

Incremental design adaptations

Towards flood-resilient housing
solutions in Bangladesh

Rens van Poppel
4849868

08.11.2024

Author: Rens van Poppel
St. no. : 4849868

Research Plan: Incremental Housing in Bangladesh

Date: 08.11.2024

Tutors:
Prof. Marina Tabassum
Prof. Dick van Gameren
Dr. Nelson Mota
Ir. Rohan Varma
Ir. Frederique van Andel
Ir. Antonio Paoletti

Published for the course: Research Plan [AR3A010]

As part of the Global Housing Graduation Studio
Architecture of Transition in the Bangladesh Delta:
Autumn Semester 2024/25 [AR3AD105]

TU Delft
MSc Architecture, Urbanism and Building Sciences
Architecture Track

Index

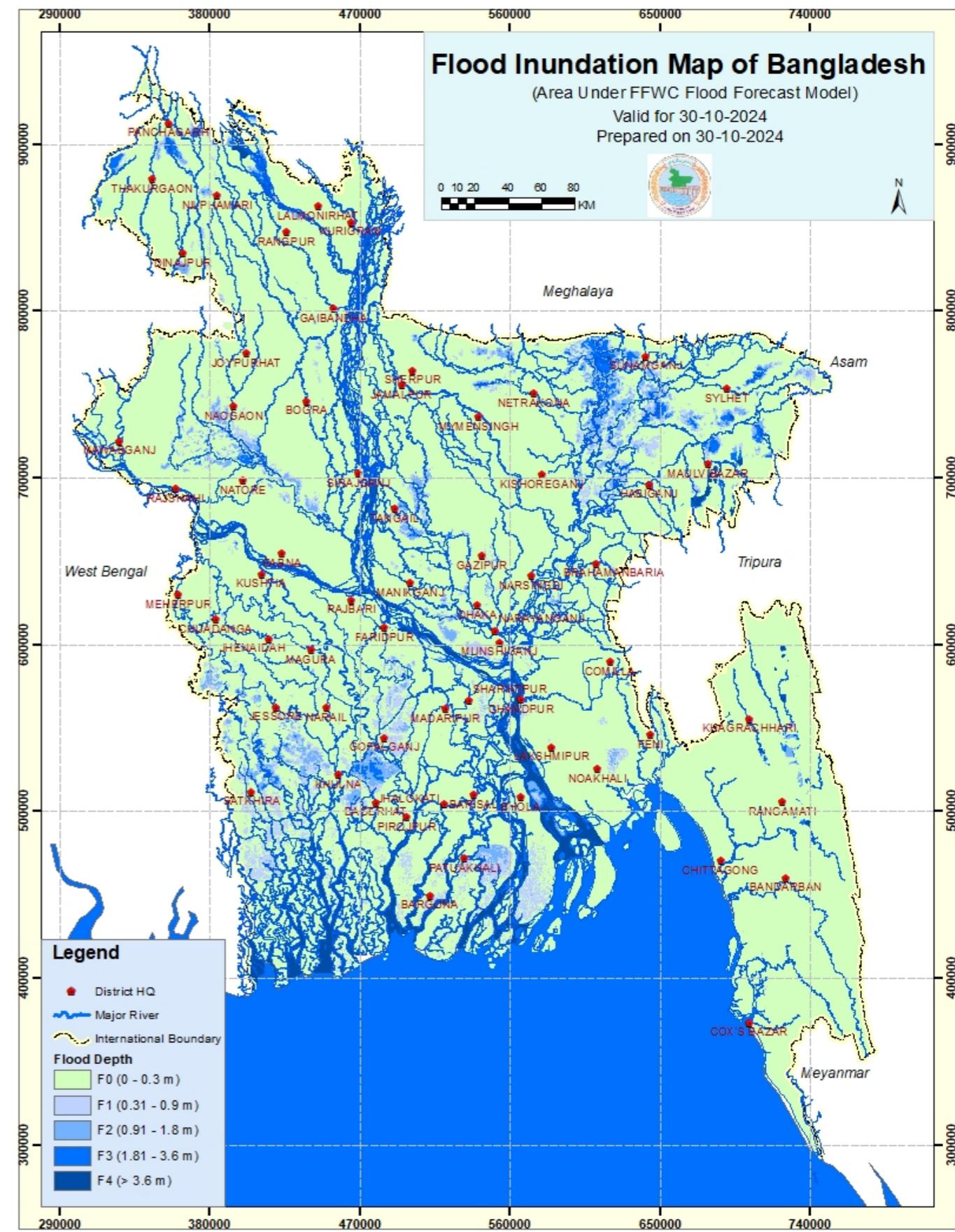
| | |
|--------------------------|-----|
| 1. Introduction | p4 |
| 2. Literature review | p6 |
| 3. Problem Statement | p8 |
| 4. Theoretical framework | p8 |
| 5. Research questions | p10 |
| 6. Design Hypothesis | p12 |
| 7. Goals & Aims | p12 |
| 8. Methodology | p12 |
| 9. Research scheme | p13 |
| 10. Relevance | p14 |
| 11. Definitions | p14 |
| 12. References | p16 |
| 13. Bibliography | p18 |
| 14. Illustration credits | p19 |

1. Introduction

The UN predicts that 70 per cent of the world will be urbanised by 2050. By then, three billion people will live in informal settlements. Research is needed on how to cope with these trends to make cities and human settlements inclusive, safe, resilient and sustainable (United Nations Statistics Division, 2023). With a population of roughly 173 million people and an area of 148.460 km², Bangladesh is one of the densest countries in the world (Bangladesh Bureau of Statistics, 2024). Yet, it is also one of the countries most stricken by climate change. Largely consisting of a flat river delta in a tropical monsoon climate, Bangladesh is extremely vulnerable to flooding. Major weather events torment the country and lead to the destruction of homes and the displacement of millions, further causing migration to urban

areas. Due to this climate-induced urbanisation, Bangladesh's major cities are overflowing, leading to informal settlements all across the country.

Next to the capital Dhaka, second-tier cities will especially see a massive influx in immigration. The division of Sylhet is in the northeast of Bangladesh and has a population of about 11 million people, of which the regional capital city of the same name houses 700.000. 27 per cent live in one of the 754 city slums (Pal & Hussain, 2016), known for their inadequate housing and the lack of infrastructure, drinking water and basic amenities. Furthermore, the Sylhet division is extremely prone to flooding, with 80 per cent of Sylhet submerged under water in 2022 (Bangladesh Red Crescent Society, 2022).



