Non-Standard Material Art as an Alternative Development of Recycled Architecture

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Abstract

The architectural world's reliance on off-the-shelf building materials has led to the issue of standardised replication in building design. On the one hand, modularity helps the scientific logic of construction, but it often causes constraints on creativity. The research aims to build another perspective in developing recycled architecture through counter-perspectives. The research method uses a literature study to build a concept using the case of the other, a different perspective and a critique of modern planning, by comparing a) Phenomenon vs Noumena; b) Natural vs Artificial; c) Standard vs Non-Standard; d) Composition and Non-Composition; e) City and Village; f) Science vs Art; g) Architecture vs Other Architecture; h) Product vs Process; i) Permanent vs Non-Permanent; j) Vertical vs Horizontal. The findings are art as an alternative field of recycled material development in the case of natural-growth architecture. The research output is the perspective and direction of non-standard material development to construct recycled architecture. The novelty of the research is the concept of alternative development as another polar of modern architectural trends so that architects can more freely develop creativity and aesthetic aspects, resulting in a variety of uniqueness.

Keywords: architecture; concept; material; non-standard; recycling.

Introduction

The environmental crisis, natural resources, climate change, global warming, and weather anomalies have prompted all parties to streamline the use of resources. The used goods, waste, and garbage are now being looked at again for utilisation. Waste, especially 'solid waste', is a stable and palpable physical form that has the potential to change its spatial form and function from a micro-sized unit to a broader scale. Solid waste, especially in the circular economy, is widely discussed and is a priority for pollution control (Yang, 2022). One of the green movements builds active participation in recycling solid waste, starting from households and extending to communities and societies. Some activists implement it in landscapes for productivity, others in spatialisation, not least in architecture.

Although the trend shows potential, it does not mean that the green movement does not face challenges. Architecture does not entirely favour waste being utilised as a truly architectural

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material. The field of architecture, for example, is already controlled by standardisation, both in terms of material shape, size, and durability, which affects the strictness of material quality and production. For example, a quality material must fulfil the following criteria: fire resistance for a certain number of hours, maintenance methods, materials used for maintenance, and installation techniques. This may be good because it proves that recognition has gone through a series of assessments and filtering, but it is not always positive if it results in rigidity; for example, internationalisation and globalisation encourage generalisation and universalisation, which results in uniformity and monotony in building elements and components. Criticism of architectural styles, for example, has questioned the uniformity in many places on earth, regardless of the uniqueness of local environmental, cultural, and climatic conditions, such as the case of international style and modern planning, which highlight generic conditions from the arrangement to the use of certain materials only (Sudaryono, 2012).

Without ignoring the above phenomenon, the movement to recycle used materials has been heavily influenced by the dominance of architectural standardisation. Plastic waste is still placed as a filler or decorative art rather than gaining an essential position in building construction. Waste materials are generally crushed, processed into a base material (plastic flakes), and then remanufactured into standardised building materials or architectural elements (Fig. 1) to mask their actual condition or remove traces of the original. However, reprocessing waste in the recycling process is not perfect. It is costly, and other complex procedures are factored into the finished price. It often happens that the total cost of a green-labelled material produced using processed materials is more expensive and is not an attractive option because it is not economical or profitable. This research questions the common conditions prevalent in industrial practice as phenomena and then reflects them as counter-perspectives to elevate the noumena.

