



Presentations of Built Examples at the Network Session
and Documentation of the Associated Training Session
at the United Nations World Urban Forum, Naples 2012

Growing Up!

**THE SEARCH
FOR HIGH-DENSITY
MULTI-STORY
INCREMENTAL
HOUSING**



mu International Cooperation
and Urban Development

SIGUS - Special Interest Group in Urban Settlement 
Affiliated with the MIT Leventhal Center for Advanced Urbanism

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Growing Up!

THE SEARCH FOR HIGH DENSITY MULTI-STORY INCREMENTAL HOUSING

**A Publication of
The Global University Consortium
Exploring Incremental Housing**

**This publication contains the summaries of presentations
on multi-story incremental housing from the 6th Session of
the World Urban Forum in Naples, Italy, in 2012.**

The original presentations may be viewed at: web.mit.edu/incrementalhousing > WUF 6.

**GLOBAL UNIVERSITY CONSORTIUM EXPLORING
INCREMENTAL
HOUSING**



*It keeps
getting
better!*



The Jalousie informal community in Haiti - surprisingly undamaged from the earthquake, an image of success.

Can the exploding urban population challenge be met with ***new incremental initiatives*** for accommodating growth?

Can the ***demonstrated energy of the informal sector*** be supported through multi-story 'starters'?

Does a ***multi-story incremental strategy*** justify the high capital costs of utility infrastructure networks?

When making policy choices, ***which is best to support***: the informal dynamic, the formal housing, or transformation of existing public housing - or all three?

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Matt Nohn, Loeb Fellow, Harvard, former Visiting Professor of Urban Management, TU Darmstadt
Dr. Reinhard Goethert, Director, SIGUS-MIT

The Introduction revisits the concept of multi-story incremental housing as a pragmatic strategy for addressing rapid urban growth pressures. They provide rationales for incremental and multi-story incremental housing, reflect upon the case studies

presented, and provide further examples, particularly of the early thinking, to broaden the empirical base of the discussion. A comparison of the incremental expansion possibilities is included as summary.

44 OVERVIEW: A Paradigm Shift In Global Housing Strategy

Claudio Acioly, Jr. Head, Capacity Development Unit, Housing and Urban Management, UN-Habitat, Nairobi. *Summarized by Venkata Narayanan AL, Mundus Urbano*

This Session highlights the growing interest by the development community on the emerging proactive incremental housing strategy. UN-HABITAT's Capacity Development Unit, promotes the importance of incremental housing as a powerful largely informal process that provides viable alternatives for urban residents to access affordable shelter, to improve it over time, and to eventually live in decent housing. Given its outstanding achievements at a very large scale, the UN considers it as a key housing strategy for its 'Global Shelter (Housing) Strategy 2025'.

The addition of the vertical incremental housing op-

tion responds to the increasing need to deliver affordable solutions in the face of increasingly valuable urban land due to rapid urbanization. Well-designed housing policies can bring the incremental process to scale, speed it up and improve the process—provided that the policy makers understand the process. Innovative policies are inclusive of the informal practices.

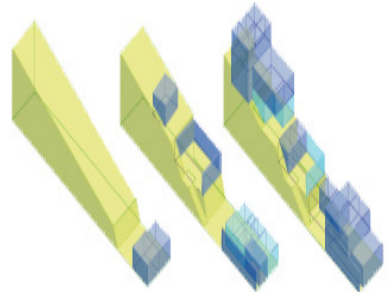
47 PERU – The Informal Alternative

Susana M. Rojas Williams; Director, International Shelter Initiatives; Habitat for Humanity International, Washington, D.C.

Summarized by Lia Brum, Mundus Urbano

Multi-story examples from the competition!

The study is based on longitudinal surveys of now legalized settlements from the 60s and 70s in Lima. Self-help housing policies in Peru were examined by revisiting Independencia, one of Lima's 'young towns' (legal squatter settlements) and trace the incremental development over a forty-five year period since its founding. The presentation also includes reflections on experiences from other countries.



EL SALVADOR – Fundasal's Two-story Expandable Units 52

Arq. Claudia Blanco, Directora Ejecutiva FUNDASAL El Salvador.

Summarized by Manuela Pinilla Rodriguez, Mundus Urbano.



