

Slum upgrading and Incremental Housing in Practice- learning from Le Corbusier&Chandigarh, Alvaro Siza&Malagueira, towards an architecture and urbanism for climate change (Portugal and India cases)

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Keywords

Incremental Housing; Slum upgrading; community design; virtual reality; participatory approach; vulnerable communities; disaster risk; humanitarian architecture; climate change;

Partner Institutions

University of Beira Interior (UBI), Faculty of Architecture of the University of Lisbon (FAUL), ONG Building 4 Humanity

Expected Future Partner Institutions

Municipality of the studied areas

OBJECTIVES

1. To discuss and advance the concept of incremental housing in social housing complexes and relocation settlements after disaster by looking at architecture masterpieces authored by Alvaro Siza and Alejandro Aravena as examples of site and service projects of the World Bank (in India);
2. To revisit the work of Le Corbusier in Chandigarh to learn lessons from modernist movement ideas and reframing them according to climate change adaptation principles, to apply the above knowledge in slum upgrading, post disaster reconstruction and resettlement project;
3. To explore methodological responses to slum upgrading and incremental housing by involving local families and assisting them through community mapping and design, and cutting edge digital tools;
4. Departing from householders' perception of their needs and aspirations, to develop sustainable slum upgrading and healthier incremental housing guidelines, to support the implementation of self help and aided and self-help procedures.

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ABSTRACT + IMAGES

From a cross-disciplinary view, the research focuses on Humanitarian Architecture and Urban Design (HAUD) and Incremental Housing (IH) practices. It addresses poorly -infrastructure areas in the periphery of major cities particularly affected by climate change (CC) and the Covid-19 pandemic. The project investigates HAUD as a reshaping of conventional architecture and urban design and IH as a response to low-income families' housing needs. The vulnerability and exposure to the risk of communities in slum areas are very high therefore, they suffer increased impacts of CC and the pandemic. The rising number of disaster-affected or poorly sheltered displaced populations underlines the need for skilful professionals in the field. With the severity of natural hazards and biological disasters, we are dealing with stress that needs increased professional attention. Literature, scientific meetings, master courses and professional board initiatives, such as forums, design competitions and training, confirm HAUD as an emerging and encompassing body of knowledge. Currently, HAUD is being advanced by practitioners and scholars interested in the role played by architects and urban planners co-working with humanitarians, social and health workers in slums, disaster-prone areas, poverty regions and crisis scenarios. To fill the gap between designers, other professionals and stakeholders, the project aims at developing translational tools while creating a framework for exploring innovative theory and practical approaches to disaster risk reduction (including biological ones), (re)building, IH and resettlement processes. These approaches to the decent housing shortage and the low adaptation capacity to CG and contagious respiratory diseases (such as COVID or tuberculosis) bring disaster risk reduction to design and building.

To fully understand the potential of combining HAUD, IH and climate change adaptation design strategies, the research will look at current and remarkable past experiences. Namely, the seminal work of Le Corbusier in Chandigarh in the fifties and sixties with synthesizes the achievements of the modern movement in architecture and urbanism; the 80's World Bank Site and Services (resettlement) projects in India, and the work of Alvaro Siza and Alejandro Aravena related to housing complex with use of incremental housing concept. Building on previous research and fieldwork collaborations, and employing digital tools to advance ideas for IH and facilitate householders visualization of the proposed slum upgrading and IH solutions, the project involves academic, NGOs and local partners in Portugal and India, and the USA. Research products include publications, outreach, educational and training proposals, joint action-research projects applications, an online collaborative database to share and transfer knowledge across other geographies. Further outputs include a mobile application enabling incremental builders to anticipate and visualize automatic design proposals and calculate associated costs. The implications of the research findings will be discussed with the local bodies in order to influence Architecture, Urban Design, Housing, disaster risk reduction, climate change adaptation and public health policies.



