

CASE STUDY

# Future Cities: New Generation's Visions of Sustainability Concepts and Models

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The creation of sustainable cities for unpredicted and uncertain futures requires and involves a broad range of disciplines. Our living conditions within the cityscape are a consequence of the actions of the past generation, while cities shape the next generation's way of life. Some of the key challenges in shaping our future cities are not only our behavioural changes but also the redesign and restructuring of the built environment to make it more liveable and give it a sustainable urban form. On the basis of the empirical evidences obtained from the Life and Sustainability classes at Thammasat University, in this study, I critically evaluated the sustainability concepts and models of sustainable future cities from the young generation's perspective. Zero energy, quality of life, green infrastructure, city resilience, and combined approach were the five main concepts explored. The analysis shows the students' perceptions and learning outcomes of sustainable concepts and models. By using the built environment module as an example, I collected data 1,735 undergraduate students enrolled in the fall semester of 2016 and closely re-examined 35 group projects. The results revealed that most of the students were familiar with the two concepts of quality of life and green infrastructure. However, there found it difficult to develop their vision of future cities on the basis of the concept of quality of life. The relationship between the new generation's perceptions of sustainability concepts and the conceptualised prototypes or models of future cities from their understanding was analysed from a socio-economic perspective. Finally, in this paper, I suggest that these two concepts, namely green infrastructure and quality of life, be used as the core concepts along with the other sub-concepts to develop the discussion towards the design and development of future cities.

**Keywords:** Future cities; Landscape visions; Sustainability; New generation; Quality of life; Green infrastructure

## Introduction

Sustainable cities for the future must be designed on the basis of a broad range of disciplines. Sustainability solutions must be focussed on consumption habits, lifestyle goals, and value systems; thus, these solutions must strongly involve the ecological paradigm shifts in political thinking, economic activities, and educational systems (Savage, 2006). Most of the metropolitan areas around the world are situated in a low-lying landscape, which might lead to the risk of and vulnerability to unforeseen climate-related factors. Furthermore, some metropolitan areas are engaged in multiple levels of initiatives for promoting and upgrading urban infrastructures and services. Owing to the vision of creating better environmental, social and economic conditions and enhancing cities' attractiveness and competitiveness, sustainable cities have become the new norm of the urban planning and environmental design challenge. Future cities are also required to have the ability to adapt to uncertain future risks and events.

Currently, from the perspective of educational practices, the methods used to teach the next generation to be fully responsive, politically, socially, ecologically, and historically, towards a sustainable way of living have become critical. This requires a major shift in attitude. We need to create more open-minded generalists who can see the complex connections to realise such a way of life instead of narrowed-minded specialists. The Life and Sustainability course at Thammasat University offers opportunities to multi-disciplinary students to shape and share their ideas on sustainability issues and long-term goals. This course emphasises the dynamic inter-connectedness of nature, consumerism and lifestyle, built environment, and energy consumption as well as the trends of global and Thailand environmental conditions. It also reviews the related environmental conflicts and the transformation toward sustainable lifestyles. The Life and Sustainability course is divided into three modules: 1) Environmental Science, 2) Built Environment, and 3) Related Economic Issues. In this research, I used the content from the second module, Built Environment, as the case study.

To create new frameworks for life and sustainability, specifically for the Built Environment module, some critical questions and issues were frequently raised and

discussed. These were aimed to provoke student interaction during the learning process. Some of these questions were as follows: How can we demonstrate and interpret the complexity of the sustainability reality and address its critical issues? How can we shape the students to have critical minds and become strong decision makers with a visionary perspective? Finally, how can we stimulate and elevate sustainability design concepts among the students in this chaotic physical world? These questions were discussed and further developed into the course framework. The course objectives of a sustainable built environment module are as follows: 1) to understand natural dynamics and how it affects the built environment, 2) to identify challenge issues and evaluate their impact on human lives, and 3) to raise questions and discuss on our way of lives and the creation of a sustainable future in the built environment. To envision a future city, the future generation needs to sharpen its visions, ideas, and values on how the future should be. In order to redesign and restructure the physical environment, new opportunities related to the concepts and models of sustainable cities should be explored.