Flood Inundation Map of Bangladesh (Flood Forecasting & Warning Centre, 2024)

2.1 Incrementality

The past decade, incremental design has been one of the main strategies employed for housing the poor. Since the 1970s, incremental housing has become a key concept for slum mitigation and resettlement programmes. However, even though it is often employed in that field, incremental design is not necessarily a practice only related to the upgrading of informal settlements and affordable housing.

2.1.1. Defining incrementality

In this research, incremental housing is defined as: “A conceptual approach to the design of houses that can gradually accommodate vertical and/or horizontal changes and expansions, evolving from the initial configuration in a series of increments over time” (Mota, 2021), fitting with the ideology of “housing as a verb” (Turner, 1972). It is this gradual growth over time that makes the incremental design strategy so fit for affordable housing programmes, since this allows for broader financing over a longer period for a yet-to-be-finished product by the dwellers themselves (Bredenoord et al., 2014; Nohn & Goethert, 2017; Wakely & Riley, 2011).

2.1.2. Incremental housing strategies through time

Looking at the history of incrementality, incremental design can be divided into a variety of historical categories: the growing house, aided self-help, sites-and-services, evolutionary houses, and expandable houses.

2.1.2.1. Growing House

One of the first cases of incremental design can be found in the works of Leberecht Migge. In 1932, in the middle of a financial crisis, Migge published his book *Die wachsende Siedlung nach biologischen Gesetzen* (The growing settlement according to biological laws), in which he argues for a 25 m² core that could grow organically through feasible additions to the house (Haney, 2010; Hochhäusl, 2014). His later collaboration with planner Martin Wagner in an exhibition saw them as leading architects and planners of

the Neues Bauen, aiming to alleviate the housing crisis of the 1930s (Wagner, 2016).

2.1.2.2. Aided self-help

Aided self-help approaches were first developed in 1904, with Sweden’s national “Own Homes” Loan Fund as a primary example (Harris, 1999). The incremental strategy gained popularity due to the great housing needs during and after the Interbellum. With the help of architects and urbanists like Charles Abrams (1964) and John Turner (1968), aided self-help housing was widely used for global aid by the United Nations and World Bank from 1960 to 1980. Distinct characteristics of aided self-help housing strategies are the minimum resources and financial feasibility of the project, but there must be clear ideas on how one could build and add to their house (Mota, 2021).

2.1.2.3. Sites-and-services

The incremental sites-and-services strategy derives from the self-help approach. Here, the emphasis is on the: “interwoven relationship between top-down design of the infrastructure (services) and bottom-up incremental improvement of the houses built on the plots (sites)” (Mota, 2021), combining governmental policies with the empowerment and emancipation of low-income groups.

The key characteristics of any sites-and-services plan are (i) resilient infrastructure, (ii) security of tenure, and (iii) implemented self-help housing. The main difference with the aided self-help approach is that the self-help approach focuses mainly on the scale of the dwelling and communal resources, while the sites-and-services approach designs total new urban districts with a government-developed infrastructural network.

Millions of homes were built in developing countries following the sites-and-services plan, further popularised by Caminos and Goethert (1978), who argued for the approach by stating it is the choice of either providing complete dwellings to the few or to provide basic utilities and services to the many.

2.1.2.4. The Correa and Doshi approach

Indian architects Doshi and Correa disliked the sites-and-services approach because of its rigidity. Therefore, they adapted a model in which dwellings were clustered differently, providing a better connection between the urban plan and the houses. The most famous examples of this philosophy are the Aranya Housing project (Doshi) and the Belapur project (Correa).

Correa’s incremental strategies can be defined through a few criteria. For slum resettlement projects it is important to provide proper transport to the city since Correa deems economic reasons the main driver of rural-urban migration. Furthermore, housing strategies should follow Correa’s bills of rights for housing, based on pluralism, participation, income generation, equity, open-to-sky spaces, and disaggregation. Correa also states that, in the Indian climate, these developments should stick with a low-rise high-density typology instead of high-rise solutions (Correa, 1989; Varma, 2018).

2.1.2.5. Evolutionary House

Another approach to incrementality is the evolutionary house. This approach focuses on a dwelling type that could grow through time. After World War II, many architects of CIAM researched the field, with the 1969 PREVI-Lima project in Peru as the most famous example. Under the supervision of Peter Land, renowned architects from all over the world designed evolutionary houses, clustered in an urban plan. Revisiting the project many years after, the project can be deemed successful, with incremental additions beyond the wildest imagination of the architects (García-Huidobro et al., 2008; Nohn & Goethert, 2017).

2.1.2.6. Expandable Houses

The expandable house is similar to the evolutionary house, but focuses more on the pragmatic materialistic aspect of building the house, fitting more with vernacular practices (Mota, 2021). The 1965 Skjetten Town project by Nils-Ole

Lund is an expandable housing project following a humanistic approach. A housing manual was provided to the housing system, based on a grid, that demonstrated how individuals could incrementally grow their dwellings.

2.1.2.7. Modern-day incremental strategies

Although incremental strategies seem to have taken a break after 1980, they are up for a revival (Nohn & Goethert, 2017; Wakely & Riley 2011; Wakely 2018). Projects like that of Quinta Monroy and Villa Verde in Chile as proof (Aravena Mori & Iacobelli, 2016). The philosophy of Aravena’s elemental, which they call ‘the ABC of incremental housing’, states that an architect should focus on (i) what is more difficult, (ii) what cannot be done by individual residents, and (iii) on what will guarantee the common good in the future. The ABC of housing therefore consists of the following design conditions:

- (i) A good location; with projects dense enough to pay for expensive, well-located sites.
- (ii) Harmonious growth in time: The design must facilitate further expansion by strategically building the structural partition walls, firewalls, installations (bathroom and kitchen), stairs, and roof. Individual additions are also framed, leading to customisation instead of neighbourhood deterioration.
- (iii) Urban layout: design collective space for up to 25 families to enhance social harmony.
- (iv) Provide structure for the final growth scenario, instead of solely the primary phase.
- (v) Middle-class DNA: in its final state, the dwelling should have an area of at least 72 m², with four large bedrooms (3x3m). The bathrooms must be spacious enough for a bathtub and washing machine and must be next to the bedrooms. A parking spot should also be provided.