Fig. Sanjay Labour Street View



Fig.2 From an informal setting into a neighborhood: Santa Marta de Corroios, in the Lisbon Metropolitan area (Seixal Municipality) (Google Earth)



Fig.3 Self construction and attempts at 'incremental housing'

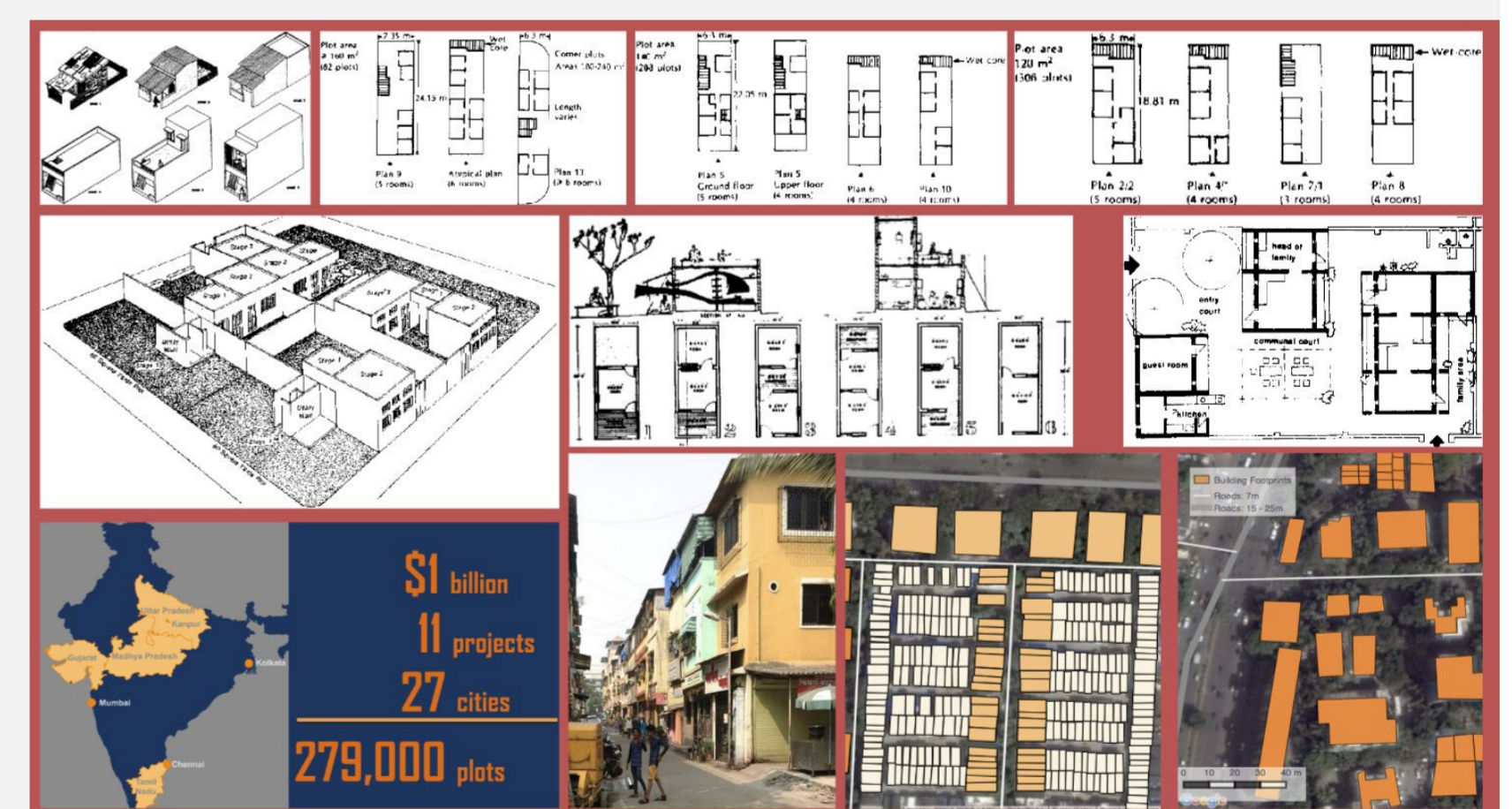


Fig.4 Site and Services projects, "Incremental Housing" strategies

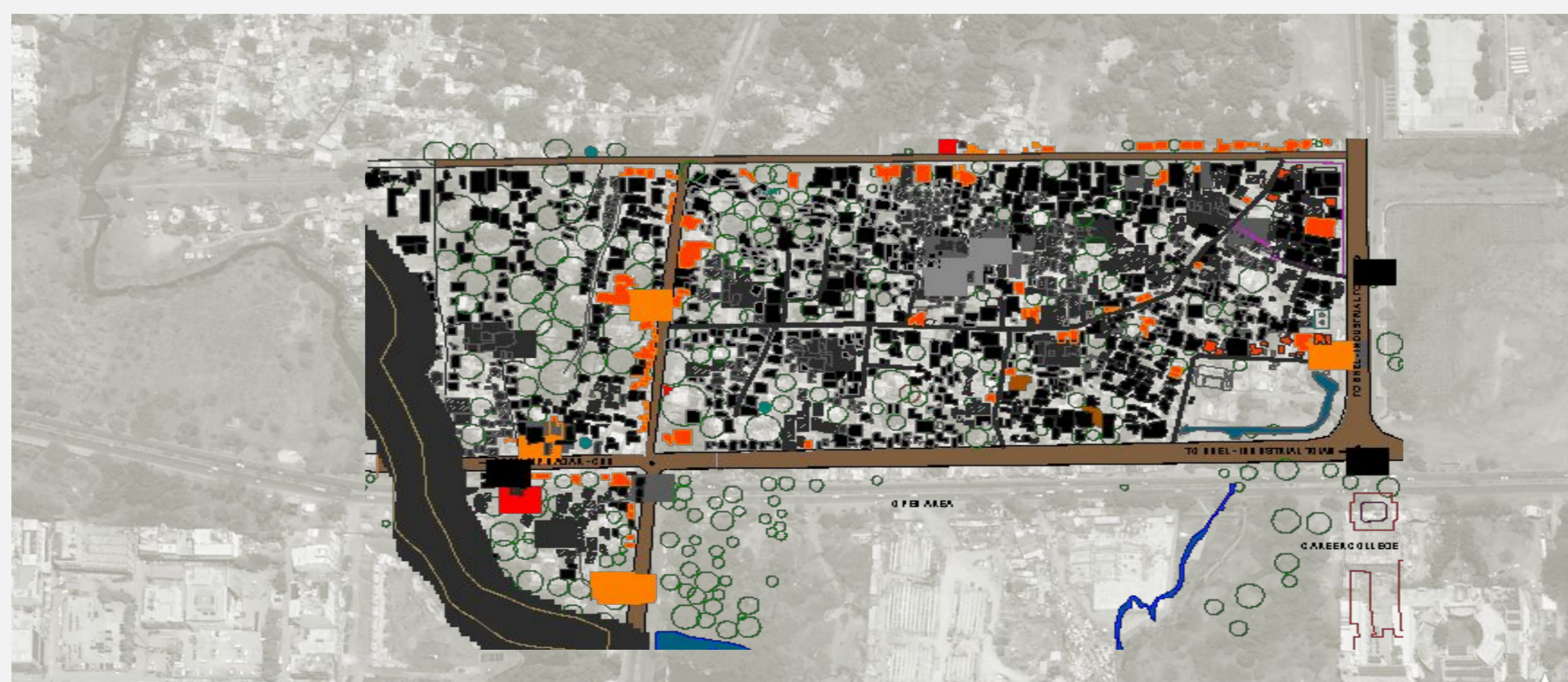


Fig.5 An Industrial slum of Bhopal - Anna Nagar (Google Earth).