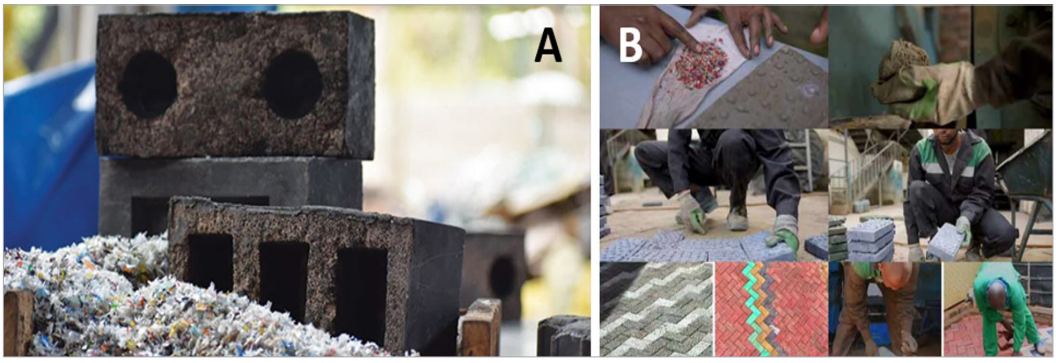

Fig. 1

(A) Bricks made from dust and recycled plastic from an Indian company (Patel, 2021); (B) Plastic Recycling makes Bricks Stronger, Harder, and Shatterproof (obengplus.com, 2021)

Methods

The research method used is the literature study method, which juxtaposes two polar theories to present a mirror of heterotopia as a theoretical comparison. The extraction of the other pole of thought is used as an architectural critique to bring out the concept of constructionism towards recycled architecture, applied in both analysis and synthesis and reflected as a review and result. Comparisons are limited to modern and post-modern thought to question global trends to parallel local conditions in Indonesia by comparing a) Phenomena vs Noumena; b) Natural vs Artificial; c) Standard vs Non-Standard; d) Composition and Non-Composition; e) City and Village; f) Science vs Art; g) Architecture vs Other Architecture; h) Product vs Process; i) Permanent vs Non-Permanent; j) Vertical vs Horizontal.

Result and Discussions

a Phenomena vs Noumena

By displaying the noumena through the mirror of reversibility, the phenomenon of generalisation in the building industry is questioned through objective specialisation because scientific truth does not reside in deductive logic but in the real world (Sudaryono, 2012). In this context, each type of waste is positioned to have a unique character. Whether in the form of materials or mass clusters,

a spatial object has the potential to be preserved and adapted to the needs and conditions of the building in a local situation or real context rather than being destroyed to produce a different totality (Aureli, 2011). For example, used bottles, both glass and plastic, have a natural character that can channel light and are cylindrical, making them suitable as a substitute for glass windows (Fig. 2). Diverse colours and shapes do not require a spatial form to use precisely the same materials. The challenge here is to find a way to connect the various waste objects into architectural elements. It is not about turning waste into standardised and uniform architectural elements. However, positioning reality in favour of phenomena would undoubtedly cause many consequences, such as strength, durability, efficiency, visual appearance, aesthetic value, and comfort. However, if siding with the noumena, promoting the authenticity of the waste character is likely to bring about new ways of thinking in reusing waste and give rise to unique recycled architecture. By positioning waste as the true potential of an architectural material, architectural uniformity can be avoided, and the localisation of a material that is abundant and redundant in a context can be re-established.

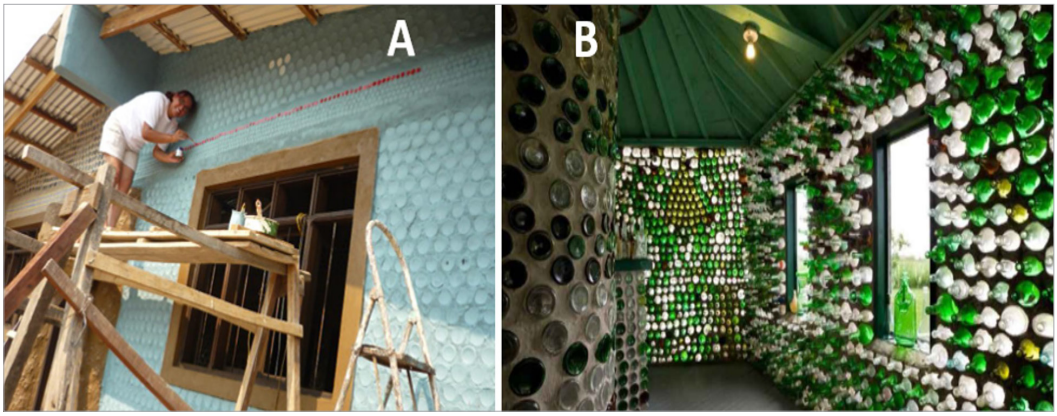

Fig. 2

(A) House made from used plastic bottles (Diez, 2015); (B) Recycled materials in construction by abrazohouse (abrazohouse, 2023)