In conclusion, incremental housing must balance low-rise high density, without overcrowding, whilst keeping the possibility of expansion from social housing to middle-class dwelling (Aravena et al., 2018).

2.1.3. General advantages and disadvantages of incremental housing strategies

If we are to match the pace of today's rapid urbanisation, incremental housing is the most promising solution due to the speed of the schemes, while still having a long-term focus (Nohn & Goethert, 2017). It is also among the most affordable for low-income families, making it especially suitable for (mass) housing projects in the global South. Furthermore, its bottom-up incremental freedom enables citizen participation and strengthens communities and individuals (Bredenoord et al., 2014; Wainer et al., 2016; Wakely & Riley, 2011).

The downsides to incremental approaches are mainly on their dependence on good governance. A sites-and-services plan without proper policy and governance is deemed to fail, regardless the quality of the design (Bredenoord et al., 2014). Additionally, since most incremental housing strategies take up lots of horizontal land and contribute to urban sprawl, seeing as they are often implemented on the urban periphery (Bredenoord et al., 2014; Caldeira, 2016).

2.1.4. The Case for Incremental Housing

To conclude the literature review on incrementality, Wakely & Riley's (2011) case for incremental housing discusses the extent of sites-and-services schemes in the past and present, as well as the in-situ slum upgrading projects that took over after sites-and-services turned out of fashion. It also poses guidelines on a managerial level for future incremental projects. Wakely and Riley pose sites-and-services projects sometimes failed because they were built on cheap land, were far from the city, and lacked good transport, infrastructure, and links to work opportunities and urban social services. In several cases, the base dwellings and plots were still too expensive for the urban poor, while government institutions were also too impatient for these long-term housing schemes to mature before being evaluated.

Still, with the current knowledge, incremental

housing schemes such as sites-and-services and slum upgrading make a strong case. With security of land tenure, households are more engaged and feel more responsibility for the quality of their dwelling and neighbourhood, investing in their dwellings by saving up and sharing the development costs with the government. Participation is key for the incremental development. Here, local communities of informal settlements also play an important role in its success.

In conclusion, Wakely & Riley point out seven points in which incremental housing strategies can find support from the public sector (i) land and location, (ii) finance, (iii) infrastructure and services, (iv) beneficiary selection, (v) site planning and building controls and supports, (vi) community organisation and asset management, and (vii) citywide strategic planning. These can be used to upgrade existing informal settlements, but also for new low-income housing programmes such as the sites-and-services approach (Wakely & Riley, 2011).

2.2. Designing for flood resilience

Floodings occur both in urban and rural areas of Bangladesh. The floods are often due to (i) river outbreaks, caused by heavy rainfall, (ii) urban flooding due to poor drainage, and (iii) coastal flooding as a consequence of the sea-level rise (K. I. Ahmed, 2005, 2014; Shaw et al., 2013). Coastal flooding is largely left out in this research, given that Sylhet is not located near the coast, but does cope with the fluvial (river) and pluvial (rainfall) flood types. Implementing flood resilience measures can reduce damage costs a hundredfold (Global Impact Investing Network, 2024).

2.2.1 Small scale measures

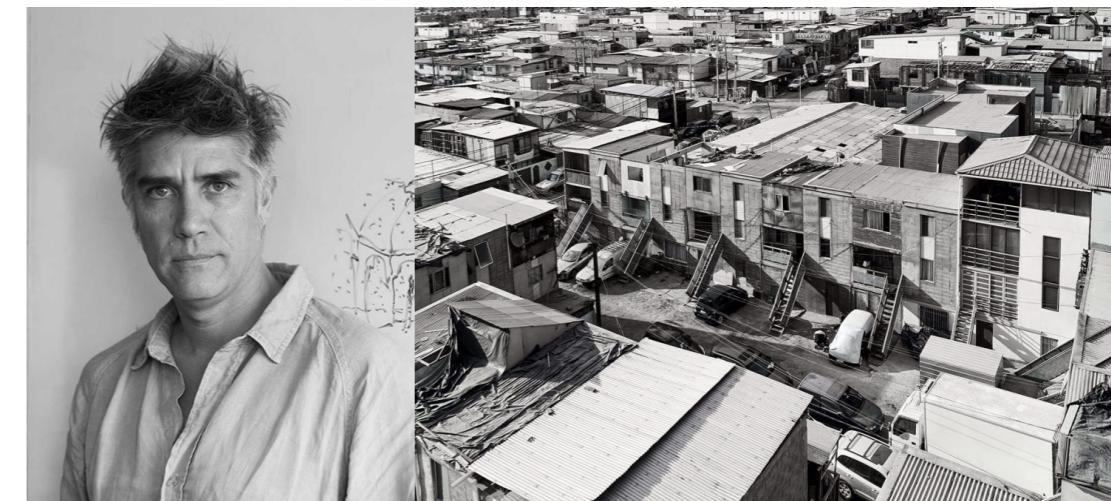
Several flood-resilience design measures can be undertaken on the scale of the building. The manual by K. I. Ahmed (2005) covers various construction techniques in detail, providing a thorough design manual on flood-resilient building. Summarising, these measures can be structured under the building components plinth, posts, walls, and roofing. Furthermore, the



Left: Balkrishna Doshi (Prasad, n.d.).
Right: Aranya Housing Complex in Indore (Aranya Low-Cost Housing, 1993).



Left: Balkrishna Doshi (Charles Correa, n.d.).
Right: Belapur Housing in Navi Mumbai (Charles Correa Foundation, n.d.).



Left: Alejandro Aravena, (Alejandro Aravena, n.d.).
Right: Quinta Monroy in Iquique (Palma, 2020).

manual discusses material qualities, construction techniques, and design guidelines. The main materials used in rural Bangladesh, are bamboo, timber, brick, reinforced concrete (RC), thatch, earth and mud.

Raising the plinth above ground level is a basic design feature of huge importance for a flood-prone context. Although earthen foundations are common, brick or concrete foundations are most resilient. Another option is to raise the building entirely by building on posts. These posts are often bamboo posts in a concrete stump. In rural areas, bamboo mats, earth, CI sheets and brick are used as walls. Out of these, brick is the only material with longer success against flooding with a high water level. Many roofs are made from thatch and CI sheets, which could fail during long, intense rainfall. RC roofs are safer, yet the structure of the walls needs to be able to hold up the roof. Additionally, the RC roof becomes a point of refuge during high-level floods (K. I. Ahmed, 2005; Mallick et al., 2024; Mokhlesur Rahman & Islam, 2013). In addition, the United Nations Environment Programme (2021) poses several guidelines on various design principles for

the house. These guidelines will make of good use for a flood-resilient housing design.

