in the coming 25 years VP2040 is concerned that the 80% decarbonisation must occur in a way that is consistent with building resilience to changed climate conditions and extreme weather events. The project defines resilience as “the ability (of urban society) to absorb disturbances and to adapt or transform in order to maintain critical functions and identity in the face of shocks and stressors”. The project team acknowledges that creating radically decarbonised and resilient cities is not solely an issue of technological optimisation but is a design challenge, requiring conception and development of fundamentally different systems, structures and practices in social, economic and governance domains (Gaziulusoy & Ryan, 2015).

The expert consultation is part of a series of research and engagement activities of the VP2040 project (see figure 1). One of the aims of these activities has been to identify key disruptive forces that could contribute to reaching the 2040 targets set by the project. The digital economy was identified as one such disruptive force. The digital economy is associated with technological, organisational and social innovations such as digital manufacturing, peer-to-peer economic exchanges facilitated by online platforms, open innovation challenges aiming to crowd-source solutions for complex and socially-relevant problems, crowdfunding public infrastructure, and so on. The

potential importance of the digital economy emerged both from foreground research undertaken on new and emerging business models (Gaziulusoy & Twomey, 2014) and in the outcomes of visioning workshops held during 2014 (see [VP2040 First Year Report](#), Ryan, Twomey, Gaziulusoy & McGrail, 2015). Having identified a number of potential disruptive forces, expert consultations and other research is being used to further interrogate their potential contribution to the transformation of Australian cities. Expert consultations are being organised in collaboration with partners of the VP2040 project. The digital

economy consultation was particularly of interest to the City of Melbourne who recognised that technological and organisational innovations emerging within the digital economy sphere could have significant implications on both hard (e.g. infrastructure) and soft (e.g. governance) systems of the city. This expert consultation was therefore undertaken with the City of Melbourne and this report will inform their [Future Melbourne 2026 Program](#), a participatory process launched in January 2016 looking at the next 20 years of the city.