b Natural vs Artificial

By Reflecting on primordial architecture, architectural materials were not produced initially based on generic standardisation and filtering. Primordial spatiality was constructed from natural materials found in the surroundings, especially those that could be reached on foot and processed by hand. Architectural prototypes show roofs, walls, floors, and structures using natural materials such as wood, stone, thatch, palm fibre, and others, depending on the context. Due to the resulting competition, industrial development and metropolitan expectations have led to stringent demands for efficiency, durability, and comfort (Aureli, 2011). The desire to escape from nature produces a variety of natural resilience, ease, and generosity of materials, framing the artificial as an achievement, changing the valuation of the beautiful through the curatorial role of the industrial world and positioning the natural as backward. Segmentation and class segregation also occur with material labels. For example, categorisation often results in the formation of classes; for example, recycling has been divided into upcycle and downcycle. In upcycle, waste is processed into a more useful form (Fig. 3A), while in downcycle, reuse has a lower value than the function of

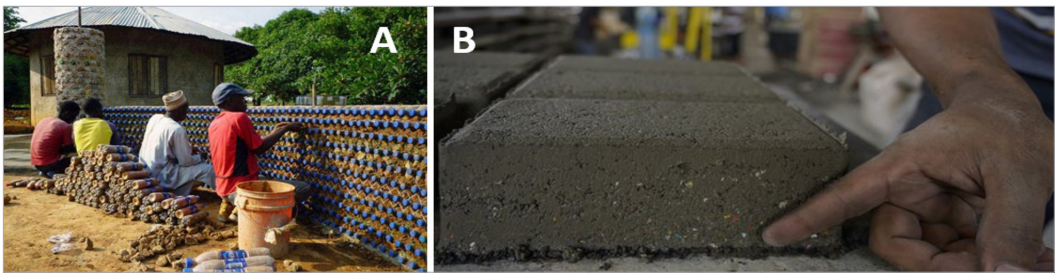

Fig. 3

(A) Upcycling: used bottle house, eco-friendly (Unej, 2016); (B) Downcycle: recycling plastic waste into bricks (Sabrina & Tan, 2021)

the original object (Fig. 3B) (Miller & Spoolman, 2019). Unsurprisingly, development encourages judgement based on progress in the eyes of the industrialised world, while environmental quality deteriorates: the artificial is often glorified over the natural.

c Standard vs Non-Standard

Conditions of judgment also affect the observation of architecture. For example, traditional, vernacular, or primordial architecture is generally lower than modern architecture (Sudaryono, 2012). The dependence of valuation on the use of building materials, methods, and market construction has compartmentalised the standardised as having size, quality, and specifications in a class of architecture. As actors and observers, architects are also heavily influenced by this standardisation. Cutting building materials is considered wasteful, polluting the environment and wasteful behaviour. Standardised building modules based on fabricated materials are said to be produced based on the logic of user ergonomics, efficiency, productivity, and other reasons. Repetition is inevitable in shape, size, and even colour due to standardisation. Visual monotony, uniform patterns, and arbitrary replication become commonplace without being tied to a producing environment (Sudaryono, 2012). The same is also encouraged in utilising waste and organic materials to achieve standardisation of preparations. Residual waste tends to be bound to conventional standards to become the equivalent of new industrial materials. Wood is compartmentalised to the size of other materials on the market; waste materials tend to be categorised under different labels and claim for a specific value only. This often happens in the case of green buildings for the sake of claiming a rating on certification rather than as a totality (Liu, et al., 2022). It takes much courage to break out of the entrenched standardisation in architecture, but it is not impossible to be another way if we want to promote reused materials as future building materials (Fig. 4A) (Verma, Khan, Mili, Hashmi, & Srivastava, 2022). All waste, not being rubbish if perceived as equal in its material properties, even if non-standard, can still be fully utilised as building materials (Figs. 4B, 4C).