SCIENTIFIC RELEVANCE FOR THE DISCIPLINE

There are many studies focusing on the participatory design methods, incremental housing, slum upgrading, as well as climate change origins and impacts. Recently, significant research has been conducted on the relationship between Covid-19 and public health measures. Further, investigations on airborne transmission factors, both from a clinical and an indoor environmental quality standpoint, tackled the ways in which Covid-19 can spread inside buildings and public transportation systems. However, there is still an important gap regarding cross-disciplinary studies that can bridge design, natural based solutions, health and indoor virus dissemination. Indeed, the cultural, the psychological, the environmental and the spiritual, besides the clinical, permeate architecture and urban design. So, if we want to tackle the problem raised by CC and Covid-19 through improving the design and building of home and public areas, an encompassing framework should be considered. This research intends to fill an important gap in architecture and urban design by adopting a social inclusive & community-design viewpoint and expanding the potential of NBS towards climate resilient and healthier urban (slum) upgrading and incremental housing.

EXPECTED ECONOMIC AND SOCIAL IMPACT

Community-design is today an emerging participatory design practice that brings the householders to the core of the design process, switching from the idea of people addressed to people involved. This means that architects and urban designers to often play an intermediate and cultural role, refraining from a design-control centred approach. Particularly in informal areas and incremental housing process, which currently represents a very significant part of the urban fabric, with nearly 1 billion people living in informal areas and self-construction or aided-self being the predominant. NBS represents a new paradigm in climate adaptation and urban regeneration responses which architects&urban designers are still to become familiar to, after a long period and delusional abundance of resources. Both the impacts of climate change and covid-19 called the attention to the need of a new approach to design, showing that public health is strongly linked to the economies at the local, regional and global level. CC and covid-19 also put in evidence that when public health is at risk, not only the wellbeing of individuals is at stake, as they cause devastating impacts in terms of diseases and casualties, but the current lifestyle and livelihoods can be seriously compromised. This project points to the improvement of the practice thereby influencing public housing and sanitation policies.

RESEARCH PLAN AND TASKS

The plan relies on the exchange of knowledge of Portuguese and Indian universities. The research project will build upon previous cooperation, namely the joint-project CIAUD_ENGAGE, Cities, Informality, Architecture, Urban Design and Engagement; investigating biological hazards, climate change and health adaptation strategies within vulnerable communities in Lisbon (and Bhopal) (which had as outputs one conference paper at the iRec - information and Reconstruction 2023 Sendai conference, a journal article, in the FAUL Portuguese journal, *Espaços Vividos e Construídos*, and a chapter in the book *Humanitarian Architecture in Practice*, by Springer (all to be published very soon).

This new stage of cooperation is supposed to expand and enhance the current partnership between the Portuguese universities of UBI (University Beira Interior), and FAUL (Faculdade de Arquitetura de Lisboa) and Indian Universities, IIT (BHU) Varanasi and IIT Roorkee and MANIT Bhopal.

The project will be developed at the CIAUD pole of UBI and will be based on fieldwork to be carried out, in four stages which correspond to different tasks and associated different methods: Local fieldwork and observational analysis will be carried out in study sites: selected slum areas in Lisbon periphery, namely in Santa Marta de Corroios at the municipality of Seixal, and slums in Bhopal and Chandigarh. A member from the Portuguese team will travel and participate, coordinate and articulate personally the co-working of both research teams (Portuguese and Indian); The qualitative data recollection and analysis comprises selective (not exhaustive) literature review, very limited technical and social surveys, a few semi-structured interviews with a focus group composed of households and key informants (informal conversation) and selected architectural and urban projects overview.

Surveys employing imaging techniques will be utilized to obtain high-resolution imagery and gather pertinent data about slum settlements, and topographical features. The surveys will also employ virtual reality (VR) applications to visualize potential enhancements to housing, novel designs, and sustainable technologies (Delgado, J., Oyedele, L., Demian, P., Beach, T., 2020). Due to the project's constraints this task will be limited to one single selected street in both Portuguese and Indian sites.

We will be looking at the role played by different stakeholders – as householders, local leaders, builders, decision-makers, designers and social technicians - and revising some of their social interactions based on the outcomes of the interviews and talks. Through a local workshop we shall create an online table of discussion (on Microsoft teams) which will be kept open for different inputs of the research teams (such as new data, and findings) and available permanently for new contributions.