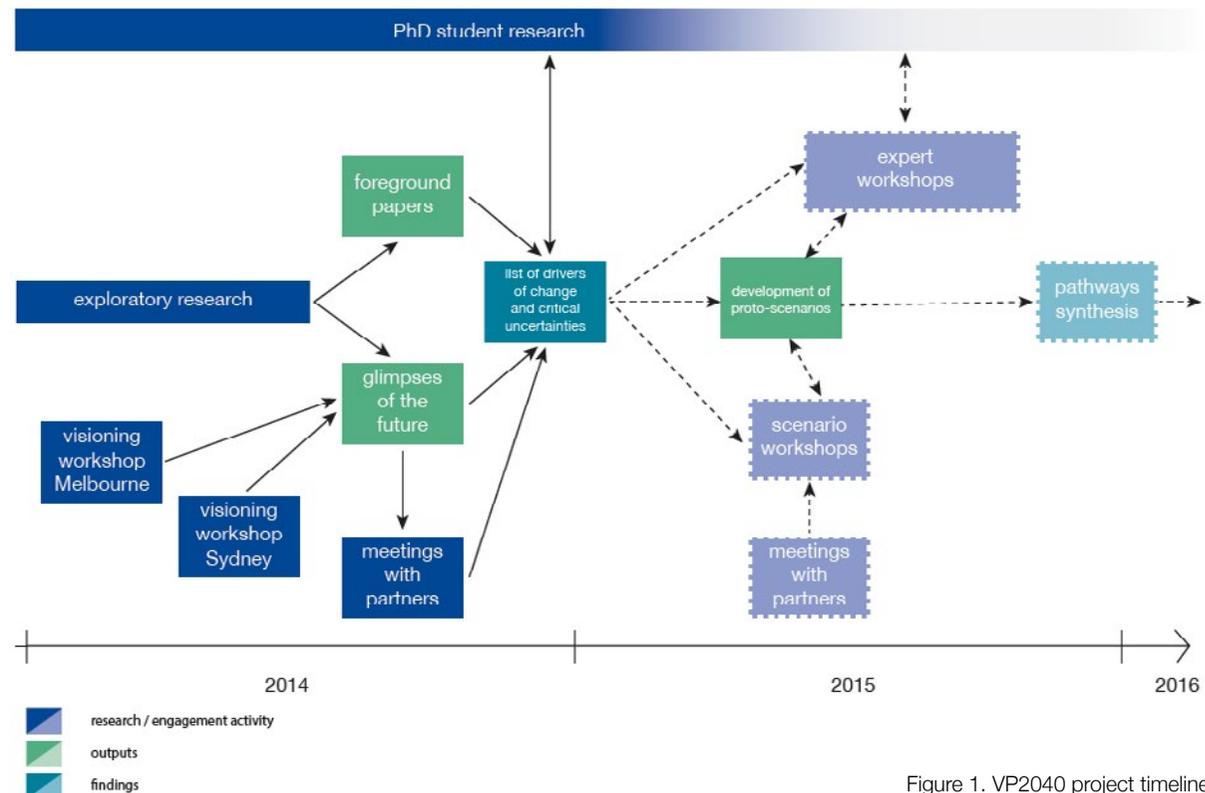


Figure 1. VP2040 project timeline

1.2 The objective and process

The digital economy expert consultation involved a total of 21 people from research, business, NGOs and local government with a diversity of expertise relevant to the digital economy and its potential for driving rapid decarbonisation in urban settings. The expertise covered by the participants included: peer-to-peer innovation, open-source innovation, the sharing economy, governance of commons, smart city technologies, and digital currencies.

The objectives of the expert consultation were:

1. Understanding the socio-environmental implications of the value-models competing for dominance in the digital economy;
2. Identifying the most promising examples of disruptive innovations enabled by digital technologies, particularly those relevant to urban decarbonisation and resilience; and
3. Identifying priorities for research and policy to accelerate the diffusion of promising digital economy innovations.

A three-staged workshop process was followed for the expert consultation:

1. A short presentation: A half-hour long presentation on the premises, examples and socio-environmental implications of the value-models of the digital economy was delivered by Michel Bauwens¹ (founding director of the Foundation for P2P Alternatives) to inform and stimulate an open group discussion.
2. Open group discussion: An hour-long structured and facilitated discussion was held to consider the ways that the digital economy could assist in transitioning to low-carbon resilient futures in Australian cities, including policy, research and innovation priorities.

3. Break-out session: A 75 minute long ideation session was held in four breakout groups responding to the four VP2040 scenarios which included a plenary feedback and wrap-up.

The following section focuses on the socio-environmental impacts of the digital economy. It combines insights from Michel Bauwens's presentation, the group discussion and our research findings and reflections. In the third section we present policy recommendations and identify some outstanding research questions related to the implications of and uncertainties associated with these impacts. The third session of the workshop was aimed at participatory refinement of VP2040 scenarios and therefore has not informed this report.

1. Michel Bauwens is the founder and director of Foundation for P2P Alternatives, an international organization focused on studying, researching, documenting and promoting peer-to-peer practices. He advised the Ecuadorian government in the FLOK project aiming to transform Ecuador into an open-source knowledge society. He is a peer-to-peer theorist particularly known for his work on the political economy of peer production and, more recently, on socio-ecological impacts of digital economy.

2. Socio-environmental impacts and potential of the digital economy

At the beginning of the workshop Michel Bauwens delivered a presentation on the value models in the digital economy and their social and environmental impacts. This was based on his work at P2P Foundation and one of his recent publications (Kostakis, Roos and Bauwens, 2015). After his presentation, these value models and their implications were further discussed by the participants. Also, research and policy priorities were identified for increasing the potential of digital economy innovations in assisting with transitions to low-carbon and resilient futures. The following sections summarise the main points from the presentation and the discussion.

2.1 Two value models and four techno-organisational models in the digital economy

Kostakis and Bauwens (2014) have argued that there are three value models competing for dominance in the digital economy: traditional proprietary capitalism, the peer-to-peer exchange model and the peer-to-peer commons model. They argue that the first model is in decline. Therefore the expert consultation focused on understanding the socio-environmental implications of the latter two models, and their potential for assisting in transitions to low-carbon and resilient futures.

Bauwens explained the difference between the two competing peer-to-peer models as:

“The peer-to-peer commons economy is when there is an effective creation of a shared resource: for example Wikipedia, Linux, Arduino, Wikispeed or Wikihouse. These create a shared knowledge resource which is used by all the players in the network.

On the other hand, a peer-to-peer exchange model is about connecting peers to trade, sell, or rent excess idle resources, such as Uber and Airbnb. The difference is there

is no consideration of, or contribution into, the commons in the implementations based on the latter model. It’s about enabling individuals to trade, so there’re quite different logics to both models.”

Bauwens stated that for effectively comparing the models’ socio-environmental impacts and their potential contribution to low-carbon resilient futures, it is useful to look at the technologies and organisational logic that underlie them. In this report we will refer to this as a techno-organisational model. The figure below presents these differences in a 2x2 matrix along two-axes with examples.