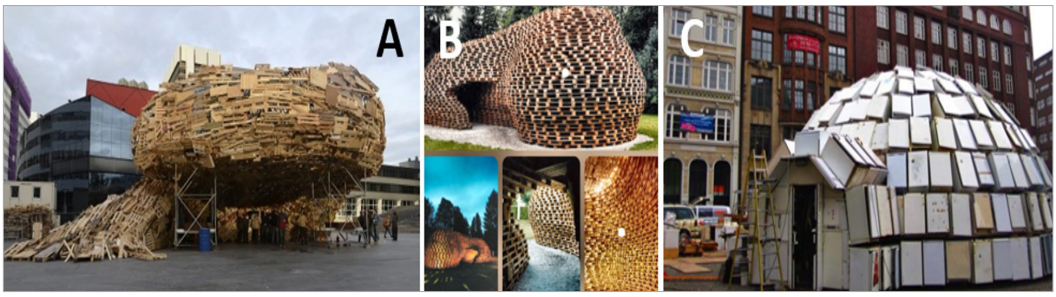

Fig. 4

(A) Vortex pavilion, located at Spuiplein, in the heart of the Hague (Bader, 2017); (B) Temporary meeting place made from wood pallets (mobli.com, n.d.); (C) Fridge igloo at the Gänsemarkt in Hamburg, Germany (Bosma, n.d.).

d Composition and Non-Composition

Architecture is a form of materiality. To build architecture, a collection of materials is composed with certain principles and rules to form a space (Aureli, 2011). As an alternative to formal composition, different architectures recommend another pole. This pole is the type of architecture that grows naturally according to its context, architecture that does not fight against the formation of the landscape and the original resources that form it (Lucan, 2012). This type of architecture may ignore symmetry, regularity and conventional balance rules (Figs. 5A, 5B). This type of architecture is oriented towards non-composition, that is, the growth of space from within in dealing with site conditions and establishing natural relationships rather than simply dominating or conquering nature. While the composition is primarily based on political formulas (Fig. 5C), the principle of non-composition is reflected in residential buildings, informal towns and villages. Therefore, non-composition is also based on local construction and austere, prioritising craftsmanship over universality. As a result, asymmetrical fabrication, irregularity, and non-uniformity are found as individual, communal, and collective expressions (Aureli, 2011). In the big picture, other alternative forms of composition are seen as mega-scale organic forms, megastructures, urban landscapes, or clusters of cal materiality in a context (Frampton, 1999).