### Literature review

Education for Sustainability fosters alternative futures by using positive methods such as future-focused thinking to create alternatives to the current situation. It also emphasises creativity, critical thinking, and innovative approaches (The Australian Research Institute in Education for Sustainability (ARIES), 2009). The community needs and values of stakeholders could be portrayed by the student group dynamics. The course emphasises and constructs future desirable vision models based on the young generation's sustainability visions which defined 'real-world' constraints. For example, the course Sustainable Ecosystems taught at the School of Sustainability, Arizona State University, develops a vision model as a team based on three subsystems of the urban ecosystem, namely 1) water, 2) green infrastructure, and 3) transportation (Iwaniec *et al.*, 2014). From the real-world perspective based on an analysis model of eco-cities, there are three ways to classify the models: 1) type of development, 2) development phrases, and 3) implementation focus (Joss, 2011). Planning for sustainability also requires not only technological innovation but also civic empowerment and engagement (Ackerman *et al.*, 2014; Joss, 2011). The present paper supports the idea that education for sustainability should emphasise on future thinking, envisioning the future creatively, and building on the conversation of public engagement and empowerment. In doing this, the paper fills a gap by analysing and discussing the young generation's perceptions and learning outcomes on the basis of their sustainable concepts and models.

### Concept and model of sustainable cities

Cities are islands of the built environment within a global ecosystem of natural landscape (Savage, 2006), secondarily organised and composed buildings, vegetation, road, infrastructure, and agricultural land. How can we create a sustainable city in the future? Can the new city portray

or mimic the ecosystem services and functions? These questions still remain for discussion on developing the innovation to create a better built environment, a better second nature.

The nature of each city is dynamic, with a different scale, size, population density, and age history. The challenges that each city faces depends on its size and level of development. Small, rich nations are facing the problems of population decline, global competition, and economic restructuring, while the small developing nations are facing the problems of weak economies, lack of basic public services, and weak urban governance. In the case of large cities, the rich nations are facing the issues of an aging infrastructure and population, inequality and social cohesion, and increasing competition for global leadership. In contrast, the large low-income nations are dealing with the issues of inadequate infrastructure for transportation, traffic congestion, population housing and urban slums, demographic challenging, socioeconomic inequality, and environmental problems. Therefore, the design of a future city requires not only a multi-disciplinary approach addressing the urban challenges faced by the emerging cities but also the use of integrated environment technologies, comprehensive urban development, fiscal sustainability, and good governance to ensure a certain level of quality of life to global citizens. The five dimensions which should be further explored are as follows: promotion of economic growth, use of infrastructure, provision of social services, minimisation of poverty, and protection of the environment (Riffat, Powell, & Aydin, 2016).

With the principles of sustainable and ecological design, Jabareen defined four distinctive urban forms: 1) compact cities, 2) the eco-city, 3) neotraditional development, and 4) urban containment. Each scheme and form of sustainable cities is quite unique in terms of density, diversity, mixed land use, compactness, sustainable transportation, passive solar design, and greening or ecological design. Moreover, the core concept of the sustainable urban form should emphasise energy conservation, controlled and reduced waste and pollution, reduced automobile use, and preservation of open spaces and sensitive ecosystems as well as a liveable community and cultural environment (Jabareen, 2006).

The future landscape designs and developments must be planned and constructed with the full recognition of local ecosystems. Hence, a new framework of ecological planning must be prepared and translated to shape and educate new generations (Suwanarit, 2018). The vision of a future landscape should address the following issues: human well-being, adaptive capacity, connectivity, equitable access, walkability, multi-functionality, conservation, and restoration. Urban landscapes should be integrative with ecological and socio-economic activities rather than being homogeneous (Salem, 2016). With respect to new sustainable urbanism and emerging cities, particularly in the urban sprawling areas, the activities and planning should be reprogrammed and redesigned with the new perspectives. The new development trends should involve both socio-economic and ecological concerns connecting the new development form with multi-function

landscapes toward sustainable urbanism. Future development should be based on landscape design guidelines emphasising the private sector's plans and initiatives with respect to these four characteristics: 1) new urban development form, 2) storm water management and open space design, 3) urban and peri-urban agriculture, and 4) flexible mobility and route options (Likitswat, 2018).

Even though different cities face different issues and scales of challenges, the concepts to tackle the sustainability challenges have already been explored. 'Sustainable city' is a considerably broad concept; it has attracted the most academic attention in this field. Other city and model concepts related to sustainability, such as 'Smart city', 'Digital city', 'Eco city', 'Green city', 'Low carbon city', 'Knowledge city', and 'Resilient city' have also been in the spotlight, while the concepts of 'Intelligent city', 'Ubiquitous city', 'Liveable city', and 'Information city' are relatively new (Jong *et al.*, 2015).

