A ladder-truss of citizen participation: re-imagining Arnstein's ladder to bridge between the community and sustainable urban design outcomes

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Abstract: There are well understood urban design approaches that respond to the economic, social, and environmental pillars of sustainable development, but urban design decision-making for sustainable outcomes is complex both technically and, in democratic societies, politically. Urban design decision-making must incorporate citizen participatory processes that, as Sherry Arnstein in her 1969 paper, 'A ladder of citizen participation' points out, are undertaken at varying levels ranging from the tokenistic through to citizen *control*. In this paper, we explore benefits and challenges of citizen participatory processes illustrated with practical examples from an Australian context and propose improvements that utilise emerging technology. We then outline a new approach that rotates Arnstein's ladder diagram 90° to instead form a ladder-truss of citizen participation. This ladder-truss includes aspects of each rung as a structurally necessary and interwoven component of inclusive participation aimed at bridging between the community and sustainable urban design outcomes.

Keywords: citizen participation; decision-making; e-participation; landscape architecture; urban design; sustainable urban design; sustainability; NIMBYism; climate change.

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1 Introduction

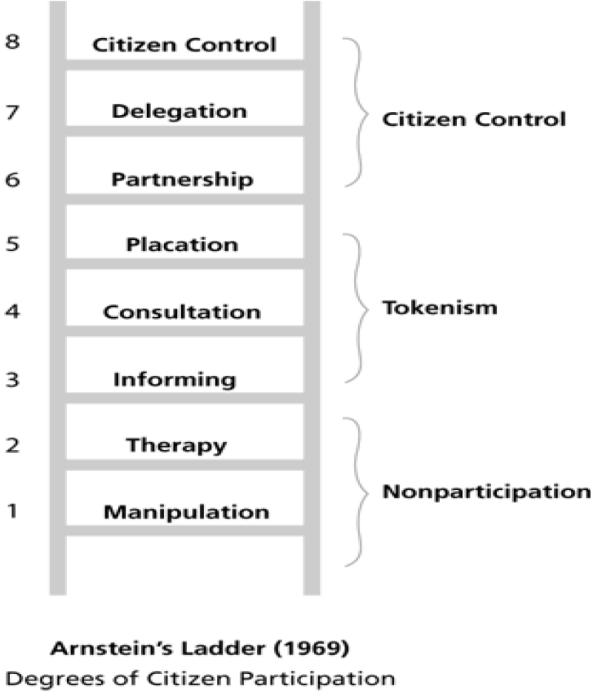
Cities both consume vast quantities of energy and contribute to climate change through intensive, greenhouse gas producing activities; construction, heating and cooling, manufacturing, and transport, but also present the greatest potential to respond to these challenges, through implementation of sustainable urban design (Kenworthy, 2018). In general, the citizens of cities, designed to accommodate areas of dense urban development, well serviced by mass transit and high-quality infrastructure for cycling and walking are more active, healthier, use less energy and pollute less per capita than those who inhabit less dense, low rise sprawling city fringes (Newman and Kenworthy, 2015; Newton, 1997; Badland et al., 2009; Giles-Corti et al., 2016). In the context of Australian cities, where sprawling, lateral expansion development patterns are still dominant, increasing density in well serviced inner suburban areas could improve sustainable outcomes. Increased density could reduce issues of social-isolation, concentrations of urban poor, impacts on adjacent rural areas such as loss of bio diversity and loss of agriculturally productive farmland (Bekessy, 2017; Garrard et al., 2018; Millar and Roots, 2012).

Over the past century, architects, engineers and planners have pioneered sustainable, energy efficient building and urban design (Whitelegg, 1993; Anderson and Michal, 1978; Brunkan, 1978). These efforts range from the typological studies of Walter Gropius from the 1920s, adjusting building form and placement to maximise energy efficiency, light and airflow, through to development of today's construction regulations and green and embodied energy ratings (Poerschke, 2017; White and Langenheim, 2020). Despite these technical advances, sustainable urban design decision-making is complex both technically and politically. In democratic societies such as Australia, decision-making often includes a public or citizen participation process, increasingly recognised as an essential part of governance, and which can have immense impact on outcomes.

Much has changed in the participation arena since the concept was outlined by Sherry Arnstein 50 years ago, in her 1969 paper, 'A ladder of citizen participation', but her paper is as relevant now as ever, with many of her ladder rung categories and the *implied* ladder hierarchy, still tangible in the current International Association for Public Participation (IAP2) spectrum (2018; Lyles and White, 2019). While public participation is a complex set of processes, that need to reflect the specifics of the context, there is a common

assumption in practice that it is universally applicable, universally good (Cooke et al., 2001, p.3), and will without doubt lead to more sustainable development outcomes, often without critique or evaluation (IAP2, 2019; VAGO, 2017). In Australia, these commonly employed citizen or public participation processes, when misused, can give voice to urban change resistance, and entrench unsustainable development choices. Thus tension ensues in urban design decision-making, between design professionals focusing on sustainable outcomes, developers focusing on costs or market demand, and citizens with wide-ranging preferences and interests (Doberstein et al., 2016; Wiesel, 2019). In this paper we describe the tensions between citizen participation and sustainable urban design development goals, and how they have been faced in the Australian context, through a revisiting of Arnstein's conceptual ladder framework (Figure 1).

Figure 1 Arnstein's ladder of participation showing hierarchical rungs of different levels of participation from the lower rungs of 'nonparticipation' including manipulation and therapy, the mid-level rungs of tokenism including informing, consultation, and placation, to the highest rungs of 'citizen control' including partnership, delegation, and full citizen control



2 Aim

Arnstein outlined the varying levels (or ladder rungs) of citizen participatory processes that range from the tokenistic through to full citizen empowerment, or *citizen control* (1969) (Figure 1). By using the metaphor of a ladder, Arnstein implied a hierarchical aspirational achievement model, suggesting lower rungs are less equitable or ethical than upper rungs. The problems with the hierarchical ladder metaphor have led to its many reconfigurations. For example, Fung re-conceived the ladder as a 'democracy cube',

focusing attention on the proper selection of participants (2006). Hurlbert and Gupta (2015), created a split ladder diagnostic and evaluation tool to address the conditions, nature and goals of decisions as the drivers of participation structure, and the International Association for Public Participation (IAP2) reconceived the ladder as a spectrum, removing rungs with negative connotations (2018).

Participatory planning and research has been used in the Australian context, to gain critical input and co-knowledge production from marginalised groups such as under-represented Indigenous populations, and social housing tenants (Barnett and Kendall, 2011; Whitzman, 2017). Conversely, participation and community engagement processes have also been adulterated, to the point of weaponisation, against sustainable development by more affluent urban communities.

In this paper, we aim to explore key challenges involved in moderating between design for sustainable outcomes and citizen participation in Australia. To do so, we return to Arnstein's original, and challenging negatively described rungs, conceptually re-conceiving these rungs as critical struts in a truss of citizen participation, or a ladder on its side. We feel this theoretical reworking of Arnstein's ladder falls at a timely moment, with changes wrought by increasingly available internet enabled methods such as e-planning and e-participation.