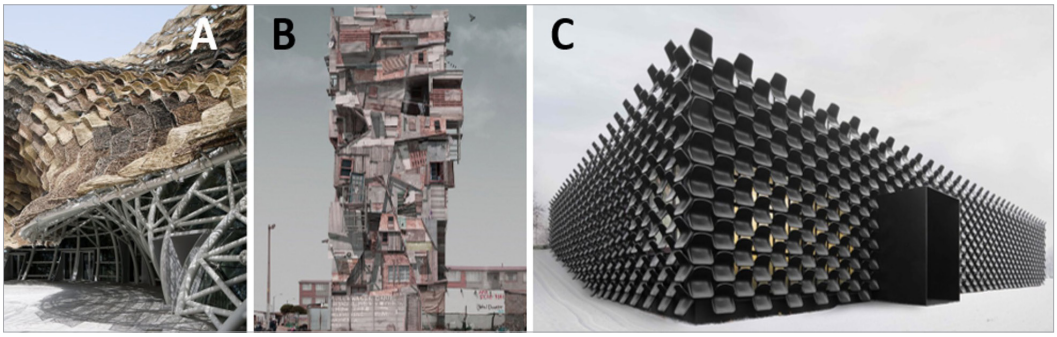

Fig. 5

(A) Spanish pavilion for expo Shanghai 2010 (Tagliabue, n.d.); (B) Con/struct: spectacular fictional landscapes (Plunkett, 2014); (C) Recycled plastic seats in gallery of furniture (Chybik+Kristof, 2021)

e City and Kampong

Architecture is believed to be the main instrument for shaping cities, another political force that can influence neighbourhoods and even the world (Aureli, 2011). A rigid, orderly, organised city is formed from clusters with specific formulas replicated with neat patterns according to certain rules. An architectural form must fulfil specific codes and regulations, including the materials that form it to be on par with the city. A well-ordered city displays the totality of high intellectual embodiment using the most reliable, latest and most advanced materials that demonstrate a specific performance. The ability of architects to produce architectural excellence is often perceived as a form of beauty (Hurol, 2022). Of course, other forms that do not fit the urban rules would be removed, set aside or ostracised. However, this does not mean these figures are unnecessary; they continue to grow and develop to build the city despite showing a different form and image (Husin, Prijotomo, & Sugiharto, 2021). In the case of Indonesia, in particular, the kampong is known as a representation of the other. A kampong or *kampung* is a term derived from a Malay/Indonesian word to refer a village of indigenous people in Indonesia, Malaysia, Brunei and Singapore. The term often applies to traditional residentials, informalities, urban slum areas and enclosed developments in South East Asian towns and cities, featuring various architectural tectonics and local craftsmanship, a contrast image of a generic city development (Mulyasari, Sihombing, & Isnaeni, 2017; Husin, 2022). The kampong is a resilient informal sector that has proven to survive with its resilience. Kampongs, perceived as a traditional, original or natural part of the settlement, are often unorganised according to standards. This is because, like many informal settlements worldwide, kampongs exhibit irregular composition of patchwork buildings and are not designed with a formalised process in mind (Frampton, 1999). The perception of irregularity is likely due to the absence of uniformity, independence in building, free expression and communal actions such as *gotong royong* (Lianto, Trisno, Husin, & Thedyardi, 2022). In addition, economic limitations and traditional skills have caused villagers to utilise used goods or waste as building materials and fillings (Fig. 6A). For a long time, they have directly applied reuse and recycling using the knowledge and skills acquired from generation to generation or brought from their origin. Some give a touch of art, belief, and cleanliness inspired by the village's daily life (Fig. 6B).

Fig. 6

(A) Design architecture & landscape, facade rumah - recycle material, tiny house - 2021 (Sejahtera, 2021); (B) Shadow House is in Semarang, Indonesia (pinterest.com, n.d.)

f Science vs Art

What is the meaning of the green architecture movement if it is still subject to industrial domination? The question of ties to prevailing values in architecture is not only fenced off by standardisation but is often detached from its context as it is a transplant adopted from a different country or condition (Sudaryono, 2012). In the context of this reflection, all scraps, used materials, waste and rubbish have the potential to become building materials. Any waste material should not be considered rubbish but a potential material. Waste is so diverse that it offers a variety of potentials to produce architectural works that are rich in ideas. It is an art that opens the gap for expressing transformation and even the evolution of various fields to create something broadly (Sugiharto, 2013). Creativity in this context can assemble this diversity into spatial works as art that is beautiful, healthy and comfortable when treated seriously (Orr & Shreeve, 2018). A wall no longer has to be a smooth, flat plane, built using only one type of material or one way of finishing, but celebrates a combination of materials of various sizes, shapes, colours and properties that create its uniqueness. The architect is in charge of arranging, assembling and connecting the various materials into a single plane, but the mason can implement the materials directly. This can be seen not only as a reflection of the perception of education and profession to question generalisation and specialisation in segmentation in the architecture industry (Trowler, 2020) but primarily as a real-life experience (Sugiharto, 2013). By balancing the two polar professions, the art of building would elevate the other polar, providing alternative principles, rhythms, hues and directions that may be different because they are not based on fabrication, standardisation and standard procedures but an expression, improvisation and resonance of an inner and evolving state (Sauvè, Mongeon, & Larivière, 2022). Therefore, it has the potential to present another pattern as a construction in architecture (**Figs. 7A, 7B**).