Netarchical platforms

The first techno-organisational model covers centralised platforms that extract value from a hierarchical network (hence ‘netarchical’). These platforms enable participants to engage

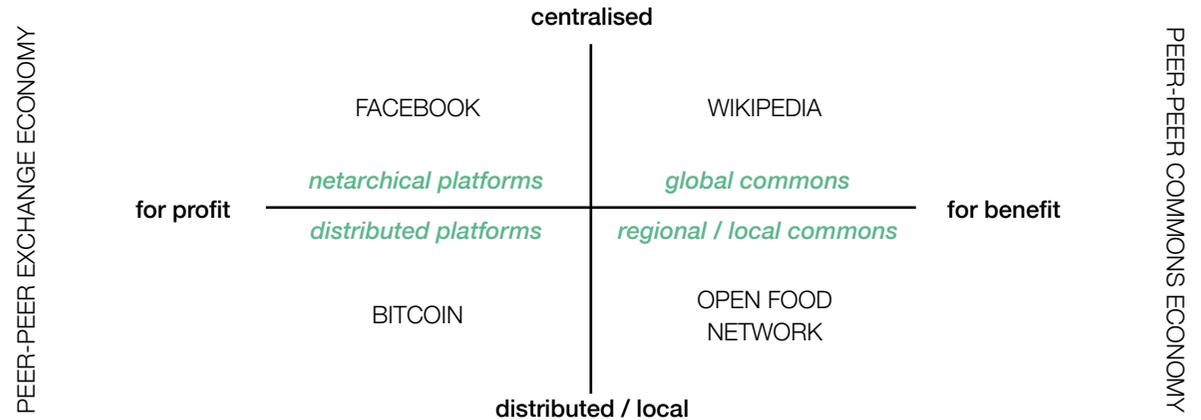


Figure 1. The two value models competing in the digital economy and the four techno-organisational models

in peer-to-peer relationships, share or exchange resources or undertake collective action such as organising migrations or civil movements, or finding missing cats. The value in these platforms is directly generated by the people actively participating in them. On the other hand, in this techno-organisational model, participants do not have a direct influence in the design of the platforms. Neither is the value generated through their participation re-invested in the participating community. In extreme examples like Facebook, the participants do not have any access to the income. In other examples like Uber and Airbnb, participating individuals generate some income for themselves, a fraction of the revenue of the platform providers. Therefore, this techno-organisational model is hierarchical even though it enables peer-to-peer interactions. It is based on extracting value from collaboration and co-creation amongst the participants.

Distributed platforms

The second techno-organisational model covers for-profit peer-to-peer activities which use distributed platforms. The platform's infrastructure allows the autonomy and participation of many players but the main focus is still profit maximization (Kostakis & Bauwens, 2014). An extreme example of this techno-organisational model is Bitcoin and other cryptocurrencies that allow anyone to trade and own property without intermediation of banks and states. Deloitte UK in a recent report examined the technology underlying Bitcoin and other cryptocurrencies utilising the blockchain. The report argued that it is a very disruptive innovation which will change how individuals and organisations interact, the ways that businesses collaborate with one another, and the transparency of processes and data (Deloitte UK, 2016). Deloitte Australia's Centre for the Edge argued that blockchain currencies are essentially forms of complementary currencies and are being pulled into existing regulatory frameworks (Deloitte AUS, 2015). The report also argued that, although in troubled economies where national currency is volatile and there is low trust in banks, cryptocurrencies (like other alternative and complementary currencies) may be adopted more widely than in stable economies like Australia and that few individuals will accept to be paid in cryptocurrencies when they are taxed in a sovereign currency. Although the logic of this techno-organisational model is clear, currently Bitcoin and other cryptocurrencies are essentially used for obtaining economic gain from others without reciprocating any benefits back to society. Therefore it is not yet clear how these currencies can contribute to supporting a peer-to-peer commons model but the underlying technology is worthy for further investigation to understand such potential.

Global commons

The third techno-organisational model is the peer-to-peer commons value model. It is less frequent than the two models articulated above but has significant implications for sustainable futures. There has been an observable trend of global open design communities emerging to collaboratively develop socially valuable products such as Wikipedia, Linux, Arduino, Wikispeed and Wikihouse. In a global commons model there is a central core value creation, an open contributory system that allows people anywhere in the world to add knowledge or technology into a common shared resource. The generic organisational model under this type has a productive community and an entrepreneurial coalition working for-benefit (not for-profit). The role of the entrepreneurial coalition is to maintain the infrastructure of co-operation and enable and empower the co-operation to occur over time. The global commons model enables participants to both utilise and contribute to the commons. For example a software developer can download the code of open software like Linux, use it, improve it and upload it back to the global commons. This has interesting implications on exchange and remuneration of labour. Global commons can work hand-in-hand with the markets through which knowledge contributions of individuals, groups or companies are rewarded financially. Nevertheless, there is currently a lack of appropriate mechanisms in place incentivising remuneration of individuals or communities creating value within the commons, which results in a reinvestment gap.