2.2.2. Large scale measures

In urban design, proper drainage is a key aspect of flood mitigation, which is frequently the main problem for floods in informal settlements (K.I. Ahmed, 2014), along with informal settlements occurring in the most flood-prone areas, deemed unsafe for development (French et al., 2020). Streets that slope towards drainage, adequate alarm systems, and sometimes shelters can be of great importance (Brown et al., 2012). Building embankments, digging waterways for water relief, or planting specific vegetation, are solutions that help prevent fluvial flooding (French et al., 2020). Next to these, transformative approaches, such as floating houses, prove more beneficial over time, since the previous approaches only work up to a certain limit (Apreda, 2016). In rural areas, some of these practices are already carried out to battle the effects of climate change (Anik & Khan, 2012). Finally, community awareness has led to social resilience to floods, meaning communities were able to better resist and overcome floods and destruction (Amoako, 2017; Brown et al., 2012).



PREVI aerial photograph (Land, 1976).



Floods in Bangladesh (Hossain, 2024).

3. Problem statement

Bangladesh's unique context, distinguished by climate-induced rapid urbanisation and overflowing cities, calls for immediate research. At first glance, the situation may seem somewhat unique for the Bengali climate. Yet, with the consequences of climate change intensifying, the same problem will likely occur in countless places across the globe over the coming decades.

The issues with informal settlements and rapid

urbanisation show that mass housing schemes that fit flood-susceptible areas are needed. Incremental housing strategies seem most probable in coping with the lack of adequate housing, but little to no research has been done on how a large-scale incremental strategy can be adapted to implement flood-resilience measures, while still coping with the financial and minimal constraints of the strategy.

4. Theoretical Framework

Out of the various incremental housing strategies mentioned, a combination of the theories into an adapted, incremental housing scheme seems the best fit for the context of Sylhet. As for the sites-and-services plans proposed by Caminos and Goethert (1978), I largely agree with the criticisms of Doshi and Correa. Moreover, the Aranya and Belapur projects seem a better fit for the Bengali context. Yet, with the huge influx of migrants and the current size of informal settlements in Bangladesh, an even more scaled-up approach may be needed that relies more on auto-construction and slum upgrading, while still employing several examples of the evolutionary houses like PREVI-Lima. This will provide a typology mix, which is also pivotal in creating pleasant urban spaces.

Another argument for an adapted version in the Sylhet context is that the success of each incremental project differs hugely depending on context: a global framework does not exist and is improbable (Bredenoord et al., 2014; Caldeira, 2016).

Furthermore, accepting auto-construction as the most accessible and affordable form of housing for the urban poor is pivotal (Bhan, 2019; Bredenoord et al., 2014). Enough cases in the global South demonstrate the success of such implementations (Neuwirth, 2005). Even though this may lead to what Ananya Roy (2004) calls "the ideology of space" and the "aestheticisation of poverty", I feel this strategy is still best. I do agree though, that the problem of poverty and informal settlements goes much further than architecture, being based

more on socioeconomic aspects. Yet, I feel good governance and design may still contribute to a solution, as long as they are given enough time. By combining incremental strategies such as the core-house, sites-and-services and (in-situ) slum upgrading, a larger strategy that fits with the Bengali context and its lack of adequate housing can be created.

As for Aravena's notions on incremental housing, I largely agree, although I do think Aravena's work is fairly specific for the South American climate. It also does not fit with the larger scale of a sites-and-services plan, although the right ingredients seem present on the scale of the dwelling and cluster. Additionally, one could question if Aravena's structures like that of Villa Verde are truly incremental, since the finished structure also creates clear growth boundaries.

The literature on flooding discusses rural and urban responses to flooding, yet many of the examples are not focussed on the material and construction scale in the urban context. The material and construction principles are researched in rural cases, and although several of these principles can also be applied in a denser, urban context, instances such as space, material availability, and incremental measures are not discussed as much. Research on flood resilience measures in urban contexts, is often on a larger scale for citywide approaches, largely leaving out the architectural design within the urban fabric on the scale of the dwelling and the neighbourhood.



Mohammadpur Geneva Camp, one of the large informal settlements of Dhaka (bdnews24.com, 2024)



Multiple buildings submerged (AFP, 2024)

5. Research Question

My research aims to answer the question: How can incremental housing strategies be adapted to the flood susceptible context of Sylhet to create affordable context-based housing solutions?

This leads to the following subquestions:

i. **What main lessons can be learned from incremental housing projects from the past?**

To set up a framework for a successful incremental design strategy, it is crucial to look at projects from the past. Since it takes years before one can truly evaluate the success of an incremental housing strategy, preferably cases of 30+ years of age are analysed. In order to review various innovative strategies, the selection of case studies spans further than the Indian subcontinent, with the majority coming from elsewhere in the Global South. These case studies will be analysed through several main criteria to set up a database. From here, a framework can be set up for an affordable incremental housing strategy.

The main criteria are:

- a. stakeholders;
- b. participation and mode of incrementality;
- c. architectural design of the unit;
- d. urban design;
- e. typology;
- f. material & construction techniques;
- g. finance, funding and affordability;
- h. governance;
- i. FSI, GSI, dw/ha, and the ratio of m² incremental additions over m² of the base core-house design.

ii. **What minimum flood-resilient design measures can be employed in an incremental strategy on an architectural and urban scale?**

I further define the framework by researching specific flood-resilience design measures for the Bengali flood-susceptible context. This is done through analysing material and construction measures from manuals on flood-resilient design and vernacular architecture. The flood-resilience aspect focuses on both pluvial and river floodings.

iii. **What social and typological features must be integrated into the design to fit with the way of living for the people of Sylhet?**

One must understand the way of living to design a successful housing strategy. This encompasses the typology of the single dwelling unit, the urban fabric and ways of living on the neighbourhood scale, as well as the cultural and social aspects.

What main lessons can be learned from incremental housing projects from the past?

How can incremental housing strategies be adapted to the flood susceptible context of Sylhet to create affordable context-based housing solutions?

What minimum flood-resilient design measures can be employed in an incremental strategy on an architectural and urban scale?