Examples from recent longitudinal surveys of 2-story 'starter cores', developed from their extensive experience in self-help housing since the '70s. Their Las Palmas expandable unit programs a second story expansion. FUNDASAL has been the leader in developing 'site & services' projects since the 70s, which have become the model for programs around the world.

HAITI – The T-Shelter: 2-Story Rebuilding After Disaster 57

Ann Lee, Project Director, Katye Project, Haiti.

Summarized by Lia Brum, Mundus Urbano



A recent example using innovative construction, funded by USAID as part of its community + house rebuilding program. It is a pilot project of innovative solutions for a post-disaster situation in a highly urbanized area: 2-story temporary structures allow for the return of displaced people from the Haiti earthquake in a heavily damaged neighborhood. The project relied on flexibility of design to cater to the often difficult post-disaster reality. The presentation looks at the pros and cons of temporary to permanent housing, as well as reflects on the next level of innovations.

62 EGYPT – Housing Prototypes - 6Th October New Town

Dr. Ahmed Shalaby, Cairo University, Egypt.

Summarized by Sandra Michel and Larissa Gocht, Department of Architecture, TU Darmstadt

Ebny Baitak or “Build Your Own House” seeks to solve the housing problems of low-income groups in Egypt. The huge informal housing sector in Egypt has proved the ability of the low-income groups to build for their own selves. This approach is considered a tool to encourage the participation of low-income groups in the construction process of their own houses in a planned and controlled environment. The project started in 2005 with the aim of providing more than 90 thousands plots of an area of 150 sqm. Each plot accommodates a small house that consists of ground plus two upper floors. Each floor has a residential unit of an area of 63 sqm in addition to a 12 sqm as a stair.

The project accommodates about 270,000 units of 63 sqm over 90,000 plots, adopting a vertical incremental expansion approach. The beneficiary has to build a two-bedroom unit of 63 sq.m. at each stage, and starts by building the ground floor for his fam-



ily use. The beneficiary can use the upper floors for his own family expansion. Otherwise, he can sell or rent the units of the upper floors to other people and generate financial benefits while providing housing units for others.

69 EGYPT – Transformations of Multi-story Public Housing in Egypt

Dr. Graham Tipple, Consultant in housing and urban policy in rapidly developing countries;

Visiting Fellow, School of Architecture, Planning and Landscape, Newcastle University, England.

Summarized by Lillith Kreiß, Department of Architecture, TU Darmstadt



Many countries have large stocks of government-built housing which, for various reasons, are in poor physical conditions and/or do not conform to the expectations of occupants. The occupants of such housing frequently make unauthorized but quite considerable changes and extensions (transformations) to their dwellings. This presentation highlights user-initiated transformations to government-built housing, with emphasis on the extensive transformations on the public housing in Cairo.

CHILE – Examples from Widespread Experience

Prof. Margarita Greene, Pontificia Universidad Católica de Chile

Summarized by Manuela Pinilla Rodriguez, *Mundus Urbano*

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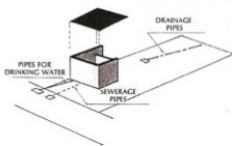
The presentation makes the case for multi-story core housing and the role of incremental housing in Chile. It traces the history of housing policy in the country, from focus on tenure, to upgrading, to now core housing and more recently to include the neighborhood. A wide range of multi-story examples are illustrated reflecting the extensive experience in Chile, from the well-known Elemental models, but also 2-story and more recent proposals for 6-story incremental units. It notes that planned core units are better than unplanned beginnings.

It concludes that the legal and the political frameworks, resources available, national technologies and available technologies are the key influences. It argues the vital importance of incorporating broader issues when developing housing policies.

Incremental Housing Design Strategies To Meet Rapid Urban Growth

Dr. Reinhard Goethert, Principal Research Associate, SIGUS-MIT

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Summarized by Blanca Calvo Boixet, Elena

Mozgovaya and Daniela Sanjines, *Mundus Urbano*

The general background to the critical physical design of core units was presented, with several exercises to focus the issues and engage the audience. The starter single room core was examined as the base for multi-story expansion.