3 Exploration structure

We first look at the history, of citizen participation and its origins in both social justice and environmental decision-making. This section includes a discussion of the benefits and success of citizen participation in improving outcomes for communities who are socially marginalised, environmental outcomes for those adjacent industrial and freeway developments, and how it has helped to bring tacit local knowledge into urban renewal proposals. This section is followed by a discussion of the less beneficial aspects of citizen participation, such as their domination of, and steering of outcomes, by self-interested motivation groups, culturally specific emotional bias, and its use politically, as an expensive *placation* tool. We then use real world examples to examine the potential of multiple new approaches employed in participatory processes, to illustrate a conceptual distributed load decision-making 'ladder-truss'.

4 Empowering the community through participation (origins of participation and what is still good about it)

Citizen participation in decision-making arose in the USA in the1960s and 1970s responding to the need to make complex development choices, with outcomes that would have implications of either an environmental or social nature on a local community (Richardson and Razzaque, 2006). It has become increasingly important as a way of incorporating localised tacit community knowledge that not only enriches urban design but can contribute to more inclusive and happier communities. An existing local community understands the background of their area, local traditions and the significance of idiosyncratic place-based arrangements that may not be immediately obvious to an outsider and how decisions have been made in the past and their positive or negative impact (Fung, 2006). Citizen, or community participation in decision-making is also

considered important as simply a process. It facilitates trust, transparency, information exchange, reduces possibilities of corruption and increases citizen engagement, knowledge, consensus and implementation support (Curtis et al., 2000; Frantzeskaki and Kabisch, 2016; Irvin and Stansbury, 2004; White and Langenheim, 2020).

While it is more difficult to quantify or prove that citizen participation improves outcomes than to see it as a process with intrinsic value, it has been clearly instrumental in facilitating inclusion of localised knowledge, redistributing of wealth and funding to marginalised communities, mandating the inclusion of environmental audits in freeway route options, saving heritage buildings, protecting old growth forests and stopping the damming of rivers for hydro-electricity among many other positive outcomes (Antrim, 1992; Dietz and Stern, 2009; Lange and Hehl-Lange, 2011).

4.1 Social equity decision-making

In the USA, processes developed to include citizens in the Urban Renewal, Model Cities, and Anti-poverty programs of President Lyndon Johnson's 'War on Poverty', helped redistribute infrastructural funding and power toward marginalised black communities. Arnstein describes the processes, drawing important distinctions between those that empowered marginalised communities and those that did not. She describes the most successful program at reducing the existing and persistent racism and inequitable distribution of funds to white neighbourhoods in the USA, through the example of the Ocean Hill-Brownsville schools in New York City, where policy and infrastructural spending became fully citizen controlled by the local black community (1969). Key to its success was the "inclusion in the room" of a majority of members from marginalised sectors (Arnstein, 1969; Fung, 2006).

4.2 Environmental decision-making

Concurrently, infrastructural decision-making for proposals with potential environmental or human health risks, was also beginning to include citizens (Fiorino, 1990). In contrast to the processes for social equity, that to be effectual, required majority representation of marginalised sectors, environmental decisions had no such socio-economic overlay. Minority and majority groups alike could be affected, and thus, questions of "who should be in the room" were less clear. Initially, citizens who wanted to be part of environmental decision-making were often altruistically motivated activist groups, fighting poor or polluting industrial developments. But in later years, distinctions between these altruistically motivated activists and more strident, less altruistically motivated anti-development groups, such as Save our Suburbs (SOS) and "Not in My Backyard" (NIMBY) began to blur (Fiorina, 1999; Haddon Loh et al., 2018).

An early example of environmental citizen participation was the US highway revolts of the 1950s and 1960s, opposing plans to extend freeways that cut through and destroyed communities and neighbourhoods. These revolts were critical in stopping unneeded freeway developments. They allowed citizens to question the motivations behind government decision-making processes and led to mandated inclusion of environmental audits for all future freeway proposals (Jacobs, 1961; Mees, 2003). Recently in Melbourne, Australia, the East-West Link freeway proposal was declared a "major transport project of state significance" under the Major Transport Projects Facilitation Act 2009. The decision was made without community *consultation*.

Community groups, outraged by clear determination of the government of the day, to go ahead with the project, began legal battles, campaigns in local neighbourhoods and staged increasingly frequent and disruptive protests, leading to abandonment of the project (Legacy, 2015).

4.3 Types and levels of citizen participation processes

Arising from these dual origins, citizen participation in decision-making has evolved into three broad types. Sometimes it is undertaken simply as a process to inform, gain support or consensus from citizens (or avoid litigation). At a deeper level it is undertaken to gain citizen feedback or local knowledge and to enable integration of community expectations into decisions. And at its deepest level is done to activate citizens towards a civic duty, such as stewardship or to enable citizen control (Boonstra and Boelens, 2011; Fiorina, 1999; Fung, 2006). Each level requires different time commitments from participants, from the minimal, to the substantial, and each is associated with processes that suit the context, purpose, goals and objectives (1969).

At the minimal level, processes such as public surveys, education, and information dissemination mail outs, may take less than an hour. Arnstein might have considered this form of participation, to sit on the lower 'non-participation' rungs of the ladder, particularly if undertaken without any expectation of citizen response, or adjustment to the proposal in light of that response.

In the mid-level, processes include one or more physically attended public town hall type meetings or facilitated workshops of approximately two to four hours each, usually without requirement for citizens to be pre-prepared, as partially, their objective is to simply inform. The other objectives of these workshops is to collect citizens opinions, thoughts and local knowledge, often through a 'Post-It' notes on a plan type procedure. Arnstein might consider this kind of participation to sit on the 'placation' rungs of her ladder, as the outcomes are concentrated on the process of consultation itself rather than integration of those outcomes into decisions (Irvin and Stansbury, 2004).

At the substantial level, processes include citizen training to enable them to assist government administrators, scientists, and designers to make difficult, complex decisions about multi-faceted proposals as representatives of their community. These processes require substantial quantities of citizen time, professional training and understanding of trade-offs and decision pathways (Fiorino, 1990; Richardson and Razzaque, 2006). This level of participation sits towards the upper rungs of Arnstein's ladder, under more contemporary terms such as partnership, co-design, co-production of knowledge and local governance (Frantzeskaki and Kabisch, 2016; Mauser et al., 2013).

4.4 Participation in the Australian context

In Australia, citizen or community participation is defined as "*the involvement of those affected by a decision in the decision-making process*" (VAGO, 2017). Communities of people in Australia who "may be affected by a decision" can be hyper-localised with homogenous, socio-economic backgrounds. As much as this definition enables the empowerment of a highly localised remote Indigenous community toward self-governance, it also enables affected, but self-interested wealthy inner suburban residents to reject plans to increase density or social housing in their area, regardless of greater societal good (Curtis et al., 2000; Dovey et al., 2009; IAP2, 2019; Wiesel, 2019).