What social and typological features must be integrated into the design to fit with the way of living for the people of Sylhet?

6. Design Hypothesis

An incremental housing strategy that uses elements of the core-house, sites-and-services, and slum upgrading schemes, will help alleviate the housing distress caused by rapid urbanisation in Bangladesh, while also implementing flood resilience design measures. The research will

have to point out if indeed this combination form of sites-and-services + core-house + upgrading is the best mode of incremental design, or if, for example, an acupunctural incremental self-help approach is more fit for the context.

7. Goal and aims

This research aims to add to existing research on mass housing solutions for Third World countries such as Bangladesh. Specifically, the housing problem caused by climate-induced mass rural-

urban migration, climate resilience and housing affordability in the global South are central topics this thesis aims to address.



Char Bara Dhul, Belkuchi Upazila, Sirajganj, Bangladesh. Floods submerged many houses on the Char Bara Dhul, a river-side village, leaving many residents marooned (Asif Mahmud & WFP, n.d.)

8. Methodology

To answer this thesis' main question '**How can incremental housing strategies be adapted to the flood susceptible context of Sylhet to create affordable context-based housing solutions?**' various methods are employed.

What main lessons can be learned from incremental housing projects from the past?

This question will be answered through a case study analysis of several projects, a literature study and interviews with specialists on incremental housing strategies. The case studies will be put together in a database. The case studies currently considered, are:

- i. PREVI Lima, Peru, 1969, Peter Land et al.
- ii. Urbanización Caja de Agua, Lima, Peru, 1961, Junta Nacional de la Vivienda
- iii. Quinta Monroy, Iquique, Chile, 2003, Alejandro Aravena
- iv. Arany Low-Cost Housing, Indore, India, 1989, Balkrishna Doshi
- v. Charkop Sites-and-Services, Mumbai, India, 1980, Vidyadhar Phatak, Alain Bartoud
- vi. New Bagalkot, India, 1985, Charles Correa
- vii. Belapur, Navi Mumbai, 1983, Charles Correa
- viii. Incremental Housing Strategy, Mumbai, India, 2009, Filipe Balestra, Sara, Göransson
- ix. Mohammadpur Geneva Camp, Dhaka, Bangladesh, 1971-present, UNHCR
- x. Jhenaidah Community Upgrading, Jhenaidah, Bangladesh, 2014, Khondaker Hasibul Kabir, Suhailey Farzana, Co.Creation.Architects
- xi. Rumah Tambah, Batam Island, Indonesia, 2018, Urban Rural Systems
- xii. Ciudad Bachué, Bogota, Colombia, 1980, Instituto de Crédito Territorial
- xiii. K206 Housing, Alexandra, Johannesburg, South Africa, 2010, Anca Szalavicz / ASA architects
- xiv. Kambimoto Housing, Nairobi, Kenya, 2005-2009, Tecta Consultants/ Reall
- xv. Skjetten Housing, Skjetten, Norway, 1967-1976, Nils-Ole Lund

Probably, not all of these case studies will be thoroughly addressed. Specifically, case studies such as Belapur, Aranya and Quinta Monroy are almost overanalysed in current academics. Yet, when simply put in statistics, these are still valuable analyses, considering they are among the most impactful and well-documented case studies in their architectural categories.

Geneva Camp, Jhenaidah and the Incremental Housing Strategy of Balestra and Göransson seem somewhat outliers since these are not necessarily designed or built on a large scale. Yet, these projects provide further insights into incrementality through a different, more participatory lens, possibly providing key takeaways for the framework.

The expected output of the case studies will be in the form of a database, diagrams and graphical analysis of the projects on the aforementioned criteria. The interviews will provide further background and additional insight, leading to diagrams to help steer the incremental housing framework in the right direction.

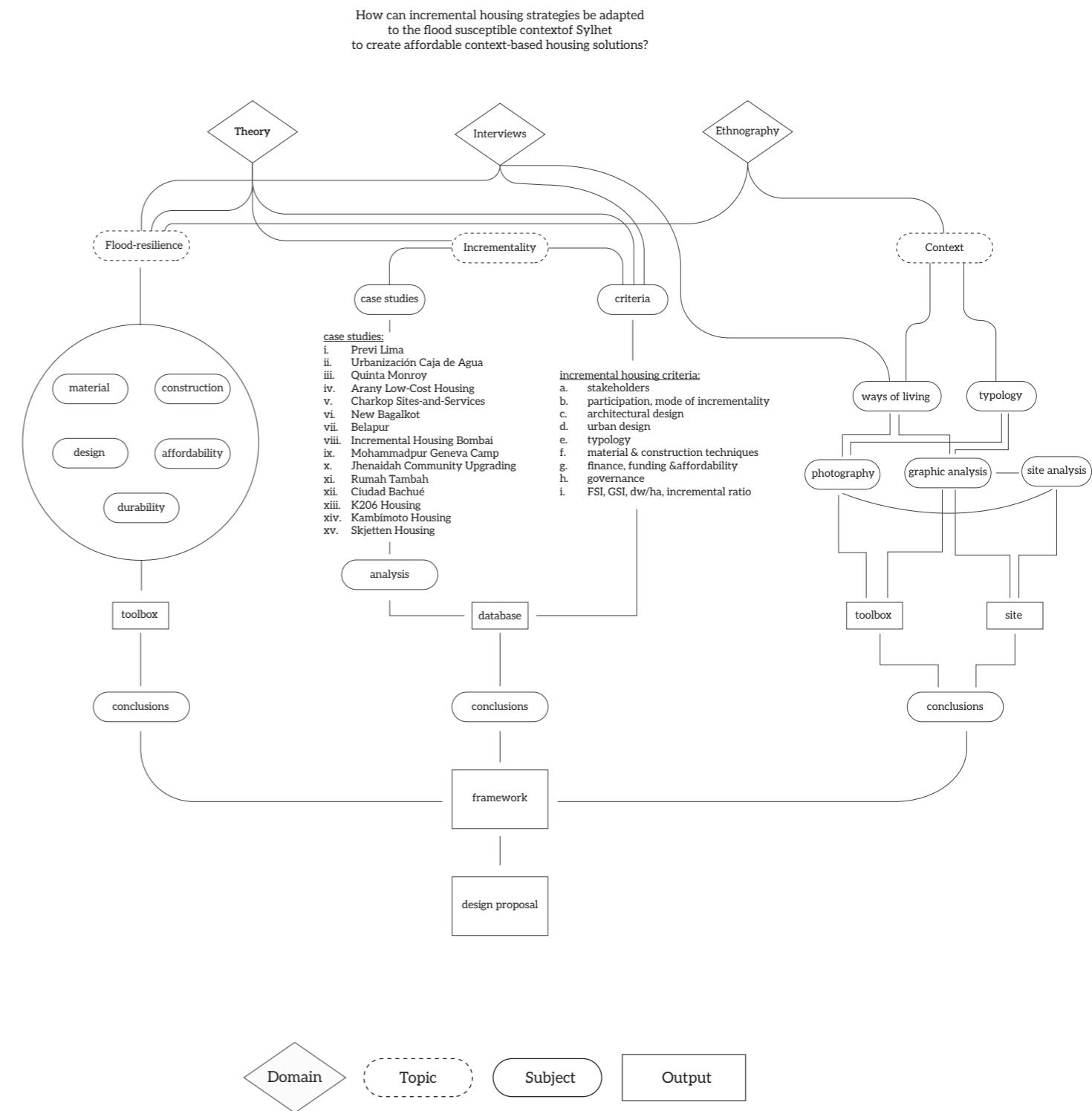
What minimum flood-resilient design measures can be employed in an incremental strategy on an architectural and urban scale?