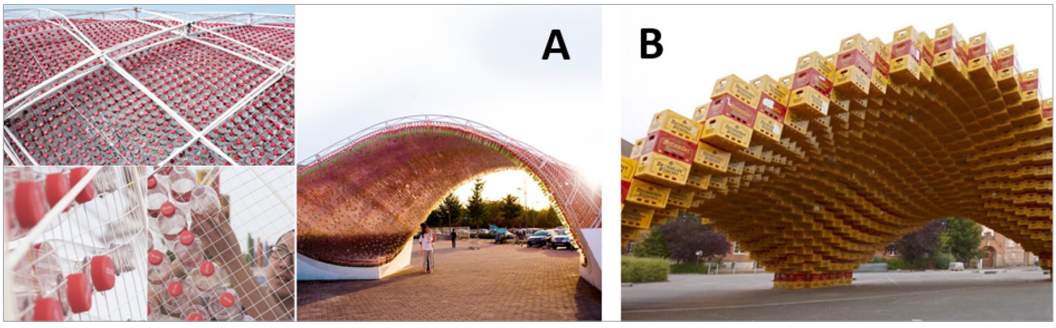

Fig. 7
(A) Cola-bow by precht, Beijing, China (Upadhyaya, n.d.); (B) Boxel/students of detmolder schule (skyscrapercity.com, n.d.)

g Architecture vs *Liyan* Architecture

Architecture as an object shows a work that certain formal institutions recognise. With the curatorial and certification process, architectural work needs to fulfil practical and administrative rules to be labelled (Trisno, Husin, & Lianto, 2023). This recognition results from an assessment by a professional body that enforces specific stability, standardisation and formality through a guarantee on society, whether it is material, system or construction (**Fig. 8A**). Objects can hardly be categorised as architecture outside these formal principles and rules. Therefore, informality is often labelled as something that does not obey the rules and does not meet architectural standards related to the science and art of building buildings (Trisno, Husin, Lianto, & Hartoyo, 2023). However, the informal still stands and enriches the formal, even supporting and complementing what the formal cannot fulfil. Informality establishes specific rules and principles based on its collectivity. In Indonesia, *liyan* is known as an Indonesian word that represents the otherness, an interchangeable translation of Foucault's philosophical term: 'of the other/the other' (McWhorter, 1989), the state of being different from or foreign to the generic social identity and even to the self.

In this sense, a kampung is associated with liyan in a city context because it represents otherness, a distinctive development compared to the modern city image (Octavia, 2021; Prijotomo, 2008). *Liyan* architecture is often represented by traditional architecture, kampongs, the informal sector and many other rich spaces still waiting for recognition by certain formal bodies to be recognised for their uniqueness. Informal representations are often labelled because of the materials used, the way they are built, the legality of the land and the people who planned them. However, this does not mean that the organic, used or processed waste materials often used by this type of architecture should categorise informal spaces as non-architectural. Instead, the character and features of different materials should provide an alternative view to the generic architectural objects that dominate the existing industry (Fig. 8B).