Five challenges structured the presentation: How to cope with the readily increasing population and the demand for housing - what is the magnitude of demand? Which housing models are appropriate for lower income groups? How to make construction accessible to consider local skills? Where to place the starter core unit to offer most flexibility? And last, how could families in exiting walkups modify their units - how do your ideas match a real example from Manaus, Brazil?

Contributors

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INTRODUCTION

MULTI-STORY INCREMENTAL HOUSING TO MEET RAPID GROWTH

Reflections by Matt Nohn (Harvard) and Reinhard Goethert (MIT)

Introduction

The *Global University Consortium for Incremental Housing* hosted two events on multi-story examples at the UN-Habitat World Urban Forum 6, which took place in Naples, Italy, September 1–6, 2012. During training and networking sessions, the Consortium shed light on the relevance and approaches to incremental housing in general and multi-story incremental housing in particular. There were three major concerns:

First, the speed and magnitude of today's urbanization is unprecedented. Without sufficient affordable shelter available at large scale and delivered rapidly, a high share of the urban population increase will be forced to live in slums and informal settlements. (Table 3) In this regard, incremental construction is not only the single largest creator of new affordable housing units worldwide, meeting the changing needs and priorities of poor families over time, but also a useful tool for aiding governments to deliver housing rapidly and at a large scale, reducing public management burden and capital costs significantly. In short, incremental housing is suggested as one of the only viable policy alternative to respond to rapid urbanization challenges with the required speed and scale and without exhausting urban poor households' and public sector resources.

Second, due to inter alia urban population and per capita real income growth facing constrained land supply and artificial regulatory constraints, land prices are exploding so that the urban poor cannot afford to buy in the formal market of rapidly urbanizing cities. To limit the impact of high land prices, multi-story incremental housing is a natural policy response: the two-pronged strategy blends the strong advantages of any incremental approach with the ability to pool land costs amongst a larger number of households participating in a dense, multi-story environment.

Third, it has always been an issue that the typical

single-story site and services project could not justify the initial capital costs of the infrastructure. The single-story initial density was considered to be just too small for the investment. One result has been the proliferation of 4-5 story walk-up apartments globally as a means to justify the costs.

And last, shared challenges of rapid urbanization constitute a great opportunity for international, particularly south-south learning. Since today's rapid urbanizers can learn from the experience of early urbanizers, the Consortium sessions brought together urban practitioners from around the globe to discuss case studies from Latin America and the Caribbean as well as Northern Africa.

In summary, multi-story incremental housing is reemerging on the international policy agenda. Therefore, development experts are revisiting incremental and multi-story construction experiences worldwide—be it in the scope of informal self-development, sites-and-services projects initiated by governments or development agencies or slum upgrading and reconstruction efforts after disasters.

“Double Population, Triple Area:” Urbanization is gaining speed and scale

The world's urban population is expected to increase by an additional 3.8 billion urban dwellers between 2010 and 2050. This increment does even outstrip the world's total (urban and rural) population of 3.5 billion in 1950 (UN Secretary-General, 2012). The increase of the urban population is particularly strong in Sub-Saharan Africa and South Asia where the population is forecast to double within only one generation (i.e. approximately 20 to 25 years). Concurrently, population densities are expected to fall (inter alia due to income growth, allowing to consume more living space per capita, and increased mobility, allowing to commute longer distances within growing metropolitan areas) so that the urban built-up area is forecast to

even triple within one generation (Angel et al, 2005).

As a consequence, many developing and emerging societies are under pressure to build all existing cities two times over again within only one generation. For example, Sub-Saharan African cities are expected to grow their urban land cover eight-fold within the first half of the 21st century. The challenges associ-

ated with this form of rapid urbanization are expected to aggravate any qualitative and quantitative housing backlog already existing—unless policies are developed that are not only simple and fast to execute but also affordable to all stakeholders so that they can be implemented at scale and at speed.