Just as this Australian definition draws no distinction between what constitutes an equitable or inequitable representative group, it also provides little guidance for implementing involvement of citizens in decision-making processes suitable for different contexts, objectives, or goals.

5 What is not so good, and the gap between designing sustainable outcomes and community opinion

Arnstein uses the ladder metaphor to discuss where methods used in the War on Poverty programs for citizen participation were successful or not, in redistributing power to 'have-not' citizens. She describes how, prior to these programs, marginalised groups were excluded from political and economic processes, that determined how information was shared, goals and policies set, tax resources allocated, programs operated and benefits like contracts and patronage parcelled out (1969).

This exclusion of minority groups is not a problem that has dissipated in Australian participation. At times, it has even increased and exacerbated divisive opinion and contextual, culturally significant bias, particularly when dominated by economically motivated self-interest groups with a desire to influence policy for personal gain (Dietz and Stern, 2009; Fung, 2006; Irvin and Stansbury, 2004; Mihaly, 2009). Clear evidence correlates Australian citizen decisions about density, selecting to block projects for social or affordable housing in their neighbourhoods, with property prices that are too high for marginalised, underrepresented young or poor people (Daley et al., 2018).

5.1 Representation

Citizen input does not automatically improve the quality of decision-making if the right people are not in the room (i.e., those with unique information), decision-makers do not actually take information into account, or citizens are not provided with the full gamut of trade off's (Berry et al., 2019; Newig, 2007). Many, if not most, people are not able to participate in mid-level processes that have specific or extended time requirements as they fit into one or more categories that exclude them. They may have young families (6 pm might sound like a good time to have a community gathering if you do not have children), they work shifts or multiple jobs, are unable to attend due to 'after school activities' or are extremely 'time-poor', have language barriers, or limited mobility. They may just not have been invited as they are not registered as property owners (renters) and are therefore not on local government invitation lists, or despite having a desire to live in a suburb, they may not have enough money to do so, as there is inadequate affordable housing. This group of people may be persistently excluded from participation in planning and urban design processes, deepening existing inequalities in unintended ways.

Who participates in decision-making and how it is conducted, can produce dramatically skewed results and an inaccurate representation of the broader community's true sentiments (Kennedy and Hartig, 2019). If community participation is limited to these in-person, at a designated-time format, and if input from diverse groups is lacking, non-response bias, akin to the increasingly inaccurate polling results for the last two American elections, affected by declining responses from poorer sectors of society in

America (limited white voters without college degrees, African American, Latino, and people of Asian descent) will result (Agarwal, 1997; Berry et al., 2019).

5.2 Potential for hijacking by selfish motivations and empathy gaps

5.2.1 Selfish motivations

While the motivational origins of citizen participation are rooted in inclusion of under represented minority citizens and altruistic environmental activism, multiple recent Google polls, show that current citizen activation for the civic interest, is difficult to achieve unless it aligns with a citizens own self-interest (Fung, 2006; Gordon et al., 2013; Krontiris et al., 2015). Conservative NIMBY opposition to densification resulting from concerns of "unfamiliarity or even prejudice" (Whittemore and BenDor, 2019), have learned to game the citizen participation system. While Arnstein offered hope that some of the grass-roots citizens in the late 1960s, had "*learned the Mickey Mouse game, and now they too know how to play*" enabling them to demand genuine levels of participation and assure that public programs met their needs and priorities, in contemporary participation, NIMBY opposition groups have also learnt the same game, exploiting it for their own interests.

5.2.2 The will of the people (who may not be all good)

The internet and social media platforms have given rise to countless environmentally and socially conscious community and advocacy groups such as 'National Shelter', a social housing organisation. However, there has also been a dark side to the rise of this citizen connectivity. The citizens of cities, as suggested by Portugali (1997), are a "*pluralistic kaleidoscope of cultures and subcultures*", including many who hold strong views, incompatible with the broad objectives of social and environmental sustainability (Healey, 1997, p.42; Sandercock, 2000). According to a new report by the Southern Poverty Law Center (SPLC), in the last half decade, online presence through Facebook groups and websites such as the Daily Stormer have grown significantly while the number of white nationalist hate groups in the USA has increased 55%. A "surging racist movement continues to be driven by 'a deep fear of demographic change'" (Tama, 2020; Wilson, 2020). Groups in the USA that fear demographic change include the Proud Boys, Base, Atomwaffen Division, and Feuerkrieg Division. In Australia, Antipodean Resistance, Australians Against Further Immigration, Australia First Party, Australian Nationalist Movement, National Action (Australia) and One Nation, all have strong xenophobic anti-immigration positions. Some of these groups also have strong anti-high density development positions, which they consider to be full of 'drug addicts' who 'cannot speak English' according to Pauline Hanson, from One Nation (Zhou and Simons, 2020). The views and preferences of this expanding minority of citizens are not necessarily conducive to sustainable transitions to higher density, low energy urban futures.

> "Racism and a chronic indifference towards the suffering of communities of colour, both inside and outside Australia, also play a significant role in the country's climate exceptionalism." (Pascoe, 2021)

Similarly in Australia, there appears to be a psychological inability to accept the scale and implications of the climate crisis (Pascoe, 2021). Led by political rhetoric touted by

multiple successive right-wing governments, large numbers of Australian citizens hold strong beliefs that climate change is not real, is not man-made, or is far less important an issue than immediate job-stability. In 2019, the Liberal-National Party (LNP) led by Scott Morrison, who once brought a piece of coal into parliament as a prop in support of continuing to build new coal mines stating, "this is coal – don't be afraid, don't be scared", was successful in the Australian Federal Election. He was selected by the "quiet majority of citizens", despite a long history of inaction on climate change, including refusing to ratify the 2002 Kyoto agreement and dismantling of the short-lived pricing on carbon emissions (2013).

5.2.3 Lack of empathy

There are also many citizens who find it difficult to put themselves in other people's positions, to see another person's *point of view*. For example, drivers can lack empathy or concern for the safety of cyclists and view them as "less than fully human" (Basford et al., 2002; Delbosc et al., 2019; Johnson et al., 2014). This example of an empathy-deficit extends beyond inability of drivers to imagine cycling, to broader inabilities to recognise implications of climate change on future generations, or the plight of indigenous communities in north-western Australia who are likely to be disproportionately affected by it (Leonard et al., 2013).

5.3 Context and culturally specific emotional bias

In public town hall type participation forums, decision-support imagery, commonly consisting of 2D photo montage or collage over photographs of a specific context or location, with a visual overlay of proposed changes, is used to elicit human cognitive appraisal responses. Such context specific visual material has one great limitation. Places can have strong emotional significance for people. The responses to change from those who consider themselves 'stakeholders' in a specific place, can thus be emotionally charged.