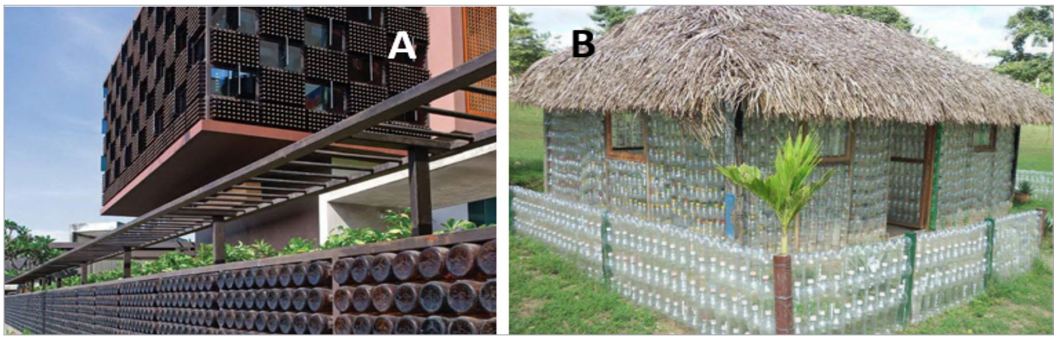

Fig. 8

(A) Ridwan Kamil's bottle house, Bandung, Indonesia, 2012 (Clara, 2023); (B) 84 DIY greenhouse plans: learn how to build a greenhouse (epicgardening.com, n.d.)

h Product vs Process

The planned and systemised formality of architecture makes construction rigid and stable. However, there is a static gap and stagnation in the design of buildings, which is born from industry. The majority of building materials are produced by large industries using various machines, mass scale, branding, marketing and trademarks to meet standardisation and target users. However, the systematic rigidity based on industrial products has resulted in a Lego-style building method with minimal variation and limited expression in artificial products (Fig. 9A). In contrast to the organic, recycled and waste material processing industries, the limitations of exploration result in openings for unlimited trials even when only able to fulfil limited demands and standards. The small, home-based, micro-production industry is process-centred, i.e., continuously improving building materials' non-uniform size, shape, colour, and character. Process in this context is a separate system that grows and develops, experimenting to find tools, materials, methods and other functions from processed or natural cycles to keep up with the development of market products. Processes are major in small industries because of the amplitude of the gap; experimentation, in this case, is not a small division or an addition because it is just catching up. Process in this context is a separate art implemented as a series, playing an important role outside the standardisation and regulation of built products. This process is at the centre of producing its character, features and uniqueness in waste processing into architectural products (Fig. 9B).

Fig. 9

(A) Brick Factory from Plastic Waste in West Nusa Tenggara, Indonesia (Arifa, 2022); (B) Kamikatz Public House/Hiroshi Nakamura & NAP, Japan, 2015 (fujii, 2017)

i Permanent vs Non-Permanent

The strength, stability and robustness of architecture are often associated with permanence. Permanent architecture means architecture that lasts long and can pass through time (Trisno, Lianto, & Tishani, 2021). However, permanence does not always guarantee regeneration, existence and adaptation; many permanent architectural works are abandoned, do not function optimally or do not provide appropriate functions (**Fig. 10A**). This contradicts the growth, change, and spatial development principles necessary as society changes. The inability of permanent architecture to transform or evolve is also one of the problems of rapid development and the complexity of demands, as one of the alternatives to non-permanent architecture mushrooming lately, informality, mobility and connectivity that have not been categorised as architecture growth side by side even in permanence. The implementation of activities, programmes, structures, and events in the form of tents, kiosks, caravans, and pop-up stores becomes a wealth of informal spatial forms in permanent space stagnation (**Fig. 10B**) (Abdel, Priyomarsono, & Trisno, 2020). Materials other than the common materials used in architecture are forced to be used even more, popular to attract audience participation, whether they come from other fields such as fabric (fashion), organic materials, new materials, used goods, or trial materials are more successful in attracting attention than commonly used materials because they attract visitors' curiosity.