World Region	Urban Population		Annual growth	Urban Land Cover*		Annual growth
	2000	2050		2000	2050	
Eastern Asia & the Pacific	517,808	1,105,254	1.52%	52,978	188,208	2.54%
Southeast Asia	206,683	561,580	2.00%	34,448	148,306	2.92%
South & Central Asia	406,151	1,368,296	2.43%	59,872	325,332	3.39%
Western Asia	163,087	377,265	1.68%	22,714	100,639	2.98%
Northern Africa	84,167	222,442	1.94%	12,104	55,263	3.04%
Sub-Saharan Africa	210,046	1,009,641	3.14%	26,500	198,147	4.02%
Latin America & the Caribbean	393,208	681,383	1.10%	91,300	262,023	2.11%
All Developing Countries	1,981,149	5,325,861	1.98%	299,915	1,277,918	2.90%
World Total	2,853,978	6,397,158	1.61%	605,875	1,929,951	2.32%

Table 1: Urban population and land cover growth.

*Assuming a density decline of 1.0 percent per year.

Source: authors' calculation, based on Angel (2011)

In this context, incremental housing appears to be the only viable strategy for building affordable housing units at the scale and speed that is required to respond to the unprecedented magnitude of rapid urbanization. Key reasons include:

- Today, incremental construction is the housing strategy that creates the largest number of housing units worldwide, already. Wakely & Riley (2011) estimate that already 20 to 70 percent of developing country cities' housing stock is developed incrementally. (The share for rural areas may safely be assumed to be much higher.)
- Incremental housing saves time and money during start-up, which allows reaching more people in need more quickly. Instead of building expensive housing units that are complete in regard to size and quality, the incremental approach provides a decent (expandable and improvable) starter option.
- Incremental housing therefore also enables societies to tackle housing challenges more easily without being

financially constrained by public deficit, limited donor-support or the poor's ability to copay for housing.

- Further, incremental housing allows expanding the core unit step by step according to the occupiers' needs and preferences. For example, if the family grows the house may be amplified; if family income grows the housing standard may be upgraded; but if the family prefers to rather spend available income on health, food or education, instead, the family is free to prioritize accordingly and defer housing investments to any later stage; further, if the family wants to generate income, the household may construct and rent out an additional room, et cetera. Figure 1 illustrates these favorable characteristics of incremental housing construction in Cuevas, Lima, Peru.

In summation, incremental housing adjusts to the technical and financial capacity of both the low and moderate-income households and the public sector (Wakely & Riley, 2011). Furthermore, the flexibility and responsiveness to changing family needs

and priorities over time is a strong argument in favor of incremental construction. In this regard, incremental housing contrasts starkly to those public housing projects that force low-income households to overspend on housing and transportation, for example after being relocated from a slum and paying rent: these households can be trapped in overconsumption of housing (and transport) at the expense of cutting back on nutrition, health or education. It should be emphasized that housing itself is an important basic good as well

as a human right—but it is by no means the single most important one: forcing the poor to pay more for housing than they actually can (or want to) afford may make them worse off than living in a smaller or lower-standard house, even if this would be deemed “inappropriate” by policy makers. The adverse effects of such well-intended but counter-productive housing policies have been documented widely and are commonly accepted today.

“When people have no control over, nor responsibility for, key decisions in the housing process, then dwelling environments may become a barrier to personal fulfillment and a burden on the economy. The important thing of housing is not what it is but what it does in people’s lives. Deficiencies and imperfections in your housing are infinitely more tolerable if they are your own responsibility than if they are somebody else’s.”