Regional / local commons

The fourth techno-organisational model (also classified as peer-to-peer commons) covers activities across distributed networks at a local-regional level. Currently we are observing a significant growth of civic initiatives and social innovations aiming to address issues such as food security, unaffordable housing and energy poverty. Technology has played a significant enabling role in this growth. One example of a regional / local commons is Open Food Foundation and Open Food Network which were featured in a working paper published by the VP2040 in 2014 (Gaziulusoy & Twomey, 2015, p. 11). Open Food Foundation and Open Food Network develop open software to support fair and sustainable food systems by way of creating an online marketplace and logistics platforms that connect local producers with local consumers. Other examples include platforms enabling car sharing (and sharing of other goods such as bikes and tools) in neighbourhoods; the Transition Towns scheme; and permaculture communities (Kostakis et al., 2015). In some cases where open software underlies activities of regional / local commons, there are intersections between the global commons and regional / local commons, with software as a global commons development where the activity supported by the software takes place at local / regional level. This enables scaling up of regional / local commons activities - as observed both in Open Food Network which started in Australia and has expanded to South Africa with [upcoming local networks](#) in the UK, France, Canada and Norway and in Enspirial (Box 1) which started in New Zealand as a local network.

Box 1: The emergence of post-corporate forms: Enspiral

Enspiral is a network of social entrepreneurs originally from New Zealand that has expanded to include contributors from Europe, US, Canada, Australia and more. It has 48 members in the core co-operative which stewards the whole network of 250 participants.

At the core of Enspiral there is a set of shared resources:

[Loomio](https://loomio.org) - an open-sourced democratic decision-making system - [Loomio.org](https://loomio.org)

[Co-budget](https://cobudget.co) - a group-financing tool. [Cobudget.co](https://cobudget.co)

Every contributor of Enspiral pays a small fee toward the running costs. Additional streams of funding come from services and ventures that are pooled. Co-budget allows reinvestment in projects within the network. These projects funded by the Enspiral commons improve Enspiral for everyone.

Enspiral's tools are open-sourced, plus anyone can contribute to them and use them in other entrepreneurial ecosystems.

Enspiral currently has 16 business ventures. These ventures have a generative attitude towards their commons and all of them aim to solve ecological, environmental and social problems.

Enspiral is not a corporation, it is a post-corporate form.

2.2 Impacts and Potential

Impacts of the different models.

According to Bauwens, the peer-to-peer exchange economy creates mechanisms for the utilisation of idle resources which can potentially assist with dematerialisation and decarbonisation of the economy. Nevertheless, mechanisms to acknowledge and remunerate the free labour invested in the digital commons by individuals or communities do not yet exist. In the lack of such mechanisms, businesses create profit from peer-to-peer exchanges by providing the platforms that enable these exchanges on a proprietary basis. Their business models do not include reinvesting into the productive communities that create the value for business by undertaking the necessary labour, or into the commons providing the resources. Therefore, it can be said that the two techno-organisational models under the peer-to-peer exchange-value model extract value from the systems they are part of but they do not involve in generation of value within those systems; these are referred to as 'extractive models'.

Kostakis et al. (2015) argue that the direct socio-environmental impacts of the two value models are similar except that the peer-to-peer commons economy could facilitate lowering of transport related impacts as a result of micro distributed production and possible downscaling of the modern assembly process. The main differences in socio-environmental impacts between the two value models, however, are indirect and structural, stemming from the different implications of the two value models in business model development, product and service design and structure of wage-labour relationships. Box 2 summarises these indirect and structural socio-environmental impacts. The implications of these impacts are relevant when considering which model could facilitate societal resilience and which model could assist in transitions to low-carbon in cities more effectively.

There was discussion in response to Bauwen's paper about whether one significant indirect impact of the value models relates to design. In a market economy which relies on scarcity and a tension between demand and supply, designing for sustainability cannot be undertaken in a genuine manner because the market requires obsolescence in some form (functional or emotional) to avoid stagnation. A peer-to-peer exchange economy has similar problems as it has to promote growth in consumption and therefore can hinder a transition to a low-carbon economy, particularly the need to reduce energy consumption and increase energy productivity.

In the peer-to-peer commons model, however, the productive community taps into a common resource pool and reinvests or contributes back into it. There is, therefore, an incentive to design for resource productivity, for circular resource flows and for durability, that is for the sustainability of that shared resource. This was referred to as 'the ethical economy' by some participants in the workshop. This implies the adoption of particular politics and values by the communities aligned with the open-source logic of the 'ethical economy'.