Place-based emotional responses can also be implicated in the rejection of sustainability, affordability, and green infrastructure. Even when citizen participants are potentially supportive of sustainable development proposals such as reducing car parking, increasing trees or increasing housing density in abstract terms, they can become emotional and resistant when these proposals impact *their* street, *their* block or *their* shopping strip directly (Doberstein et al., 2016). Examples of this resistance include trader stakeholder groups, well known for rejecting parking space reductions in front of *their* shops, despite mounting evidence that parking has, if anything a negative influence on shoppers' perceptions (Wolf, 2004); residential stakeholder groups who may *generally* agree with proposals to increase trees, still rejecting or removing trees they consider too large for *their* front yards (Andrew and Slater, 2014); and groups who may generally support increasing density locally, fighting construction of multi-storey buildings on *their* street (Doberstein et al., 2016).

5.4 Post-It Note placation, and Ill-informed non-consent

Finally, citizen participation is sometimes devoid of co-production of knowledge (Mauser et al., 2013). This happens when the objective of running participation is to generate

consent for a proposal, or as put by Arnstein run for the purpose of citizen '*placation*' (Connor, 1988). In these cases, the participation process can involve elaborate and costly workshops that generate lots of participant activity as an input. This might include placing coloured dots and Post-It notes on butchers' paper and invoking 'blue sky thinking'. The outputs of the process might be a set of guiding principles along lines that everyone agrees upon, such as a 'more equitable city' or a 'greener city', statements potentially as useful as 'make it nicer' or 'puppies are nice', in helping to deliver implementation pathways for difficult spatial decisions. Rarely do the outputs imagine futures that differ from now and the potential sacrifices these decisions might require (White and Langenheim, 2020; Wiesel, 2019).

Since Arnstein's provocation, a response to a context juxtaposing powerless citizens with powerful decision makers, many alternatives and re-inventions have been put forward, adapting her conceptual framework for other contexts. Throughout these re-inventions Arnstein's basic rung categories and hierarchical structure (where upper rungs may have been seen as the most desirable outcome) are still reflected, including the International Association for Public Participation spectrum (IAP2, 2018). Many of these re-inventions still grapple with the implied hierarchy of the ladder and the questions of representation ("right people in the room") are still debated (Connor, 1988; Fung, 2006; Hurlbert and Gupta, 2015).

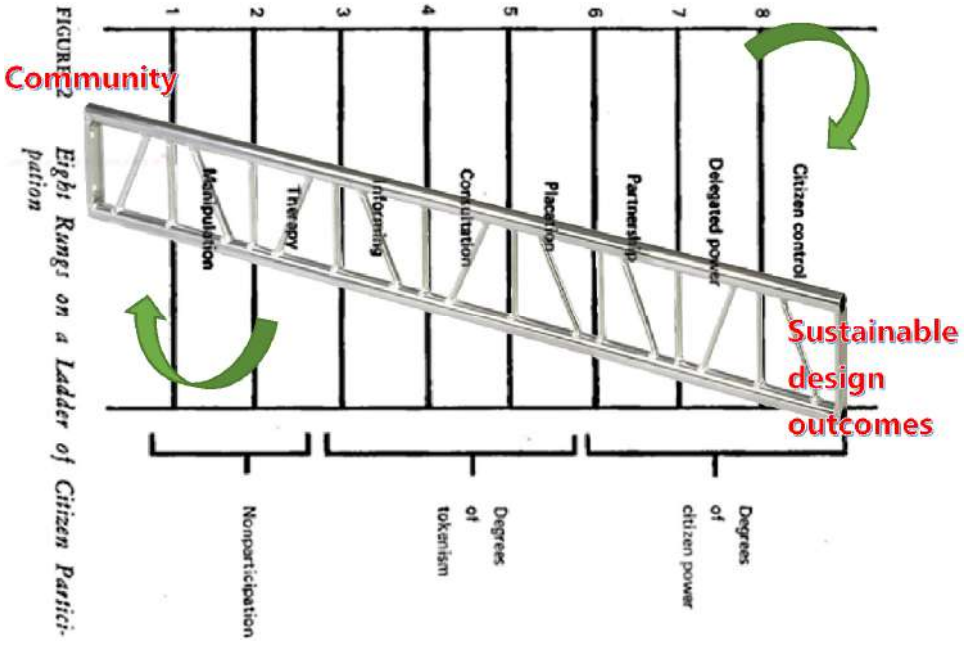
While there are substantial challenges with incorporating citizen participation into sustainable urban design decision-making, its value, applicability, and ability to deliver more sustainable outcomes are rarely questioned. As Arnstein suggested over 50 years ago, "citizen participation is a little like eating spinach: no one is against it in principle because it is good for you" (1969).

But further exploration of participation models in the context of urban design for sustainable outcomes is needed. A method is needed that can accommodate different kinds of citizens with different motivations and filter conflicts of interest, is inclusive of the financially rich and poor as well as the time-rich and time-poor, can allow for education of citizens to facilitate informed input, encourages citizens to try to understand and empathise with other citizen's points of view, allow for expert contributions and for that expert input to be valued and even lets angry citizens vent their frustrations. An inclusive model would render the hierarchical rungs all equally important to different degrees, *running simultaneously and acting together* to respond to the specific challenge. This inclusive model can help *bridge the gap* between diverse groups of citizens and sustainable urban design outcomes.

6 Flipping the ladder sideways: as a 'ladder-truss'

To meet this need, we propose a new way of looking at Arnstein's rungs, turning them sideways, to remove the hierarchy of the ladder, and re-conceptualise them as struts in a 'ladder-truss'. One that tries to fit the *right kind of participation* to the *right kind of people involved* to decide the *right questions for the right challenges*. Like those used in construction, the 'ladder-truss' model for participation could conceptually allow for distributed load, where each element works together to spread loads and 'bridge' in a highly efficient manner. The exploration of this suggested model requires some redefinition of the terms in lower rungs in Arnstein's ladder and some sacrifices in the upper ones (Figure 2).

Figure 2 Illustration showing the 90-degree rotation of Arnstein's ladder to become a ladder-truss of participation where each rung or participation-type has value and is a necessary structural element for bridging between the wider community's citizens and sustainable urban design outcomes (see online version for colours)



6.1 (Positive) manipulation

Arnstein describes the *manipulation* rung of participatory processes as a form of unscrupulous engineering of support. In the case of the "Urban renewal (also known as the Negro Removal) program, *manipulations* involved development of 'Citizen Advisory Committees' and Community Action Agencies", that were used to sign off on both participation and manipulative underhanded deals.

In re-envisioning the ladder as a truss, we offer an alternative, positive definition of *manipulation*, based on the idea of skilful handling of data, material or a medium to craft urgently needed positive enabling questions. The questions asked of citizens, need to help present and describe the wider sustainability issues and the implications, trade-offs and sacrifices that sustainability decision-making entails. This might mean that citizen participation in, for example density decisions, would no longer center on visual and emotive questions of 'neighbourhood character' or preferred building heights, but might ask, more substantiative questions such as, "would you like your children to be able to afford to live close by?" And for green infrastructure, questions might shift focus from the aesthetic aspects of street tree species selections, to include functional implications of shade provision for children on their homeward journey from school (Langenheim et al., 2020).