Outreach, and webinars involving locals, communities leaders and local representatives will boost the visibility to the project and eventually influence local and regional public policies. Specialized members of both teams will be handling UAV based

Photogrammetry, Geospatial Data Quality, Remote Sensing, GIS Applications, BIM integration and generative design. (Namely Pedro Duarte, João Garcia and Lais Penha from Portugal and Harsimran Kaur, Anurag Ohri and Parshant Rehal from India).

Consultants will be assisting the research team (which includes two PhD students from each side) in the areas of the right to the city debate (Isabel Raposo), psychological impacts on the elderly (Rosa Marina Afonso), shape grammars for generative design housing (José Nuno Bairão) and mass customization and immersive reality (José Pinto Duarte). (Duarte, J.P. 2001)

Since the incremental housing emphasizes a gradual development and expansion of the overall house, usage of AR and VR visualization and simulation techniques will be helpful for stakeholders to make informed decisions on indoor design planning, material selection, and process of construction. Such a process relies heavily on active community participation and stakeholder engagements. As per Delgado et. al. (2020), six general use-cases have been identified for the application of Augmented Reality (AR) and Virtual Reality (VR) in the Architectural, Engineering, and Construction (AEC) sectors.

The six main categories of activities in this context are: Stakeholder engagement, Design support, Design review, Construction support, which encompasses construction planning, progress monitoring, construction safety, and operative support as sub-categories; Operations and management, and Training. Use of AR and VR techniques can be influential in showcasing and exposing the capabilities of incremental housing to the stakeholders.

The surveys carried out in the initial stages will be incorporated into a database to be shared through an online collaborative platform. The project will also benefit from consultations with the Pennsylvania University to exchange with the Computing Design Innovation group led by FAUL Professor José P. Duarte who uses 3D and Virtual and Augmented Reality in the favelas of Rio (with his students). Adding to this we shall cooperate with the Digital Computing Group at CIAUD, aiming at the design of an App to support households in finding the best incremental housing solutions and calculate related costs. In further developments of the project, open GIS software and graphical user interface apps it will be able to run on mobile devices, geo-referencing and storing information about risks and houses' surveys and incremental housing (IH) solutions.

These solutions will be devised and co-designed within the local communities, taking as reference the architectural lessons. Namely those taken from:

- Chandigarh urban planning and architectural urban form by Le Corbusier, considering sunlight and natural ventilation, and the balance between urban systems, built, green and mobility.
- Site and Service projects (Caminos, H. & Goethert, R., 1978) George, G. & Goethert, R. (2011)

- Alvaro Siza's Malagueira evolutionary social housing project and Alejandro Aravena's resettlement projects in Chile to accommodate communities affected by disasters (tsunamis, earthquakes and forest fires). A catalog of IH will be set up, feed the project database and be shared among partners.

The project will finish with the returning to the field and showing the local residents the created solutions through traditional drawing and also virtual reality, possibly using equipment to augmented reality visualization. A booklet summarizing the project will be distributed to local representatives and a presentational exhibition of the material produced will be proposed to the involved universities and municipalities (in alternative this will take place online).

EXPECTED SCIENTIFIC RESULTS

Framing design guidelines for slum upgradation and incremental housing from the perspectives of architecture and urban design for the stakeholders in India and Portugal.

Knowledge dissemination of the technological survey findings to the householders, in the form of webinars and onfield discussions for inclusive redevelopment and upgradation approaches

Documenting Cost effective design options and solutions to invigorate a consensus of the strategies for slum area upgradation proposals and encourage the householders to participate in design and upgradation approaches and implement the design interventions on their own to their living environments

Action based initiatives in the form of publications in a reputed journal, and a book chapter to be published on the findings

Outreach activities, including seminars, focus group discussions and workshops for the local communities to share their knowledge and experiences for generating a learning about the community resilience to disasters and pandemics.

BUDGET: € 7.500,00

- a) travel expenses: 3800€
- b) digital equipment: 1700€
- c) software: 600€
- d) design services: 250€
- e) web-services: 300€
- e) stationery and printing shop: 500€
- f) ink cartridges: 100€
- g) insurance: 250€
- Total: 7500€