Box 2: Summary of indirect and structural socio-environmental impacts of the two value models

Peer-to-peer exchange model

- does not address overconsumption or deal with consumerism at a cultural level
- the dematerialisation effect observed by some is not because there is less material throughput in the economic system, it is because there is an additional, very resource efficient economic sector based on cognitive labour
- does not raise environmental awareness as argued by some but only reinforces the existing awareness (at best)
- planned obsolescence is an inevitable part of business models which are for-profit
- the users are not contributors to the platforms which creates a wage-labour dependency

Peer-to-peer commons model

- assists with re-establishing the relationships between workers, products, users and means of production through localisation and direct participation (except in cases in which low-cost raw materials come from somewhere else)
- encourages diffusion of local knowledge, therefore incentivises designs that suit best to the context
- encourages higher resource efficiency (planned obsolescence and other means of creating artificial scarcity is contradictory to the logic of a commons based economy)
- circulation of commons does not necessitate an increase in scale as the value is created by a reciprocal relation between benefit and nurture. Nevertheless, the peer-to-peer commons value model is agnostic about growth which might be a barrier for sustainability because any digital commons necessitate natural commons

Lack of understanding of motivations

Studies on the socio-environmental impacts associated with distributed manufacturing are only emerging. Similarly, there is little research on whether the individuals and communities participating in this new mode of manufacturing are aware of these impacts. One such study was recently conducted in Finland (Kohtala & Hyssalo, 2015) with the participation of thirteen makers – end-users who are involved in production of their own products – to understand how practitioners assess the environmental sustainability of future practices associated with the maker culture. This study found that makers did not consider sustainability as relevant to the future of makerspaces and they

differed in their capacity to anticipate issues. Nevertheless, despite emerging work on practitioners' understanding of sustainability issues relevant to peer-to-peer production, there is a lack of studies which look at behavioural and value drivers in these productive communities to provide an informed opinion about the potential growth of "ethical economy" ideals within these communities.

Box 3. Enabling the city as commons: Bologna Regulation

In 2014, the City of Bologna officially adopted the Regulation on Collaboration between Citizens and the City for the Care and Regeneration of the Commons (Comune di Bologna, 2014). This regulation enabled any neighbourhood collective to propose improvements to the neighbourhood such as streetscaping, reorganising a square or establishing a co-working centre. The regulation defines a review and negotiation process between the city and the neighbourhood collective about how the city can help create these infrastructures. Within one year of coming into force, Bologna Regulation enabled 100 citizen-led projects to be undertaken in collaboration with the city. The city facilitated these projects through online digital platforms. This can be likened to the vision of for-benefit associations have in peer production. The regulation inspired several other cities and sits as an iconic example of the emerging city governance model in which citizens take initiative to propose policies, with local governments acting as facilitators for empowering and enabling social-individual thought.

Data ownership

Another issue discussed by the workshop participants was the implications of data ownership in relation to two of the value models. It was pointed out that there was a risk of “data feudalism” in the peer-to-peer exchange model. Initiatives based on for-profit peer-to-peer exchange may give individual businesses a lot of power over cities as they become the “owner” and therefore the rightful supplier of citizen-generated data collected through the platforms that are their intellectual property. Concerns were expressed that this will create incentives for those businesses to act in ways that will counter sustainability objectives if this would undermine their business interests. For example, Uber was highlighted as a company currently making agreements with local governments in some cities to supply them with mobility data. The concern expressed in the workshop or example was that, in addition to the contested ethics of ownership of citizen-generated data, Uber could decide to selectively release data that would benefit their business and undermine competing initiatives – for example public transport. The general consensus among the participants was that city authorities had to be wary of becoming dependent on privately owned data and should put in place mechanisms to keep citizen-generated data open-source. Echoing the workshop participants’ concerns, Greenfield (2013) warned against the ‘Smart City’ narrative that frames public administrations as “customers of corporate-provided solutions”. Teli et al. (2015) suggest that computing in urban space should be people-centric, enabling recursive engagement of citizens who become co-owners and co-producers of the digital commons.

Another participant suggested that with the increasing impact of climate change there is a need to build adaptive capacity into city support systems and that a centrally-owned single platform is potentially less resilient than a distributed model managed by a community of innovators. It was argued by other participants that the first step in achieving a successful distributed model is

automating the workings of city support systems and connecting the different platforms these operate under to create intelligent infrastructure that “speak” to each other. Over time, this would enable historical data analysis and predictive planning and design. Proprietary ownership of these platforms could create a fear of lock-in and companies who try to take that approach are facing resistance.

Of course, companies can design and own these data sets as open platforms and it was pointed out that some technology companies are currently competing to do so. This generates conversations between competitors and this was considered to be beneficial for the cities and public. Another participant challenged the assumption that there is a need for platforms at all. Through the use of geographic addressing, requests for services or information can be “dropped” onto the network to be picked-up by dispatchers nearby. Such a system would not require a platform but a mesh-based approach. This part of the discussion implies that there are different options for how digital technologies can be deployed and used in cities without necessarily pointing to a consensus on which approach has the highest potential for increasing resilience and decarbonisation of the economy in cities.