6.1.1 Compelled empathy: forcing point of view (skilful manipulation)

Expressing complex urban design scenarios, requires skilful modelling that communicate both visual and functional outcomes of changes made to multifactor, interacting urban systems. We suggest that animated Immersive Virtual Environments (IVE) created from 3D digital models (including virtual reality (VR), Augmented Reality, and 360-degree videos) that skilfully *manipulate* a viewer out of their own personal perspective and allow them to experience spaces through the eyes of unfamiliar others (with who they do not usually identify), can create a form of compelled empathy. For example, a person who identifies as a driver, can view the streetscape through the eyes of a cyclists or as a pedestrian, or a local homeowner, can view social housing through the eyes of social housing tenants. Using IVE's provides a way to generate informed participants and informed participation in an immersive and empathetic way (Figures 3–5) and might overcome some of the fears associated with increasing density or impact on neighbourhood character in established suburbs.

Figure 3 Screen grab of perspective view in game engine immersive virtual environment showing a street configuration with a barrier fence scenario (see online version for colours)

Source: The authors

Figure 4 Screen grab of perspective view in game engine immersive virtual environment showing a street configuration the a 'green barrier scenario' (see online version for colours)

Source: The authors

Figure 5 (a) showing e-participation with citizen moving their smart device around to see different angles of the immersive virtual environment, and (b) showing a screen capture of what the participant sees on their smart device screen (see online version for colours)

(b) (a)

IVEs have ability to convey scale and facilitate navigability more readily than 2D imagery (Meenar and Kitson, 2020). IVE's can also overcome many of the confounding factors associated with 2D photo-based visual stimuli, local place-based emotive associations can be removed, individual variables can be controlled for, backgrounds can be standardised, and light conditions can be equalised across multiple scenarios. IVE's can also be used to communicate accurate visual representations of time-based changes such as the maturation of green infrastructure and allow citizens a new perspective on time-based outcomes of juvenile tree planting programs. IVE's can be used in e-participation formats, opening up a more inclusive conversation which can include the opinions of people who might ride through a place from another suburb, and could allow for choices to be realistically grounded in citizen preferences gathered at scale beyond the confines of local stakeholder groups (Irvin and Stansbury, 2004). IVE's can be used to manipulate a participant's range of perspectives and increase a participant's understanding of urban design problems that fall outside their own unique experience.

This said, we still need to acknowledge that some people are not able to see from another person's perspective, regardless of a virtual camera's spatial position or engagement with animated visual material. If a citizen holds fundamental ideological beliefs such as those linked to climate change denial, white supremacy, extreme fear of change, or suffers from empathy deficit disorder, they might still fail to put themselves in another person's shoes even with the assistance of an IVE. It is therefore important to elicit responses from citizens in participation that allows or even encourages them to express any such beliefs. It is important to provide room for those with dissenting views, to put these views forward. We explore participation from this sector of society in the next strut of the truss, *therapy.*

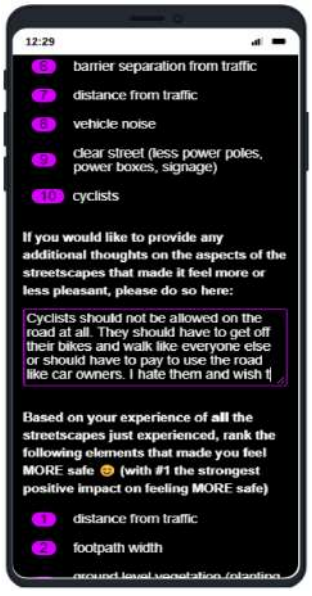
6.2 Therapy

In Arnstein's *therapy* rung, she demonstrated where participation attempted, through programs such as 'control-your child' or 'clean up', to "*adjust the values and attitudes of people living in social housing towards those of the larger society*". Through therapy processes in the War on Poverty Program, citizen participants were treated as patients

with pathologies requiring cure "*rather than changing the racism and victimization that create their 'pathologies*'" (Arnstein, 1969).

But *therapy* too, like *manipulation* can be seen in a positive light. The citizens whose beliefs cannot be swayed or reasoned with, given any amount of information; mask protesters in the face of the spread of Covid-19; AIDS, evolution, holocaust, climate change and vaccine deniers, all of whom are part of society and who's increasingly vocal values and attitudes, conflict with sustainable development goals (Shermer, 2010). As these sectors of society expand, it becomes increasingly important to understand what drives their attitudes, and to be able to work with, and extract value from the feedback and information they provide even when it is unpalatable. What can be offered to these people whose views cannot be changed through information, is a place to *therapeutically* rant and vent (Figure 6). What can be offered is a form of *therapy*.

Figure 6 Screen grab of online e-participation study of perceived safety and place making study (by the authors) showing open-ended text response section to allow for participants to add additional detail and reasoning behind their responses, raise questions, and in some cases document ideological beliefs or motivations, or express themselves through 'therapeutic' diatribes (see online version for colours)



By providing *therapy* outlets as an integrated element of the participatory ladder-truss for these views to be recorded within citizen participation processes, two positive outcomes can be obtained. Inclusion of their voice is achieved, and data can be gathered about what sits at the core of their grievances in a way that could potentially be used to improve communications to help *inform* these citizens for a more enlightened debate or shift perceptions as we explore in the next section.

6.3 Informing

As put by Arnstein, *informing* is the first 'legitimate' rung in citizen participation, but it must be coupled with time allowance for feedback or questioning or alternatives.

To make sustainable urban design decisions, requires an understanding of a much bigger and more complex picture than what might affect an individual person or a single suburban neighbourhood today. Globally, to keep up with rising population, two billion new homes will be needed over the next 80 years, with Sydney, Australia alone requiring 1 million by 2041 (Smith, 2020). More frequent, more extreme, and longer duration heat waves coupled with increasingly frequent and more erratic floods will cost lives, and continuing car reliance, and low rates of physical activity will result in poor urban population health.

These are the issues that must be weighed up in urban design in Australia today, whether the decision-makers are citizens, designers, planners, or elected officials. This means we need to enable *informed participation,* that clearly articulates trade-offs, and allows clear, transparent communication of who shoulders the expense of sustainable development, whose responsibility is the future and what individual sacrifices might need to be made for a greater societal good (Doberstein et al., 2016).

The *informing* strut of the truss, as described by many other citizen participation theorists, is fundamental. *Informing* is essential for distributing load on the truss, without it, the truss fails and bridging to sustainable development cannot occur.