Turner, 1976

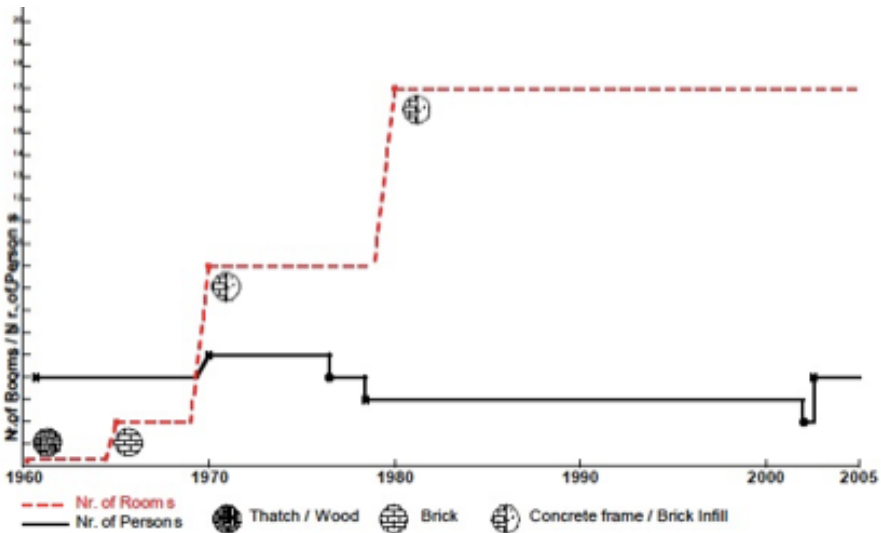


Figure 1: example of successful incremental housing construction in Cuevas, Lima, Peru.
 Source: FAUA/UNI & SIGUS/MIT Workshop (material online at: <http://web.mit.edu/incremental-housing/articlesPhotographs/pdfs/Cuevas-19-23Only.pdf>)

The pressure of utilizing lands more efficiently

Secondly, not only because of urban area expansion (Table 1) and income growth real estate prices increase in urbanizing and industrializing countries but also where land supply and transportation systems do not match the demand for land—which is almost always the case—constrained land markets let land

prices rise even more steeply. The urban poor cannot keep pace with this development, rendering them even more vulnerable to living with housing deprivations and in slum conditions (Table 2 and Table 3). Consequently, incremental construction on a small, informal plot of land is the only housing option that is affordable to the urban poor (Text Box 1 and Table 4).

Scenario – land condition	Land value
1: Agricultural land	\$2/sqm
2: Non-agricultural permit	\$10/sqm
3: Informal subdivisions (not serviced)	\$20/sqm
4: Peri-urban formal residential land (serviced), FAR 1.0	\$40/sqm
5: As 4, but increasing the FAR to 2.0	\$80/sqm
6: As 5, but permitting commercial as the highest value use	\$200/sqm
7: As 6, but constructing Bus Rapid Transit alongside the property	\$240/sqm
8: As 7, but increasing the permitted FAR to 5.0	\$480/sqm

Table 2: land price increases during urbanization

Note: FAR=Floor Area Ratio. Stylized figures based on permitted land use, density and level of infrastructure in Latin America. The value increase also reflects the urbanization of land that, originally located at the periphery, eventually locates at a relatively more central location due to urban expansion. Otherwise higher FAR would not automatically reflect in higher land value, due to lack of demand. Source: author's stylized calculations based on Smolka, Implementing Value Capture in Latin America (2013), GIZ, Bus Rapid Transit Planning Guide (2007), and qualitative interviews.

World Regions	Urban Population (000)			Slum Population (%)			Slum Population (000)		
	2000	2010	annual change	2000	2010	annual change	2000	2010	annual change
Developing Countries	1,955,811	2,576,832	2.80%	39.4	32.6	-1.88%	770,590	840,047	0.87%
Sub-Saharan Africa	215,277	309,519	3.70%	65.0	61.7	-0.52%	139,930	190,973	3.16%
Northern Africa	82,079	102,249	2.22%	20.3	13.3	-4.14%	16,662	13,599	-2.01%
Eastern Asia	613,013	838,931	3.19%	37.4	28.2	-2.78%	229,267	236,579	0.31%
South-Eastern Asia	200,179	261,532	2.71%	39.6	31.0	-2.42%	79,271	81,075	0.23%
Latin America and the Caribbean	393,619	465,246	1.69%	29.2	23.5	-2.15%	114,937	109,333	-0.50%

Table 3: Change in urban and slum population for the 2000-2010 period

Source: authors' calculations based on UN-Habitat (2013)

1 square meter of formal, serviced land at the periphery of Ahmedabad, Gujarat, India costs approximately INR 10,000 (US\$PPP 625) so that a small land parcel of 30 square meters costs INR 300,000 (\$18,750). For comparison, an urban poor household earns less than INR 3,300 (\$188) per month only, of which INR 500 (\$31) or 15 percent of household income is assumed to be disposable for housing. If the household were able to contribute a downpayment of INR 50,000 (\$3,125), which is difficult at this income level, a loan would need to finance INR 250,000 (\$15,625). Even if the household were eligible for formal credit, which is difficult again, interest of 1 percent per month would already amount to INR 2,500 (\$156): exceeding the capacity to pay by four times. Finally, figuring in the cost of amortization over a 10-year loan period, the equal monthly installment (EMI) would be INR 3,587 (\$224): even exceeding the household's income. In short, even if all favorable but unlikely assumptions held, the cost of financing a vacant 30 square meter land parcel would exceed the household's entire income over a 10-year period (ignoring the effect of income growth).