Automation

Another concern expressed in the workshop was about automation under the peer-to-peer exchange model with for-profit enterprises. The concern is that automation will displace people from jobs that they have now, with a larger pool of social functions that need less people to operate them. In the best known and most cited - yet unpublished - study on technological displacement of jobs, Frey and Osborne (2013) estimated that 47 per cent of the 702 job categories identified by the US Bureau of Labour could be vulnerable. While there are strong counter arguments against this thesis and the estimates of

technological replacement of jobs as a result of computerisation (e.g. Autor, 2015), the transition to the new economy may be disruptive and painful for some workers and industries (Mokyr, Vickers & Ziebart, 2015). The Future of Jobs report by the World Economic Forum surveyed senior talent and strategy executives of leading global employers representing more than 13 million employees across 9 broad industry sectors in 15 developed and emerging economies and regional economic areas in 2015. The respondents of the survey predicted strong employment growth across the architecture, engineering, computer and mathematics job families, a moderate decline in manufacturing and production roles and a significant decline in office and administrative roles, the latter particularly as a result of automation (WEF, 2016). The implications of digitisation on employment conditions and types, and on the number and location of jobs is highly relevant to social and economic resilience and needs to be considered in plans, scenarios and policies focusing on low-carbon and sustainability transitions. One participant argued that to compensate for decreased job security and the risk of displacement, a universal basic income could be introduced. Similarly, Mokyr et al. (2015) believe that wages for some classes of workers may need to be supplemented and the set of publicly provided goods may need to be expanded. Chase (2015) argues that the governments need to recognise the emerging model of working and tie benefits to people rather than jobs to ensure labour is protected.

Governance and the tragedy of the commons

One participant highlighted the issue that, in extractive economies, endless growth is not regarded as a problem and resources that can be produced and waste that can be absorbed by the natural environment is assumed to have no limits. The same participant also pointed to the resulting socio-cultural implications of consumerism. Along the same lines, Kostakis et al. (2015) argued that the efficiencies and dematerialisation

that are assumed to flow from digitisation can be reversed by increases in consumption within the peer-to-peer exchange economy; with on-line consumption adding to, rather than replacing, consumption of energy and resources. Thus extractive economic models can lead to the exploitation and degradation of the commons, rather than protecting or enhancing them. This is the basis of the logic argued by Garrett Hardin in 1968 in “The Tragedy of the Commons” (Hardin, 1968).

Hardin’s article has long been used to justify privatisation of commons as the most effective management strategy particularly by the ecological modernists (Bollier, 2014). Nevertheless, privatisation is only one of the commons management strategies and is not applicable to all types of commons (Meadows, 2008). The underlying assumption in Hardin’s work and the work of other scholars arguing for privatisation is that individuals are selfish and maximize benefit for themselves. This view is widely critiqued by behavioural economists who point to the variety of ‘real-world’ behaviours that are not derived from immediate concern for the self, but are altruistic, group or reciprocal behaviours (Venkatachalam, 2008).

Nobel Laureate political economist Elinor Ostrom has developed a sophisticated theory on how to govern the commons based on criticism of mainstream economics and her own research and has developed design principles for governing the commons (Ostrom, 1990; 2010). Box 3 presents these design principles as updated by Cox, Arnold and Villamayor-Tomás (2010). There’s an emerging body of work reflecting on the applicability of these principles to digital and knowledge commons (e.g. Hess & Ostrom, 2007; de Rosnay & Le Crosnier, 2012; Frischmann, Madison, & Strandburg, 2014). Nevertheless, there is a shortage of creative and analytical thinking that links this emerging body of work with discussions on digitisation of/in the urban domain. This highlights an opportunity for theoretical and applied research.

Box 3: Design Principles for Governing Commons

Principle	Explanation
User boundaries:	Clear boundaries between legitimate users and non-users must be clearly defined.
Resource boundaries:	Clear boundaries define a resource system and separate it from the larger biophysical environment.
Congruence with local conditions:	Appropriation and provision rules are congruent with local social and environmental conditions.
Appropriation and provision:	The benefits obtained by users from a common-pool resource, as determined by appropriation rules, are proportional to the input required in the form of labour, material, or money, as determined by provision rules.
Collective-choice arrangements:	Most individuals affected by the operational rules can participate in modifying the operational rules.
Monitoring users:	Monitors who are accountable to the users monitor the appropriation and provision levels of the users.
Monitoring the resource:	Monitors who are accountable to the users monitor the condition of the resource.
Graduated sanctions:	Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and the context of the offense) by other appropriators, by officials accountable to the appropriators, or by both.
Conflict-resolution mechanisms:	Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.
Minimal recognition of rights to organize:	The rights of appropriators to devise their own institutions are not challenged by external governmental authorities.
Nested enterprises:	Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.