#### **Scale-related sustainable built environment lessons**

The course content is divided into four topics and lessons related to the scale of the built environment: human scale, neighbourhood and community scale, city scale, and landscape scale. The first lesson is on the human scale; it includes sustainable and unsustainable architectures, most of the time questioning the appropriateness and compatibility of vernacular or international design of architectures locally and globally. Furthermore, it provides the principle knowledge of active versus passive design for the building energy consumption approach, which is quite important for addressing real-world challenges. Secondly, in the lesson on the neighbourhood and community scale, the question on the identity of the community as well as the quality of life is raised. The sense of community, safety and security issues, and cultural landscape with a socio-cultural and heritage perspective locally were also the key challenges. Thirdly, in the lesson on the city scale, the talk illustrates the ability to cope with the other risks and natural disasters, earthquakes for instance. This lesson reviews the conflicts of our unsustainable lifestyles and the choices we have made to expand the built environment, as well as the possibility to make the cities

more friendly, supporting the equality of humans and the other living organisms and having the ability to cope with uncertain crises or disasters. Lastly, in the lesson on the landscape scale, the concept of landscape as green infrastructure is adopted and explored. As most of the cities are built on flood plains, most cities are vulnerable to flooding conditions without realising that the wet conditions are quite normal and natural. Landscapes as green infrastructures increase the adaptability of the cities to these risks and play a crucial role in making the cities more resilient. Landscape ecology plays a hidden role for these contents; it maintains the co-existence of the natural factors in patches of the built environment. The paradigms of anthropocentrism versus ecocentrism are the main concepts to be challenged, showing a different way of thinking and living sustainably.

#### **Key concepts of sustainable cities**

By categorising the sustainability concept and model literacies and matching them with the class dynamic and lessons, I concluded that the four key concepts of sustainable cities are as follows: zero energy, quality of life, city resilience, and green infrastructure. The four key concepts of sustainability were synthesised and identified as follows on the basis of the class dynamics related to the scale of a physical human-engineered environmental difference: 1) Zero energy related to the personal or building scale is the main concept for a sustainable architecture class. 2) Quality of life related to the neighbourhood and community scale is the main concept for the sustainable neighbourhood and community class. 3) City resilience related to the city scale ranging from small, medium, large, to mega city is the main concept for the city and climate adaptation class. 4) Green infrastructure related to the landscape scale ranging from rural to urban landscape is the main concept for the sustainable landscape class.

**Table 1** provides a summary of the four key concepts of sustainable cities related to scale, from the Life and Sustainability course, as well as the model of a sustainable city in general terms. These four key concepts were further used as a guideline for pretesting questionnaires and developing future city visions and projects.

**Table 1:** Concept and model of sustainable cities.

<b>Scale</b>	<b>Life and sustainability built environment lessons</b>	<b>Model of sustainable cities</b>	<b>Key concepts of sustainable cities</b>
<b>Personal building</b>	Sustainable architecture	Smart city Digital city	Zero energy
<b>Neighbourhood community</b>	Sustainable neighbourhood and community	Low carbon city Intelligent city Liveable city	Quality of life
<b>Small city Large city Mega city</b>	Cities and climate adaptation	Resilient city Disaster resilient cities Climate adaptation city	City resilience
<b>Landscape</b>	Sustainable landscape	Eco city Green city Blue green city	Green infrastructure

### Methodology

In this study, I analysed and discussed the student's perceptions and learning outcomes on sustainable concepts and models. On the basis of empirical evidences from the Life and Sustainability classes at Thammasat University, in this research, I critically evaluated the sustainability concepts and models of sustainable future cities from the young generations' perspectives. The survey aims to pretest the personal understanding of sustainability concepts in the Built Environment module. The teaching team designed a series of questionnaires to test the basic understanding of sustainability issues and aspects. This process allowed the instructors to understand the basic knowledge of a particular group of students and set ways to guide and develop further discussions and findings.

### Method

The main steps of this study were as follows: 1) Identifying the four concepts of sustainability to match with the course outline on a sustainable built environment. 2) Collecting data from surveys and team projects to understand both personal perceptions and team decisions on sustainability concepts and models, as well as the visions of future cities. 3) Analysing the result to re-examine and redefine the visions of future cities from the new generation's perspective and collaboration.