This question will be answered through a literature study, studies of existing buildings in Sylhet and judging them on their material and construction qualities, as well as interviews with experts on flood-resilient design. The expected output is a toolbox that adds to the framework on materialisation and construction guidelines.

What social and typological features must be integrated into the design to fit with the way of living for the people of Sylhet?

Interviews and site analysis will help answer this question, with the aim of creating a design that will benefit and fit into the people's lives. By talking with locals, analysing the functional layout of homes and through photographs, this ethnographic approach gives the final set of tools to answer the main question in the form of the design proposal.

9. Research Scheme



10. Relevance

This research is relevant since the unique situation of incremental housing design paired with flood-resilience measures has not been well-documented in this context. As climate change keeps on worsening, it will be useful for the context of Sylhet, but also for other contexts that will deal with the damage of climate change in the future.

11. Definitions

Global South

I combine the definitions of Sheppard, Leitner, and Maringati (2012) on Southern residents: “those, everywhere, whose livelihoods have been made precarious by geohistorical processes of colonialism and globalizing capitalism.” and that of Oxford Languages dictionary (2024): “the nations of the world which are regarded as having a relatively low level of economic and industrial development, and are typically located to the south of more industrialized nations.”

Incremental housing

For this research, Nelson Mota’s (2021) definition of incremental housing is used. Mota defines incremental housing as “A conceptual approach to the design of houses that can gradually accommodate vertical and/or horizontal changes and expansions, evolving from the initial configuration in a series of increments over time.”

Informal settlement

A piece of land which squatters have claimed and built upon, creating a slum or shantytown. The dwellings lack access to improved water; access to improved sanitation; sufficient living areas; durability of housing; or security of land tenure (United Nations Human Settlements Programme, 2003).

12. References

Abrams, C. (1964). *Man's struggle for shelter in an urbanizing world*. Cambridge, Mass : M.I.T. Press.

Ahmed, K. I. (2005). *Handbook on Design and Construction of Housing for Flood-prone Rural Areas of Bangladesh*.

Ahmed, K. I. (2014). Factors in building resilience in urban slums of Dhaka, Bangladesh. *Procedia Economics and Finance*, 18, 745–753. [https://doi.org/10.1016/s2212-5671\(14\)00998-8](https://doi.org/10.1016/s2212-5671(14)00998-8)

Ahmed, R., Al-Maruf, A., & Jenkins, J. C. (2023). *Transforming Bangladesh: Geography, People, Economy and Environment*. Springer Nature.

Alam, A. (2023). Incrementalism, housing supply and city-making from below: learning from Khulna, Bangladesh. *International Journal of Housing Policy*, 1–26. <https://doi.org/10.1080/19491247.2023.2232202>

Amoako, C. (2017). Becoming Resilient? Incremental Learning and Flood Responses in Informal Settlements in Accra, Ghana. *ResearchGate*. https://www.researchgate.net/publication/317370926_Becoming_Resilient_Incremental_Learning_and_Flood_Responses_in_Informal_Settlements_in_Accra_Ghana

Anik, S. I., & Khan, M. a. S. A. (2012). Climate change adaptation through local knowledge in the north eastern region of Bangladesh. *Mitigation and Adaptation Strategies for Global Change*, 17(8), 879–896. <https://doi.org/10.1007/s11027-011-9350-6>

Apreda, C. (2016). Climate change, urban vulnerability and adaptation strategies to pluvial flooding. *DOAJ (DOAJ: Directory of Open Access Journals)*. <https://doi.org/10.6092/2531-9906/5040>

Aravena, A., Louisiana (Museum : Humlebæk, Denmark), & Elemental (Firm: Santiago, Chile). (2018). *Elemental: The Architecture of Alejandro Aravena* (M. J. Holm, Interviewer; M. M. Kallehauge & L. Rydal Jørgensen, Eds.; J. Rowley & G. Garner, Trans.). Lars Müller Publishers.

Aravena Mori, A., & Iacobelli, A. (2016). *Elemental : manual de vivienda incremental y diseño participativo = incremental housing and participatory design manual* (2nd ed.).

Bakshi, R. K. (2023). Bangladesh Delta Plan: Anatomy of a Long-Term Development Strategy. In R. Ahmed, A. Al-Maruf, & J. C. Jenkins (Eds.), *Transforming Bangladesh: Geography, People, Economy and Environment*. Springer Nature.

Bangladesh Bureau of Statistics. (2024). Report on Socio-Economic and Demographic Survey 2023. In *Bangladesh Bureau of Statistics*. Ministry of Planning. Retrieved November 8, 2024, from <http://nsds.bbs.gov.bd/en/posts/167/Report%20on%20Socio-Economic%20and%20Demographic%20Survey%202023>

Bangladesh Red Crescent Society. (2022). Flash Flood 2022: Situation Report #3. In *Bangladesh Red Crescent Society*.