6.3.1 Understanding motivations and priorities through gamification

One method of engaging people while attempting to *inform* them as well as understand their desires, hopes and motives involve the application of 'gamification'. 'Gamification', as defined by Deterding et al. (2011) is the use of game design elements in non-game contexts. Recently, there has been a wave of research into gamification for health purposes with mobile apps produced to encourage activity such as walking and cycling. Likewise, there has also been a wave of e-participation web-based planning 'games' that use online challenges with tasks and questions of missions that relate to neighbourhood planning issues. The games include working with imaginary budgets or point-scoring which appeals to those predisposed to extrinsic motivation, to provide a 'safe space' for experimentation where participants can play around, exploring the space of possibilities while observing the *consequences of decisions taken*, without running any real risk of damage (Devisch et al., 2016). This gamification of engagement processes can have a considerable impact on citizen's understanding of urban issues, so if nothing else, helps contribute to creating more *informed* communities, and if done well, can shift motivations of participants to at least consider greater goods.

6.4 Consultation and placation (overcoming distrust and animosity)

For Arnstein, *consultation* and *placation* were still tokenistic and undesirable forms of participation. Citizens of ghetto neighbourhoods were routinely given attitude surveys, but their concerns never appeared to be addressed. For Arnstein, *consultation* and *placation* were the rungs of the ladder that ticked "having participated in participation".

Today's butcher's paper workshops can often still play much the same role as they did in Arnstein's day. The opportunity to participate is there only for those who *can* choose to join a town-hall workshop in the middle of the working day, or in the evening during children's dinner time, meaning *consultation* to collect any *nuanced local knowledge* is provide by a very narrow fraction of the community. This non-inclusive form of *consultation* misses the opportunity to gather a wide range of *localised*

knowledge, and excludes a large proportion of communities from feeling they are having input and being listened to in reporting issues regarding urban topics (Thiel and Fröhlich, 2017). More inclusive *consultation* that increases scale, scope, and accuracy of data collection that allows for better filtering and analysis is needed.

Workshops, run when without the use of either propositional, speculative visualisation material, or high quantities of citizen spatial training and *informing* to assist them in understanding complex interacting issues, can negate opportunities for insightful knowledge co-production and end up focusing on simplified single issues, enabling the continuation of status quo planning such as resistance to tall buildings, or on broad 'motherhood objectives'.

6.4.1 Getting broader representation in the (virtual) room and spatially-specific information with e-participation

When we are asking questions about sustainable urban development we need to ask; who is a representative group and how do we define the quality of citizen responses as data that can be queried, calculated filtered, and selectively used to inform decisions in ways similar to how we comfortably and selectively use scientific knowledge (Beunen and Opdam, 2011)?

As outlined above, there are issues with representation in public participation in sustainable development decision-making, particularly in the Australian context. Sustainability is a question for a whole society that at its core aims for equitable distribution and smart use of resources. Sustainable decision-making runs into problems when a sector with economic privilege has the power to safeguard resources for their own hyper-localised group.

In response to the limitations to the town hall-style of *consultation*, Brown and Kyttä (2014) argue that community input *can* include the citizens who are working two jobs, have parental responsibilities and cannot make community meetings. Brown and Kyttä suggests the answer for more inclusive input is in digitally supported public participation geographic information systems (PPGIS). In these online forms of *consultation*, commonly referred to as e-participation, place-based knowledge can be gathered from all people in the community who have access to the internet and smartphones with geo referencing capabilities. This *consultation* approach is interesting as it can elicit very specific neighbourhood knowledge that is localised geospatially (with GPS coordinates).

Online *consultation* is accessible to a broader range of society than in-person processes. It can be delivered in multiple languages, allow greater accessibility options for people with vision impairment, can be completed at times that are convenient for the participant and can help to be more inclusive for the time-poor, financially poor, and those too young to normally be able to participate. Where there is potential exclusion of less-computer savvy members of the community or with restricted access to computers, as described by Gottwald et al. (2016), e-participation can be augmented with physical participation using designated 'drop-in' sessions where citizens with limited access or ability can be assisted in the e-participation. This kind of assisted e-participation does not require highly skilled workshop facilitators and could, for example be conducted with the help of intern-level staff.

These e-participation platforms allow us to gather responses from a broader representation, from not only hyper-local groups but also semi-local groups, such as cyclists who might ride to work through a place but not live in the area, or from residents

impacted by storm water flooding down-stream from a proposal up stream, and from non-local to regional groups whose perspectives and knowledge can shed alternative lights through their different experiences.

6.4.2 Using data as a method for motivation filtering, understanding expressed and revealed preferences

What e-participatory platforms also deliver is the ability to filter, query and selectively use the data generated through *consultation*. While this does depend on the quality of the e-participation study, participant responses can be filtered not only by their location (through stated zip/post codes or revealed IP address locations), but also their motivations, attitudes, beliefs and values and potential self-interests. If your data analysis reveals the 'Proud Boys' have participated in your study, and that they have strong anti-immigration and anti-density responses, an open discussion can be conducted about the choice to include or exclude their responses. It may be that their responses are excluded from questions of social housing inclusion or urban growth, but their input into footpath finishers or tree-species *are* included.

E-participation also allow for both explicit-stated but also revealed preferences. This allows us to understand what people say they want, and what they actually want, and understand if there are differences. For example, citizens' consumption behaviours may diverge significantly from their stated values on sharing and waste (Webb et al., 2018).

6.4.3 From Post-It notes on butcher paper to engaging with modelled and tested alternative speculations to elicit more meaningful feedback

To put forward quantifiable and visualisable propositions for the future requires a shift from the last 50 years of planning fashion where architecture, urban design and planning has moved away from comprehensive proposals to bureaucratic planning processes and vague and unmeasurable motherhood statement 'objectives' (Sorkin, 2009). Planning documents in most cities in the world, *city futures* are described with feel-good phrases that are *easy to garner support* from communities that suggest their city should be a 'green city', 'liveable city', 'healthy city' 'connected city' 'innovative city' and 'vibrant city' (DPCD, 2016; Victoria Department of Infrastructure, 2002). These terms are then broken down into vague paragraphs about how 'green cities' are good, but very rarely do they detail precisely what is meant by 'green cities' and exactly how this will be measured or achieved. There would be very few people who would oppose any of these broad objectives, and as there is such little detail on implementation, there is very little content to which one might object.