2.3 Reflections

Foster and Iaione (2016) mention co-city (a commons-based collaborative city) and sharing-city (a city that promotes sharing practices among its citizens) as two evolving city strategies. The discussions in this expert workshop explored the potential of the dynamic interactions between these two evolving city strategies in the context of the digital economy. Several examples of peer-to-peer commons economy were discussed in detail, such as the Bologna Regulation. The implications of the peer-to-peer exchange economy, on the other hand, could not be considered in comparable detail because of the limits of the knowledge and experience of the experts². The potential synergies between these two value models in transitioning to low carbon and resilient cities were thus under-explored.

It is not realistic to expect that the dominant economic model will quickly shift to a mature peer-to-peer commons model. Also, the transformation of city support systems during low-carbon and sustainability transitions will require huge amounts of capital input which may initially be easier to provide under the for-profit hierarchical business models. Therefore there are governance and policy challenges ahead to accommodate the co-existence of two value models in ways that will facilitate the decarbonising of our cities and build resilience.

Anecdotal evidence suggests that strong corporate players in the peer-to-peer exchange economy (even though they have successful business models and strong future visions) are not engaged with the ideas of peer-to-peer commons economy. They often seem un-aware of criticisms targeted to the extractive basis of their value generation approaches. Representatives of these two values models rarely share the same public debate and discussion platforms. For example, a policy pitch hosted by the Grattan Institute in early 2015 ([Regulating the Peer-to-Peer Economy](#)) featured two representatives from businesses that would be classified under peer-to-peer exchange economy;

no representatives of enterprises that could be classified as peer-to-peer commons were included. Given the two value models have significantly different policy implications and given the lobbying power of businesses operating with for-profit hierarchical platforms, there is a risk that the potential implications of the peer-to-peer commons model will be overlooked by policymakers, despite its potential contribution to resolving urban climate challenges.

Participants at the expert workshop strongly agreed that truly participatory processes for policy development and budgeting must be developed and implemented. However, sustainability and low-carbon transitions in cities is a different challenge for policy and engagement from many other future planning processes because in this case the framing is normative; i.e. there is an overarching state that needs to be achieved (by a particular time) as a result of current interventions. Although cities have been adopting more participatory approaches to planning and development (and civic technologies also create unprecedented opportunities for improving these processes) there is a risk that the decisions made as a result of these processes may not yield the required levels of decarbonisation and resilience within the timeframe required. Therefore, the design of these participatory processes should enable effective expert input and clearly frame the boundaries of a “decision playground” where citizen-led policy experimentation can happen without jeopardising the normative requirements that frame future-making. Given cities are nested complex systems, comprising physical, biological, social-cultural and economic interactions and information flows, as well as a large number of diverse actors, catalysing appropriate transformation is difficult. This points to the importance of collaboration between research institutions, governmental agencies, media and citizens for the effective communication of facts and uncertainties. In addition to science communication, there is also a need for collaborative research on deliberative processes that are empowering, efficient and that can account

for the complexity and strategic importance of decisions needing to be made.

Digital technologies will create several opportunities in cities for the reduction of carbon dioxide emissions. Whether these will be effective in radical decarbonisation and resilience building in the long term will depend on the policies that will be put in place in the short term. The expert workshop highlighted the different systems that need to be considered in policies responding to the potential of peer-to-peer technologies and social and business innovations.

2. It was unfortunate that at the last minute the representative from Uber was unable to attend the workshop.

3. Policy Recommendations and Research Needs

Based on the expert consultation and our research findings and reflections, we propose the following policy recommendations and associated research questions under four main categories:

Developing and Implementing Citizen-centric and Democratic Governance Models

Understanding and leveraging institutional, organisational and cultural enablers for creating sharing cities

- How do planning and legal systems at different tiers of the government enable, or create barriers to, the sharing of physical elements of cities?
- How can cities be made more amenable to sharing the under-utilised assets including infrastructure, vacant land and vacant public buildings?
- To what extent can the sharing of cities' physical elements reduce carbon emissions and increase resilience?
- How can local governments, non-governmental organisations, research institutions, chambers of commerce and the entrepreneurial community facilitate cultural change?

Developing and implementing models of governance for the physical and digital urban commons

- What roles do the different tiers of the government play in developing digital public infrastructure and protecting the citizens' 'right to data' while keeping the innovation space open?
- How do physical and digital urban commons interact?

- What principles should be in place for effectively governing the physical and digital urban commons?
- Which existing institutions can assist with governing physical and digital commons? How effective are they?
- What new institutions and organisations should be created for designing and implementing these governance models?