As a consequence, households opt for smaller land parcels (often less than 10 square meters in size) in the informal land market with prices starting at about INR 2,000 (\$125) per square meter. As a result a plot of land of 10 square meters costs as little as INR 20,000 (\$1,250), which can be financed from household savings (possibly augmented with help of extended family or informal credit). This is the typical starter option of the urban poor producing densely populated slums: building upon the 10-square-meter plot, shelter and infrastructure are developed step by step. This incremental strategy is affordable to virtually all households. Eventually improved with a starter core of 10 square meters, the package of land and unit costs approximately INR 50,000 to INR 100,000 (\$3,125 to \$6,250, depending on construction quality), which is affordable to many poor, but not the poorest households. In the contrary, the lowest-cost dwelling unit in the formal market costs INR 250,000 (\$15,625) or above, which is affordable only to middle-income households. Therefore, informal settlements, in which families start off with a shack or incrementally expandable core house, are the only affordable housing strategy for the majority of the urban poor outside of the reach of government assistance.

Note: In developed markets an income share of 30 percent spent on housing is assumed to be affordable. However, this rule of thumb does not hold for low-income households in developing countries, usually: an income share of only 10 to 15 percent should be assumed in most cases, as the households are forced to spend a significantly larger income share on basic goods, particularly food but also transportation. In addition, informally employed laborers without access to formal safety networks (e.g. health insurance) are more vulnerable to emergency situations. This has been documented/reconfirmed during market research for structuring low-income housing finance companies and national policies and is also found in literature (e.g. Fergusson & Payne, 2000).

Text Box 1: Affordability of land and housing in Ahmedabad, India in the year 2008
(The text uses a PPP conversion rate of 16, based on the World Bank.)

Affordability level	Household income	Payment capacity
Excellent: even affordable to the poorest	Equal to or less than INR 3,300	15% INR 500
Good: affordable to most poor households	Equal to or less than INR 7,300	20% INR 1,460
Fair: affordable to middle-income households	Equal to or less than INR 14,500	25% INR 3,625
Low: only affordable to better-off households	Over INR 14,500	25% INR 3,625

Loan Amount	Loan Term	Equal Monthly Installments (EMI) by annual interest rates					
		8.00%	10.00%	12.00%	16.00%	20.00%	24.00%
INR 20,000 Informal plot or starter shack on pre- existing lot	2.0 Year(s)	INR 905	INR 923	INR 941	INR 979	INR 1,018	INR 1,057
	5.0 Year(s)	INR 406	INR 425	INR 445	INR 486	INR 530	INR 575
	10.0 Year(s)	INR 243	INR 264	INR 287	INR 335	INR 387	INR 441
	15.0 Year(s)	INR 191	INR 215	INR 240	INR 294	INR 351	INR 412
	<i>zero amortization</i>	133	167	200	267	333	400
INR 50,000 Informal plot of land with a simple shack	2.0 Year(s)	INR 2,261	INR 2,307	INR 2,354	INR 2,448	INR 2,545	INR 2,644
	5.0 Year(s)	INR 1,014	INR 1,062	INR 1,112	INR 1,216	INR 1,325	INR 1,438
	10.0 Year(s)	INR 607	INR 661	INR 717	INR 838	INR 966	INR 1,102
	15.0 Year(s)	INR 478	INR 537	INR 600	INR 734	INR 878	INR 1,029
	<i>zero amortization</i>	333	417	500	667	833	1,000
INR 100,000 Informal plot of land with a decent starter core	2.0 Year(s)	INR 4,523	INR 4,614	INR 4,707	INR 4,896	INR 5,090	INR 5,287
	5.0 Year(s)	INR 2,028	INR 2,125	INR 2,224	INR 2,432	INR 2,649	INR 2,877
	10.0 Year(s)	INR 1,213	INR 1,322	INR 1,435	INR 1,675	INR 1,933	INR 2,205
	15.0 Year(s)	INR 956	INR 1,075	INR 1,200	INR 1,469	INR 1,756	INR 2,058
	<i>zero amortization</i>	667	833	1,000	1,333	1,667	2,000
INR 250,000 Lowest-end market: 25sqm flat in a walk-up	2.0 Year(s)	INR 11,307	INR 11,536	INR 11,768	INR 12,241	INR 12,724	INR 13,218
	5.0 Year(s)	INR 5,069	INR 5,312	INR 5,561	INR 6,080	INR 6,623	INR 7,192
	10.0 Year(s)	INR 3,033	INR 3,304	INR 3,587	INR 4,188	INR 4,831	INR 5,512
	15.0 Year(s)	INR 2,389	INR 2,687	INR 3,000	INR 3,672	INR 4,391	INR 5,146
	<i>zero amortization</i>	1,667	2,083	2,500	3,333	4,167	5,000