Bhan, G. (2019). Notes on a Southern urban practice. *Environment and Urbanization*, 31(2), 639–654. <https://doi.org/10.1177/0956247818815792>

Bredenhoord, J., Lindert, P., & Smets, P. (2014). Affordable housing in the urban global South: Seeking sustainable solutions. In *Routledge eBooks*. <https://doi.org/10.4324/9781315849539>

Brown, A., Dayal, A., & Del Rio, C. R. (2012). From practice to theory: emerging lessons from Asia for building urban climate change resilience. *Environment and Urbanization*, 24(2), 531–556. <https://doi.org/10.1177/0956247812456490>

Caldeira, T. P. (2016). Peripheral urbanization: Autoconstruction, transversal logics, and politics in cities of the global south. *Environment and Planning D Society and Space*, 35(1), 3–20. <https://doi.org/10.1177/0263775816658479>

Caminos, H., & Goethert, R. (1978). *Urbanization primer: Project Assessment, Site Analysis, Design Criteria for Site and Services*.

Correa, C. (1989). *The new landscape: Urbanisation in the Third World*.

French, M., Trundle, A., Korte, I., & Koto, C. (2020). Climate Resilience in Urban Informal Settlements: Towards a Transformative Upgrading Agenda. In *Palgrave studies in climate resilient societies* (pp. 129–153). https://doi.org/10.1007/978-3-030-57537-3_7

12. References

García-Huidobro, F., Torriti, D. T., & Tugas, N. (2008). *Time builds!*

Global Impact Investing Network. (2024). *Improving household resilience to flood risk | Navigating Impact*. Navigatingimpact. Retrieved October 16, 2024, from <https://navigatingimpact.thegin.org/strategy/c4r/improving-household-resilience-to-flood-risk/>

Goethert, R. (2010, September). Incremental Housing: A proactive urban strategy. *MONDAY DEVELOPMENTS*, 23–25.

Haney, D. (2010). When Modern Was Green: Life and Work of Landscape Architect Leberecht Migge. In *Routledge & CRC Press*. Routledge.

Harris, R. (1999). Slipping through the Cracks: The Origins of Aided Self-help Housing, 1918–53. *Housing Studies*, 14(3), 281–309. <https://doi.org/10.1080/02673039982803>

Hochhäuserl, S. (2014). Grass roots modernism: Architecture and organization in Austrian settlements and allotment gardens, 1921–1925. *ResearchGate*. https://www.researchgate.net/publication/290878263_Grass_roots_modernism_Architecture_and_organization_in_Austrian_settlements_and_allotment_gardens_1921-1925

Islam, F., Talucder, M. S. A., Das, M., & Uddin, M. S. (2023). LIFESTYLE STATUS OF SLUM PEOPLE IN SYLHET CITY OF BANGLADESH. *ResearchGate*. https://www.researchgate.net/publication/384324600_LIFESTYLE_STATUS_OF_SLUM_PEOPLE_IN_SYLHET_CITY_OF_BANGLADESH

Islam, M., Kotani, K., & Managi, S. (2016). Climate perception and flood mitigation cooperation: A Bangladesh case study. *Economic Analysis and Policy*, 49, 117–133. <https://doi.org/10.1016/j.eap.2016.01.001>

Mallick, J., Shahriar, A. T. M., Rashid, A. M. M., & Munira, S. (2024). ASPIRATION PICTURE AND CLIMATE ADAPTATION: HOUSEHOLDS' INCREMENTAL STRATEGIES IN CLIMATE-RESILIENT HOUSING IN RURAL COASTAL BANGLADESH. *Khulna University Studies*. <https://doi.org/10.53808/kus.2024.21.01.1012-se>

Mokhlesur Rahman, M. M., & Islam, A. (2013). Adaptation Technologies in Practice and Future Potentials in Bangladesh. In *Disaster risk reduction* (pp. 305–330). https://doi.org/10.1007/978-4-431-54249-0_16

Mota, N. A. (2021). Incremental Housing: A Short History of an Idea. In L. Medrano, L. Recamán, & T. Avermaete (Eds.), *The new urban condition : Criticism and Theory from Architecture and Urbanism* (pp. 160–182). Routledge.

Napier, M. (2002). *THE ORIGINS AND SPREAD OF CORE HOUSING* [PhD Dissertation, University of Newcastle upon Tyne]. https://www.researchgate.net/publication/260126216_Core_housing_enablement_and_urban_poverty_the_consolidation_paths_of_households_living_in_two_South_African_settlements

Neuwirth, R. (2005). Shadow cities: A billion squatters, a new urban world. In *Routledge eBooks*. Routledge. <https://doi.org/10.4324/9780203936245>

Nohn, M., & Goethert, R. (2017). *Growing Up! The search for high-density search for high-density multi-story incremental housing: Presentations of built examples at the network session and documentation of the Associated Training Session at the United Nations World Urban Forum, Naples 2012*. <https://portal.dnb.de/opac.htm?method=simpleSearch&cqlMode=true&query=idn%3D1137624736>

Oxford Languages. (2024). Global South. In *Oxford Languages*.

Pal, J., & Hussain, M. (2016). Health care practices of older people in Sylhet: A study conducted in slum areas of Sylhet city of Bangladesh. *International Journal of Humanities Social Sciences and Education*, 3(4). <https://doi.org/10.20431/2349-0381.0304011>

Rana, M. M. P., & Ilina, I. N. (2021). Climate change and migration impacts on cities: Lessons from Bangladesh. *Environmental Challenges*, 5, 100242. <https://doi.org/10.1016/j.envc.2021.100242>

Rashid, M. U. (2020). Identification of Housing Crisis in a Confined Settlement: A study of Mohammadpur Geneva Camp. *CREATIVE SPACE*, 7(2), 125–142. <https://doi.org/10.15415/cs.2020.72011>

Rashid, S. F., Gani, S., & Sarker, M. (2013). Urban Poverty, Climate Change and Health Risks for Slum Dwellers in Bangladesh. In R. Shaw, F. Mallick, & A. Islam (Eds.), *Climate Change Adaptation Actions in Bangladesh* (pp. 51–70). Springer.

Roy, A. (2004). Transnational Trespassings: The Geopolitics of Urban Informality. In *Urban informality: transnational perspectives from the Middle East, Latin America, and South Asia*. Lexington Books (pp. 289–317). Lexington Books ; Center for Middle Eastern Studies, University of California at Berkeley.