Figure 1 outlines the survey design and methodology underpinning this study. First of all, four key concepts were identified by adjusting to the course outline and using various models on sustainable developments. As it was not simple to define the concepts and models of sustainable future cities, the process of reviewing the literature on sustainable development and environmental planning from international scholars and experts was very crucial. Secondly, the survey and the project assignment on creating a future city were launched before the lesson began. Lastly, in this paper, I discussed the vision of the future generation of sustainable future cities on the basis of the results obtained from the survey and the sample projects.

### Data collection

By using the built environment module as an example, I collected data from 1,735 undergraduate students enrolled in the fall semester of 2016 from 10 different faculties. According to their diverse backgrounds and multi-disciplinary nature, including Faculty of Law, Business School, Faculty of Political Science, Faculty of Social Administration, Faculty of Liberal Arts, Faculty of Journalism and Mass Communication, Faculty of Science and Technology, Faculty of Dentistry, Faculty of Fine and Applied Arts, and Faculty of Learning Science and Education, the classes were separated into three sections. The data were collected from the first section of 455 surveys, the second section of 482 surveys, and the third section of 789 surveys.

Figures 2 and 3 represent the future city design exhibition and the selected project samples. The design schemes show the concept and model of sustainable cities as a main umbrella including green infrastructure, combined approach, quality of life, zero energy, and city resilience.

Right after the survey was launched, a group of eight to ten students was challenged to design a future city on the basis of their group discussion and collaborative processes. The assignment guided and encouraged students to carefully develop their ideas and reframe shared visions within the team-work processes. Within five to six weeks, each team came up with the visions and designs of future cities. From the 175 team projects on the vision and design of future cities, only 20% were selected. By selecting qualitative samples focussing on strong vision as well as clear graphic representation of the future city designs, I closely re-examined the 35 selected group projects and exhibited them to the public.

### Results

To understand the personal perceptions of and the background knowledge on the concepts and models of sustainable future cities, the abovementioned four key concepts were literally selected from the survey before an actual class began to test the fresh ideas from the

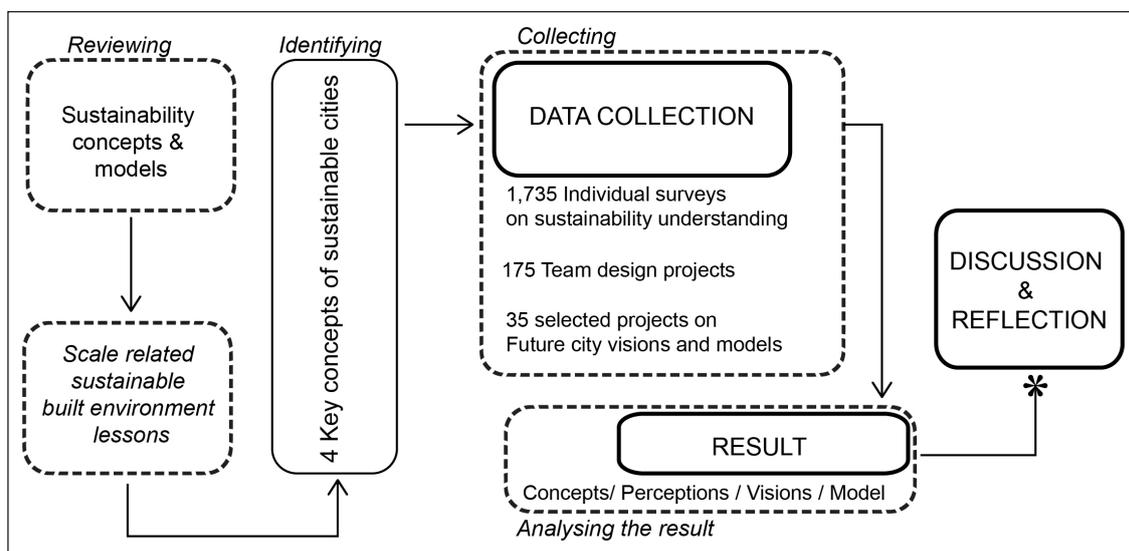
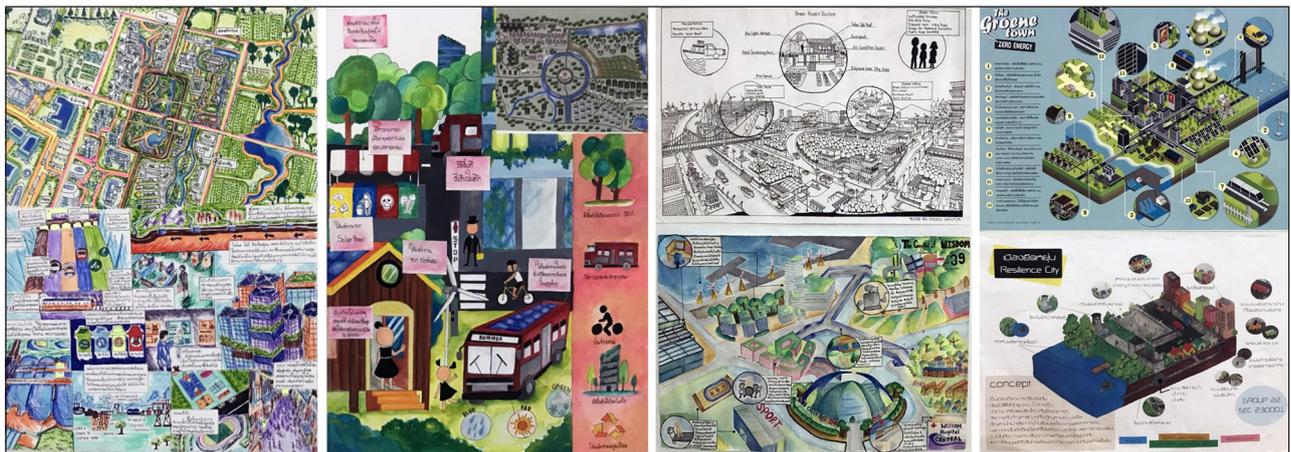