Table 4: Incremental construction on informal land is the only option affordable to most poor households. Cross-tabulation of loan amounts for typical underlying assets (land and construction), loan term and interest rate—the Case of Ahmedabad, Gujarat, India (Year 2008 data; INR can be converted to US dollar with an exchange rate of 16 INR/US\$PPP or of 44 INR/US\$.) Source: authors' calculations, based on market research for the SEWA Grih Rin business plan.

This discussion shows that incremental housing may be the only housing option at scale that is affordable for all parties involved. Ultimately, someone needs to pay the bill: be it the urban poor or the government or a combination of the two parties. (The private sector cannot be expected to build social housing, unless it is able to generate a profit paid by any of the former two groups. Exceptions such as corporate social responsibility projects exist. While welcome, they do not provide solutions at the required scale, however.) Therefore, affordability and cost recovery are two necessary preconditions for building any housing program that is large enough to counter the magnitude of rapid urbanization pressures.

Policy Options for Housing the Ultra Poor

The question of how to house the 'poorest of the poor' has been debated widely. As the ultra-poor have only minimal if any resources left for housing, it has often been argued that they would not be able to expand and, thus, be trapped with the starter package. Thus, an incremental approach would hardly work for them. Instead, the poorest of the poor should receive finished, complete units for either ownership or rental use.

Some early housing projects therefore included blocks of rental units. However, if the poor are subsequently charged full rent they will likely still not be able to afford it. As a consequence, the poor may be forced to cut back on other essential expenses (such as health or education; see above) or default on their rental payments. In the former case, "decent housing" may make the poor worse off than the housing they can afford in the free, typically informal market (Turner, 1976). In the latter case, the owner (usually a government) has two basic choices: to evict the people or to forego the rental income. Either choice is unattractive to public decision makers: besides the political risk, eviction would make the poor worse off than before moving into rental housing; in contrast, the failure of cost recovery makes the provision of rental units at scale impossible. Thus, fully charged rental units may be unable to tackle rapid urbanization at speed and at scale. Alternatively, if the poor pay only a subsidized

rent (e.g. for management and part of depreciation cost) or live rent-free, then they may as well receive a unit for ownership that is subsidized at the discounted value of the rental subsidy.

Designing Housing Programs for Scale

Owner-occupiers will likely both care better for the estate and more easily tolerate any deficits (Turner, 1976), resulting in a relatively smaller administrative challenge to governments – even though maintenance and possibly incremental expansion would still require public support. In that case, units would arguably need to be affordable to enable a high degree of cost recovery, required for addressing rapid urbanization at a meaningful scale without exhausting government resources. In addition, projects should be designed with characteristics that are somewhat unattractive to better-off households to reduce the risk of gentrification, the potential skimming off of subsidies and the likelihood of low-income households moving-back to informal settlements. Such characteristics should however not be confused with a poor standard that may raise ethical concerns. Instead, gradual provision of basic infrastructure (for example, starting with community-level water and sanitation facilities and improved dirt roads), shared tenure promoting collective action and limiting property transactions or limited parking options are other strategies that are not only unattractive to middle-income households but also acceptable to the poor, if not natural features of low-income self-provision. For example Cohen (2007) mentions the case of the early sites and service project Pikine in Dakar, Senegal where the provision of running water in the individual housing units (instead of originally planned community water taps) likely promoted gentrification and capture of subsidies by better-off households. In summary, incremental housing can reduce the required capital outlay significantly. Thereby, it becomes possible to build affordable housing for the exponentially growing urban population at a large scale and rapidly.