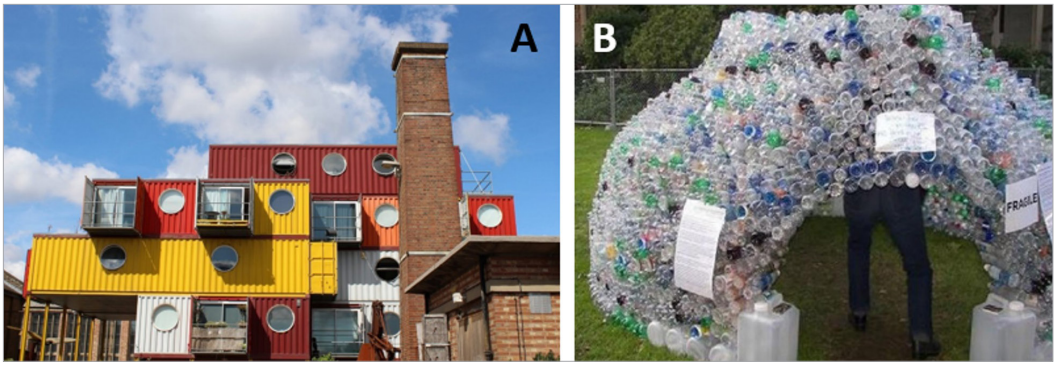

Fig. 10

(A) Container City is a 5-floor workspace in Trinity Buoy Wharf, London (Lacey, 2002); (B) Bumbershoot 2008: The Plastic Bottle Greenhouse (Kain, 2008)

j Vertical vs Horizontal

The issue of sustainability is one of the bases for encouraging buildings to be vertical to leave more natural green open space. The world's major cities are full of high-rise buildings, some due to land constraints, others pursuing luxury, appearance and status to compete in the city (**Fig. 11A**). In another corner of the city, the urban village offers another aspect of sustainability.

Fig. 11

(A) 1000 recycled doors transform the facade of a 10-story building in Seoul (Choi, 2011); (B) Slums area (Tempo, 2014)

Kampongs are houses with small or medium-sized businesses that support the city's development from behind. The kampong establishes a human connection to its base. Apart from the optimal use of the base area, unlike skyscrapers, kampongs are built from non-permanent and organic materials. The kampong utilises materials easily found around the site, including scraps and waste (Fig. 11B). With simple materials and construction, the kampong grows horizontally, mimicking a mega-form according to the topography, like an urban landscape in the middle of the city. The temporariness of the materials that make up the kampong opens up the interpretation of its growth, development and organisation while leaving room for future intervention.

Conclusions

Ordinary conditions often become a phenomenon, while counter-perspective is recommended to be developed so that it has the opportunity to develop as a noumena. The research findings are:

a The reuse of rubbish, waste, and used goods is becoming an increasingly vigorous movement and is believed to be one of the solutions to the problem of environmental crisis. So far, most of this reuse refers to the standards that apply in architecture. The rubbish, waste and used goods are first processed and adjusted to the shape, size and standard. Standardising waste into standard materials for the building industry requires precision and thoroughness, so production machines are usually used on a large scale, with substantial capital, lengthy procedures, and marketing systems that follow existing and long-standing systems.

b Attachment to existing standards limits the involvement of many parties in the movement to reuse waste, waste and used objects, tiny industries, and manual production because they often cannot meet the standards and criteria that have become a reference in the architectural world. Architecture contains elements of art in addition to technical elements. Some parts of architecture or buildings must meet standards, for example, in terms of structural strength, but some parts can be more freely developed in the direction of art, which tends to be free and non-standard.

c Reusing garbage, waste, and used goods should be directed towards the construction side, adapting their character as much as possible to the same character in the building. As an element of art, the use of waste and discarded objects in buildings also does not always require processing or changes in form that refer to the applicable material standards because the character of waste has its unique character as a building feature.

In this way, architects can more freely develop creativity and aesthetics and have the opportunity to highlight the natural character of waste to produce uniqueness and answer the challenges of uniformity in architecture.

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