Figure 1: Methodology mapping. Source: Fa Likitswat.



**Figure 2:** Future city design exhibition. Photo: Fa Likitswat.



**Figure 3:** Future city design—project samples. Photo: Thammasat University.

learners' perspectives. The questions on the survey were asking the students which of the concepts and models of sustainable future cities they are familiar with. They could select either one or more than one term which could lead to a sustainable concept in a future urban and built environment design. This process aimed to obtain the fresh ideas of the new generation, avoiding dominating their perspectives and absorbing the lesson learnt in the class. The first survey showed that close to 50% of the students confirmed that the concepts of quality of life and 'green infrastructure' were common as per their understanding. Approximately 20% of the students said that the zero energy concept was quite well-known. Further, only 10% of them could grasp the concept of city resilience. The results illustrated that most of the students were familiar with the two concepts of 'green infrastructure' and 'quality of life', while the concepts of 'zero energy' and 'city resilience' were quite far away from the majority perception of the sustainability concepts and models. The level of understanding of the terms related

to the sustainability concepts from all three sections also showed a similar trend.

**Table 2** illustrates the new generation's perceptions of sustainability concepts from a survey of a group of students from Thammasat University.

Next, group projects on designing a future city were assigned. The abovementioned four concepts of sustainable cities were used as the example of sustainability concepts. The students were challenged to hold group discussions, work across their disciplines, and design a future city. The design had to be a result of team decisions on sustainability visions as well as of development of the models of future cities.

The findings from the 35 selected samples of sustainable future city design projects were related to the students' perceptions obtained from the first survey. Most of the teams used and amplified the concepts of green infrastructure and further developed them as their visions for the future city design schemes. However, they found it difficult to develop the city visions on the basis of the

concept of quality of life. The concept of quality of life was embedded and used as a sub-concept for their city design models irrespective of whether their main idea was green infrastructure, combined approach, zero energy, or city resilience.

**Table 3** presents the relationship between five concepts and approaches behind the visions and the developed models. These five concepts of sustainable cities were zero energy, quality of life, green infrastructure, city resilience, and a combined approach. The visions based on the new generation's future city designs show quite complex proposals beyond the idea of physical designs. Some of the schemes were highlighted on social interactions and new

stand on quality of life. The following are some examples of the visions and new city models: Forest city, Green city, Happiness city, Creative city, and Liveable city. The shared visions could shape and generate a discussion among the students to collaborate on future cities and scenario designs.