Professor Michael Neuman pointed out the importance of putting forward fleshed out design propositions or comprehensive plans in his paper "Does planning need the plan?" (Neuman, 1998), which cites influential design treaties including Camillo Sitte's '*The Art of Building Cities*' (1889); Ebenezer Howard's 'Garden Cities' (1898); Tony Garnier's 'Industrial City' (1917); Le Corbusier's 'Plan Voisin' (1925) and 'A Contemporary City of 3 Million Inhabitants' (1922); and Frank Lloyd Wright's 'Broadacre City' (1935). These noteworthy examples of urban design visions have many flaws but offer themselves up for critique and broader discussion. There is a clear proposition that we can agree with or disagree with. We can look at the perspective views drawn from within Radiant City or the hand-rendered views of Broadacre City and assess for

ourselves – *would this be a good place to live? Is it more sustainable? Is this something we want to aspire to?*

Designers hold the ability to put forward propositions that may be in 'sketch' form but are clear enough to read the intended spatial qualities. Designer's abilities to visualise propositional design speculations and analyse them through the use of complex systematic scientific models is one of the strengths of designers (Dunne and Raby, 2013). Their visualisations are often explored in 3-dimensional space with 'digitally sketched' massing models through to realistic computer renders or animated walk-through videos, as well as complex geo-spatial data representations. These visualisations can play an important role in facilitating collaboration and shared understanding with stakeholders (Guhathakurta, 2002; Langenheim et al., 2017; Webb et al., 2018).

6.5 Partnership

In Arnstein's upper-level rungs of the citizen participation ladder, she outlines 'partnership'. For Arnstein, this involved redistribution of power and negotiation between citizens and power holders who agree to share planning and decision-making responsibilities through such structures as joint policy boards, planning committees and mechanisms for resolving impasses. Today, partnerships may still involve sharing of power, and this needs to be kept at the forefront of minds, but in the context of sustainable development, importantly, partnership can also involve the co-production of knowledge and exploration of opportunities that come from combining knowledge and ideas from a wide range of groups.

6.5.1 Knowledge co-production partnerships (citizens, experts, stakeholders, and expert-stakeholders)

The complexity of co-production of knowledge for sustainable urban development is different in degree from that encountered in earlier participatory research. To inform the move from co-design to knowledge co-production, at local and broader levels, there is a growing importance of drawing on multiple disciplines, frameworks and methodologies brought together in inter- and transdisciplinary discourse (Webb et al., 2018). Sustainable urban development requires facilitated partnerships with input from citizens, architects, landscape architects, engineers, ecologists, economists, and social scientists with input from various engineering modelling, as well as visual impact inputs.

In response to this need for this kind of inter/cross disciplinary knowledge co-production, a national team of researchers led by Peter Newton, have developed the iHUB National Urban Research Platform (Figure 7). The iHUB is a nationally networked platform of urban research laboratories located at Swinburne University of Technology, the University of New South Wales, University of Queensland, Monash University and Curtin University, that provides computational, visualisation and broadband communications capable of supporting a broad spectrum of real time, distributed, collaborative built environment and design activities. These activities can involve multi-disciplinary researchers, multiple tiers of government, cross-sectoral industry and citizens gathering in a room to make collective decisions based on real-time data analytics (Newton et al., 2020).

Figure 7 Rendered perspective view of one of the iHUB National Urban Research Platform nodes that joint to make up a national cross-disciplinary collaborative urban design and analysis network (see online version for colours)

Source: The authors

6.5.2 Citizen science

There is little doubt that citizen participation in citizen scientist initiatives, that range from the specific data collection needs of the Yellow-bellied Glider monitoring project in northern Queensland, through to, the BioBlitz initiatives run throughout Australia, focused on involving school children in cataloguing the living world around them, have multiple benefits for both participants and for science itself, that are filtered through the aims of the projects. Citizens become informed and enabled to build a more accurate mental picture of the complexities of the natural world around them, and at the same time they are involved in co-production of knowledge and partnership with scientists. Citizen scientist data is valued and used in scientific research but is also able to be filtered where necessary when data quality requires (Silvertown, 2009).

6.5.3 Partnerships programs between citizen, government, industry, and institutions

There is great potential to explore opportunities for partnerships between local communities and a range of stakeholders including varying levels of government, industry, and institutions. In a report commissioned by the Australian Government (Department of Climate Change and Energy Efficiency) and the National Climate Change Adaptation Research Facility (NCCARF) *Indigenous climate change adaptation in the Kimberley region of North-western Australia*, Leonard et al. (2013) concluded with a focus on the key priority to develop Indigenous adaptation planning: participatory planning processes that incorporate Indigenous traditions and customs.

Successful programs developed in partnership with Indigenous Australian communities include placed-based design education programme delivered in a remote

learning context in the Warmun Aboriginal community, East Kimberley, Western Australia involving adoption of a two-way learning framework that emphasised self-actualisation, co-creation and shared insights and involved learning through story-sharing and connecting content to place (Edwards-Vandenhoek, 2018).

Another good example is a partnership with community groups and industry such as the Arnhem Land Progress Aboriginal Corporation collaborating with the Modfab 3D printing company and local schools for the 'Plastic Fantastic' project. The project combined the concept of 'caring for country' through the clean-up of plastic waste, waste recovery (plastic bottles converted into 3D printer filament), 3D print technology, and indigenous culture in a partnership designed to increase school attendance in the remote community of Milingimbi, North East Arnhem Land, in the North of Australia (Terzon, 2015).

6.6 Delegation and citizen control

Finally, in Arnstein's upper-level rungs of citizen participation, she outlines '*delegation*' and '*citizen control*'. As she discusses, at this rung of the ladder, full accountability, and final power of veto rests with the citizen group, a situation only reached in a handful of Model Cities. At the highest rung this model places no intermediaries between the 'neighbourhood corporation' and the source of funds (Arnstein, 1969). To various degrees, *Delegation* and *Citizen control* outline where, and what type of decisions can be made by a community and provides a structure for empowerment of citizens who have a genuine and legitimate commitment to improving their community through a decentralised system of government.

While these decentralised citizen-controlled communities were successful, as discussed by Arnstein, they were also vulnerable due to the level of 'decentralisation and divisive separatists' groups that arose. Nevertheless, these pioneers of the model of full citizen control provide the blueprint for many other hyper localised, decentralised community participation in decision-making, based on a rigorous process, transparent and scientific, with clear outlines of where the opportunities for choice exist.

Full delegation or control can be given to decentralised hyper-local groups when the implications of their decisions are also hyper-localised. In urban design decision-making most if not all decisions are connected to, and impact wider existing and future communities. Urban design decision-making is closer to making decisions based on access to water resources. If a decentralised community up stream chooses, for example to use 95% of the rivers' water to irrigate cotton crops in their local area, these decisions will have devastating impacts on the communities and environment down-stream. In these cases, full localised *citizen control* is not appropriate.

There are, however, many instances where degrees of *delegation* or *citizen control* are entirely appropriate, and in these cases, there to be ongoing resourcing and iterative support mechanisms. The 'Closing the Gap' strategy is a government commitment to health equity and reducing disadvantage among Aboriginal and Torres Strait Islander people with respect to life expectancy, child mortality, access to early childhood education, educational achievement, and employment outcomes. The Aboriginal community-controlled health service (ACCHS) sector, works within this framework toward these goals, achieving better than general practice outcomes for the complex health problems faced by Indigenous people (Panaretto et al., 2014). They face constant threat of budget cuts and rationalisation of programs that they administer, that are

desperately needed to meet the desired health and equity targets set within the Closing the Gap strategy. These decisions made by the ACCHS have significant positive impact for the Aboriginal citizens with little to no implications beyond these communities, and therefore there is absolutely no question if the full *citizen control* ladder rung is warranted. This return of control to these citizens is a small, but critical step towards delivering on the social equity aspect of sustainability.