Shaw, R., Mallick, F., & Islam, A. (2013). Climate change adaptation actions in Bangladesh. In *Disaster risk reduction*. <https://doi.org/10.1007/978-4-431-54249-0>

Sheppard, E., Leitner, H., & Maringanti, A. (2013). Provincializing Global Urbanism: A manifesto. *Urban Geography*, 34(7), 893–900. <https://doi.org/10.1080/02723638.2013.807977>

Turner, J. (1968). The Squatter Settlement: an Architecture that Works. *Architectural Design*, 38, 355–360.

Turner, J. (1972). Housing as a Verb. In J. Turner & R. Fichter (Eds.), *Freedom to Build: Dweller Control of the Housing Process* (pp. 148–175). Collier Macmillan.

United Nations Environment Programme. (2021). A Practical Guide to Climate-resilient Buildings & Communities. In *UNEP - UN Environment Programme*. <https://www.unep.org/resources/practical-guide-climate-resilient-buildings>

United Nations Human Settlements Programme. (2003). The Challenge of Slums: Global Report on Human Settlements. In *UN Habitat*. Earthscan. Retrieved November 8, 2024, from <https://unhabitat.org/the-challenge-of-slums-global-report-on-human-settlements-2003>

United Nations Statistics Division. (2023). *SDG indicators: Make cities and human settlements inclusive, safe, resilient and sustainable*. United Nations. Retrieved October 16, 2024, from <https://unstats.un.org/sdgs/report/2023/goal-11/#:~:text=Over%20half%20of%20the%20global,in%20the%20next%2030%20years>

Varma, R. (2018). Affordable Cities: Interview with Charles Correa. *DASH | Delft Architectural Studies on Housing*, 7(12/13), 88–101. <https://journals.open.tudelft.nl/dash/article/view/4998>

Wagner, M. (2016). *Martin Wagner: The Growing House: Das Wachsende Haus* (J. Fezer, M. Hager, & C. Hiller, Eds.). Spector Books.

Wainer, L. S., Ndeneingoma, B., & Murray, S. (2016). Incremental housing, and other design principles for Low-Cost housing. In *The International Growth Centre* (C-38400-RWA-1). Retrieved October 14, 2024, from <https://www.theigc.org/sites/default/files/2016/11/Wainer-et-al-2016-final-report.pdf>

Wakely, P. (2018). Housing in developing cities. In *Routledge eBooks*. <https://doi.org/10.4324/9781351212397>

Wakely, P., & Riley, E. (2011). The case for incremental housing. *Cities Alliance : Cities Without Slums*, 1–72. <http://web.mit.edu/incremental-housing/articlesPhotographs/pdfs/Case-for-Incremental-Housing.pdf>

13. Bibliography

Balestra, F. (2014, September). Contemporary museum for architecture in India: Architecture every day. *Domus*, 10, 34–41.

Correa, C. (2012). *A place in the shade: The New Landscape and other essays*. Hatje Cantz.

Davidson, C. (1995). Aranya Community Housing. In *Architecture Beyond Architecture: Creativity and Social Transformations in Islamic Cultures*. Academy Editions.

Goethert, R. (2014). *CAPTURING PROCESS OF INFORMAL HOUSING DEVELOPMENT : A LONGITUDINAL SURVEY METHODOLOGY a pattern recognition approach* [Slide show]. UN WORLD URBAN FORUM 7, Medellin, Colombia. (Original work published 2010)

Liechty, G. (2023, April 26). Incremental housing — the case for slums and beyond. *Medium*. <https://medium.com/@guy.liechty/incremental-housing-the-case-for-slums-and-beyond-f9cd234149f2>

Morshed, A. (2017). The Politics of self-Help : women owner- Builders of grameen Houses in rural Bangladesh. *Cua*. https://www.academia.edu/82520495/The_Politics_of_self_Help_women_owner_Builders_of_grameen_Houses_in_rural_Bangladesh

Mota, N. A. (2018). To Be Continued.: Housing, Design and Self-Determination. *DASH | Delft Architectural Studies on Housing*, 7(12/13), 52–69. <https://journals.open.tudelft.nl/dash/article-view/4995>

Munot, Y. (2023). *Participatory In-Situ Slum Upgrading in Yerwada, Pune* [MSc Thesis]. Erasmus University Rotterdam.

Padora, S. (2020). *How to build an Indian house*. Nai010 Publishers.

Van Gameren, D., Van Andel, F., & Van Der Putt, P. (2016). *Global Housing: Affordable dwellings for growing cities* (Vol. 12/13). Nai010 uitgevers. <https://doi.org/10.7480/dash.12/13>

14. Illustration Credits

AFP. (2024). *Multiple buildings submerged*. https://www.gva.be/cnt/dmf20240822_95099050

Alejandro Aravena. (n.d.). <https://parametric-architecture.com/10-remarkable-works-of-alejandro-aravena/>

Aranya Low-Cost Housing. (1993). <https://hiddenarchitecture.net/aranya-low-cost-housing/>

Asif Mahmud, S. & WFP. (n.d.). *Char Bara Dhul, Belkuchi Upazila, Sirajganj, Bangladesh. Floods submerged many houses on the Char Bara Dhul, a riverside village, leaving many residents marooned*. <https://www.disasterprotection.org/blogs/anticipatory-action-for-monsoon-flooding-in-bangladesh>

bdnews24.com. (2024). *Mohammadpur Geneva Camp*. <https://bdnews24.com/media-en/image/39b8e9e5293a>

Charles Correa. (n.d.). <https://architectuul.com/architect/charles-correa>

Charles Correa Foundation. (n.d.). *Belapur Housing*. <https://charlescorreafoundation.org/2022/03/13/incremental-housing/>

Flood Forecasting & Warning Centre. (2024, October 30). *Flood Inundation Map of Bangladesh*. <http://www.ffwc.gov.bd/index.php/map/inundation-map/bangladesh-today>

Hossain, M. P. (2024). *Floods in Bangladesh*. <https://www.volkskrant.nl/buitenland/bangladesh-boos-op-india-vanwege-zware-overstromingen-die-beide-landen-treft~b333b15f/?referrer=https://www.google.com/>

Land, P. (1976). *PREVI aerial photograph*. <https://www.transfer-arch.com/reference/previ-lima-1969/>

Palma, C. (2010). *Quinta Monroy*. <https://www.architectural-review.com/buildings/housing/revisit-quinta-monroy-by-elemental>

Prasad, A. (n.d.). *B. V. Doshi*. <https://www.architecturaldigest.in/story/remembering-architect-bv-doshi-indian-architecture-iconic-landmarks/>