**Discussion and reflection**

There should be several ways to design sustainable future cities even though the term sustainability is itself very broad and generic. In this study, I attempted to redefine the concept of sustainability with respect to the sense of scale in the built environment, ranging from human

**Table 2:** Perception of sustainability concepts.

Classes and surveys/Concepts	First section	Second section	Third section	Total	Total percentage
	455 surveys	482 surveys	789 surveys	1,735 surveys	
<b>Zero energy</b>	144	117	145	376	21.70%
<b>Quality of life</b>	210	200	359	769	44.30%
<b>City resilience</b>	58	51	87	187	10.80%
<b>Green infrastructure</b>	186	227	375	788	45.40%

**Table 3:** Visions of future cities from 35 selected projects.

Concept of future city	Number of projects (percentage)	Visions/models (samples)	Keywords/explanations
<b>Green infrastructure</b>	12 (34%)	Forest city Green city	Green economy, Quality of life, Ecosystem services, Blue green network, Green building, Green design, Ecological planning <ul style="list-style-type: none"> <li>• A strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services.</li> <li>• This blue and green network can improve environmental conditions and quality of life.</li> <li>• It also supports a green economy and creates job opportunities.</li> </ul>
<b>Combined approach</b>	10 (28%)	Green + energy city Zero Energy + Transportation	Has alternative energy resources, is environment friendly, and incorporates natural systems. <ul style="list-style-type: none"> <li>• The city design is based on combined concepts of sustainability.</li> <li>• The design focuses on technological innovations and infrastructures.</li> </ul>
<b>Zero energy</b>	8 (23%)	Zero energy city Electric city	Net zero building, Zero automobile, Clean energy, Alternative public transformation <ul style="list-style-type: none"> <li>• This scheme promotes net zero building and passive energy conservation design.</li> <li>• It also highlights clean energy resources and public transportation services.</li> </ul>
<b>Quality of life</b>	3 (8%)	Happiness city Creative city Liveable city	Creativity, Public services, Lifelong learning, Alternative transportation systems, Pedestrian friendly, Social welfare <ul style="list-style-type: none"> <li>• Built environment which can promote work life balance, happiness, and better lifestyle.</li> <li>• The design focuses on creativity, connectivity, and social interactions and engagements.</li> </ul>
<b>City resilience</b>	2 (5%)	Resilient city	Adaptation, resilient citizens, adaptive infrastructure <ul style="list-style-type: none"> <li>• The city has the ability to adapt and cope with several natural disasters such as floods and earthquakes.</li> <li>• Smart and adaptive infrastructure which can recover after shocks or stresses.</li> </ul>

to landscape scales. Four concepts, namely zero energy, quality of life, city resilience, and green infrastructure, were used as the key concepts to challenge the students working in teams, discussing and developing their shared visions. The term 'green infrastructure' was the top ranking perception of the concept of sustainability and was used to develop the future city designs. The term 'quality of life' was also highly popular at the beginning; however, only a few groups used this concept to create the main vision of their city design schemes. This concept was used as a sub-concept instead of the main idea. A combined approach was also proposed to reach a compromise between at least two main concepts, mostly binding 'green infrastructure' and 'zero energy', before stating the visions for the city designs. However, the concept of 'city resilience' was not often recognised and selected as a sustainability concept by the considered group of students.

The terms 'green infrastructure' and 'quality of life' are widely understood; thus, these can be used as the common language to build on the discussions on sustainable future city development. As these two concepts are debatable and open up some avenues for further discussion, in this paper, I suggest that they be used as the main focus and the core principles in future built environment design. The questions on the living standard of the future generation still remain debatable from generation to generation. The other key concepts missing in this study include cultural heritage, local context, sense of place, and fair governance, which should also be explored in a future study. The relationship between the new generation's perceptions of sustainability concepts and the conceptualised prototypes or models of the future based on their understanding should also be debated from a socio-economic perspective. It requires creativity, imagination, and discussion on the basis of scientific literacies to promote resilient learners within the uncertain environment (Sterling, 2010). Shaping critical minds and strong decision makers of young generations to envision future cities and learn to adapt to future scenarios is crucial for promoting the next generation of sustainability drivers.

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### Competing Interests

I declare that I have no significant competing financial, professional, or personal interests that might have influenced the performance or presentation of the work described in this manuscript.

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