7 Discussion

This paper proposes potential improvements through a 90-degree rotation of the ladder diagram to form a "Ladder-truss of citizen participation". This ladder-truss includes aspects of each rung as a structurally necessary and interwoven component of inclusive participation aimed at bridging between the community and sustainable urban design outcomes. We suggest that the ladder-truss of participation, like structural trusses, require load to be distributed across each truss-web (vertical rung), and that if elements are missing, it fails. In Australia, the definition of public participation as "*the involvement of those affected by a decision in the decision-making process*", is sometimes misconstrued as only those in the immediate proximity to a proposal, sometimes a small group of people impacted in a highly specific way. By ignoring the formidable problems and less palatable rungs of participation we are not forging a bridge to more sustainable urban development.

Arnstein's critique of the *manipulation* rung was that *manipulation* enabled the engineering of support for inequitable outcomes, but in the sustainable urbanism participation ladder-truss, there is a serious need for the engineering of citizen support. While *positive manipulation* is still complex and needs to be done carefully and transparently or risk alienation, we feel it can be implemented without provoking sensations of being manipulated. For example, placing participants into another person's point of view can be done honestly, openly and with accuracy. Questions too, can be manipulated to expose further questions rather than simply focusing on existing norms, personal preferences, and prejudices, that current lines of questioning in these forums are rife for weaponisation and the 'Mickey Mouse game'. Good questions can shed light on issues, open never before considered perspectives and help people relate to the issues and problems of others.

Therapy was another negatively connotated rung of Arnstein's ladder, culled in the IAP2 Participation Spectrum. But as we note, this is an important part of inclusivity and bridging. Cities are places of great diversity, particularly in Australian cities, and can contain people with immense societal differences. While not all complaints or grievances can be acted upon, people can be listened to and have their opinions registered. There needs to be a place to express and record anger, fears and frustrations, and urban designers and policy makers must use it to develop better understanding of communication gaps, as well as help develop better strategies to target or 'pitch' information appropriately, to speak to, not speak down-to these citizens. The process of filtering, discussed earlier, is very important. Filtering should be done by carefully drawing from expert urban professionals and scientific evidence. Again, transparency is critical, any filtering of input must be contextualised and justified though open and honest discussion to not appear as elitists deciding on whose opinion is included or excluded.

Perhaps a major issue with this part of the ladder-truss is the term, *therapy*. It may be better as the *enunciation* rung?

Consequences for 'unknow others' (future generations, future residents, people struggling with housing affordability) of localised unsustainable choices are not necessarily immediately apparent to those making those choices. Like waterways, changes in one location within one city system can have devastating consequences for places at great distances or systems which must adapt to respond. Cities are, after all, a series of complex interconnected and interacting systems. And while there is a no scarcity of academic literature exploring the complexity of cities and various kinds of self-organisation through concepts such as *complex adaptive systems* (Karakiewicz, 2020; Karakiewicz et al., 2015; Kvan and Karakiewicz, 2018), and *assemblage theory* (Woodcock, 2016), urban waves of 'potentiality' in the *quantum city* (Arida, 2012), *informing* layperson communities who are contributing to decision making with such theories, if not done very well, is likely to be alienating and counter-productive. Here multiple benefits of gamifying the process of citizen participation, which reinforce ongoing citizen education about the complexities of the interlinked issues to garner more *informed* input and *informed* participation as opposed to the ill-informed participation that can occur today. While sustainable urban design gamification is currently primitive with somewhat dull gameplay with graphics that look like a *Minecraft*[1] than *Red Dead Redemption 2*[2]*,* as this approach develops, we may see much higher levels of sophistication in the quality of not just the gameplay and graphics, but in the questions the games may be able to answer.

Consultation, a process often undertaken at local government level with hyper localised groups of 'people affected by a decision' is the level where nuanced information is co-generated with communities. By broadening the consultation though the use of various e-participation and gamification approaches, (big) data can be gathered that can be queried for a multitude of inclusive perspectives but also filtered were appropriate. Those with truly toxic motivations are able to vent which may be cathartically *therapeutic* but not necessarily influence outcomes, whereas others may be elevated to positions of *partnership***,** *delegated power, or citizen control*.

To move past 'Post-it note *placation*', it is important to consult with the community moving beyond overly broad principles and engage with detailed propositions with specific implementation strategies that can be tested, questioned and debated. *Consulting* with communities for consensus that a city should be a 'greener city' is no more helpful than consulting for agreement that 'puppies are nice' – both do not deliver a strategy for implementable change. As impacts of climate change are beginning to play out across the world with intense bush fires, deadly heat waves, and flooding occurring more frequently and with more intensity, particularly in Australia (Colvin et al., 2020; Hall and Crosby, 2020), there is a need for rapid and radical urban transformation. Community agreement on non-committal statements of intended urban niceties are no longer enough. Clearly defined sustainable urban design propositions for the future that are testable thought modelling are needed, and they should range from the conservative 'baby steps' speculations through to radical and optimistic speculations as suggested by Dunne and Raby (2013).

8 Conclusion

This paper is an early exploration of the ladder-truss of participation concept and explores the global issue of sustainable urban design and citizen participation through an Australian context with particular urban morphological and cultural challenges that may be vastly different in other countries, and does not delve into theoretical concepts deeply, instead using practical local examples. The concept does, however, have potential to be expatiated and developed to a full conceptual framework that could be applied in any context.

The Victorian Auditor General's definition of public participation as "*the involvement of those affected by a decision in the decision-making process*" does not serve the purposes of sustainable urban design decision-making where the outcomes of decisions have substantial implications for others, not necessarily in the room at the time. Citizen participation in urban design decision-making is shaping how sustainable and how environmentally resilient cities can be, but without proper support and without informed participation the necessary sacrifices and benefits of making these difficult decisions will not be taken.

To implement sustainable cities, we need to move beyond the implied democratic-ness and expectation that, in its current form, citizen participation will deliver sustainable urban design outcomes. While Arnstein's ladder is now over 50 years old, the wave of exciting new engagement approaches, emerging technology and data analytics tools suggest that now is the perfect time to reinterrogate and re-invigorate the concept as a Ladder-truss of Citizen Participation: to re-imagine Arnstein's ladder as an efficient, non-hierarchical, load-distributing structure to bridge between the community and sustainable urban design outcomes.

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Notes

[1]Minecraft is a sandbox video game developed by Mojang that uses deliberately low-resolution blocky representation of space using voxels (video-pixels).

[2]In contrast to Minecraft, Red Dead Redemption 2 very high-quality, almost photo-realistic computer graphics action-adventure game developed and published by Rockstar Games.