Facilitating and widening the scope of public debate on urban data and peer-to-peer alternatives

- In policy development, how can the scope of public debate on the generation, use and ownership of urban data be widened so that the interests of the public are not foreshadowed by the interests of commercial enterprises?
- How can local governments, non-governmental organisations, research institutions, chambers of commerce and the entrepreneurial community facilitate interaction between representatives of peer-to-peer exchange economy and peer-to-peer commons economy so that mutual learning and synergistic innovation can take place?

Facilitating participatory decision-making and budgeting

- How can the government facilitate genuine participation of citizens in idea generation, decision-making and budgeting on matters that will influence their experience with the infrastructure and services of cities?

Managing and Leveraging Urban Data

Supporting the development of a digital open design commons and open information platforms

- How can Australian cities, research institutions and the entrepreneurial ecosystem contribute to the development of a global digital open design commons that, when coupled with local distributed manufacturing networks, be re-localised to reduce transport related carbon emissions and increase resilience?
- What kind of platforms can be developed by cities so that city-related information relevant to the citizens is easy to find?

Establishing and supporting experimentation with data and technologies in cities

- How can cities establish and maintain "data playgrounds" where actors can explore unexpected interrelationships between data sets so that cross-linkages between service silos are enabled?
- What are the different options for how digital technologies can be deployed and used in the cities?
- Which of these options have the highest potential for increasing the resilience and decarbonisation of the economy in cities?

Developing and Supporting New Models of Business and Securing Finance

Educating, empowering and collaborating with digital entrepreneurs to direct innovation efforts and resources towards decarbonisation projects

- How can young people be provided with access to hard and soft resources (space, funding, mentoring, legal advice etc.) and therefore supported in entering into the 'ethical entrepreneurial' economy?
- How can cities support the innovations regarding the protection, management and governance of physical and digital urban commons to scale-up and become competitive at a local level?
- How can new models of working such as radical freelancing be leveraged to direct time, cognitive capacity, and talent towards decarbonisation projects?
- How can the awareness of individuals and communities contributing to and innovating through the development and maintenance of both physical and digital commons be increased about the socio-environmental impacts of their activities?
- How can these individuals and communities be empowered to become collaborating partners in identifying and minimising the negative socio-environmental impacts of their activities?

Identifying and developing financial enablers of the digital economy that will assist in radical decarbonisation

- How can sources of funding alternative to traditional governmental and bank loans or angel investment (e.g. superannuation funds) be directed to digitally connecting big

infrastructural networks such as power and water?

- How can we create models of value circulation within the digital economy so that there is reinvestment to assist with radical decarbonisation?

Maintaining Socio-economic Resilience

Leveraging the expected changes in distribution and number of jobs across sectors by creating employment opportunities that will help shift to a decarbonised economy

- How can social and economic resilience be maintained and improved in the face of the digitisation of employment in Australia?
- How can we create and secure new jobs for those that will be replaced as a result of automation?

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Appendix I - List of Participants

Participant	Organisation
Andrew Maher	Aurecon
Anthony Cussen	City of Melbourne
Bjorn Nansen	University of Melbourne
Claire Mason	CSIRO
Darren Sharp	Shareable
David Mayes	City of Melbourne
Jacyl Shaw	Carlton Connect Initiative
Jeff Robinson	Aurecon
Jenny Kennedy	University of Melbourne
John Watson	The Conversation
Jose Ramos	Action Foresight
Julian Waters-Lynch	Holos Group
Lorraine Tighe	City of Melbourne
Martin Hablutzel	Siemens
Matt Low	Arup
Matthew Willcox	City of Melbourne
Pete Evans Greenwood	Deloitte Digital - Centre for the Edge
Priscilla Davies	ABC
Serenity Hill	Open Food Network
Sharon Ede	Share Adelaide /SA Govt
Toby Kent	City of Melbourne

Appendix II - Workshop Agenda

1-6 pm Friday December 4 2015	
1:00 – 1:15	Arrival and registration
1:15 – 1:30	Welcome and introductions Chris Ryan, Visions and Pathways 2040, University of Melbourne Yvonne Lynch, Future Melbourne, City of Melbourne
1:30 – 2:00	Presentation Socio-environmental impacts of two value models in the digital economy Michel Bauwens, P2P Foundation
2:00 – 3:00	Open group discussion In what ways either of the value models can assist in transitioning to low-carbon resilient futures in Australian cities? What policies and innovations are needed to overcome or minimise the associated socio-environmental impacts and maximise the potential of either value model during transitioning to low-carbon resilient futures in cities?
3:00 – 3:15	Afternoon tea
3:15 – 4:00	Breakout group work Analysis and refinement of VP2040 scenarios with references to two value models of the digital economy
4:00-4:30	Wrap-up and close
4:30-6:00	Drinks and networking



Visions and Pathways 2040



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