A large variety of starter options exist, ranging from "empty lots" as the lowest-cost option over small "starter cores" and "starter shells" to more complete

houses or apartments, possibly embedded in multi-story structures but still expandable. However, at a first glance, to provide such scaled-back housing options may appear unattractive to many: while starter cores may still be acceptable, “empty lots” or “lots with just toilets” as provided in many sites-and-services projects may expose the policy maker to external criticism. For example, an early site and service project on Nairobi’s airport road provided only sanitation cores as the starter option; reportedly the Kenyan president ordered its demolition. The image may have been perceived as bad for tourism as well as raising concerns on the alleged quality of public programs.

To avoid poor policy choice, decision-makers should consider designing a program so that it matches the available public budget with the demand, factoring in both the amount of different units needed and the affordability gap, given the households’ capacity to pay. Too often decision makers opt for building a high-quality pilot project that provides good images, rather than creating a program that is affordable to all stakeholders and, thus, can go to scale. Where affordability leads to rational standards the public narrative around the project needs to build the political acceptability, particularly in case of incremental projects with initially smaller, unfinished but expandable units. Elites and policy makers need to embrace the approach and understand the time factor.

Margareta Greene’s research on Chile’s history of housing policies provides interesting insights, suggesting that low-income and lower-middle income countries may perform well by providing minimal starter options, matching available public resources to the large-scale demand for housing. However, middle-income countries, particularly if facing lower urbanization rates and existing qualitative deficits, may fare well by providing more extensive housing support, which they are more likely able to afford given their relatively higher income and more moderate demand. Greene shows that, regardless of the starter option chosen, households expand their dwelling units incrementally so that they eventually reach a decent dwell-

ing size (with 1 room per inhabitant), regardless of the starter unit’s size. Thus, low-income countries can effectively provide decent housing to a large population by providing minimal starter homes and spreading allocated resources more widely. In our eyes, the Khuda Ki Basti Program (KKB) in Pakistan, rewarded with the Aga Khan Award for Architecture, is an interesting case because it is very-low-cost and enjoys high cost recovery so that it has a meaningful scale and has been replicated: focusing on the enabling habitat rather than the housing unit, much in the original spirit of sites and services, the project provides empty lots with tenure security (lease to own financing), access to infrastructure (e.g. initially off-grid community water taps) that is gradually upgraded by community clusters, access to social amenities (e.g. subsidized mobile clinics), and access to the city (e.g. subsidized semi-formal transit). (Tasneem, 2011; Asad & Rahman, 2004)

Not only the resources available for redistribution determine whether such a radical approach is viable, but also by political acceptability. One key reason is that the incremental construction takes longer, the smaller the initial subsidy component is: thus, poor households stay longer in relatively poor housing conditions. Greene’s research also suggests that poor households benefit significantly from redistributive housing policies with better and larger starter homes that have multiple advantages: they are ready to move in, so that households do not need to pay double rent (or start off in a temporary self-constructed shelter as in the case of KKB); they provide better quality housing during start up; and, they aid in households reaching decent housing conditions more quickly without exhausting the households’ resources. Thus, not only the improved political acceptability but also social welfare may suggest the provision of better starter options. This suggestion is obviously constraint by governments’ ability to afford capital-intensive housing subsidies at a large scale and the pressure to spend on other basic goods than housing, particularly health, education and public infrastructure (particularly transportation, which makes an important contribution to successful housing projects by connecting settlers

with the city and with job opportunities). For example, Medellin, Colombia built cable cars and escalators, together with public amenities, in order to improve the connectivity of its slums with the city core. Moreover, a major thrust of 'inclusive cities' is to bring in the lower income into the normal employment opportunities.

However, the most important finding is that the poor will incrementally construct decent quality housing over time in either case, regardless of the starter option chosen, making significant financial contributions to total project costs. For example, a World Bank evaluation of the above-mentioned project in Pikine argued, "the concept of the project had been validated by the fact that for every \$1 of public funds, some \$8.2 of private funds had been invested in housing in the neighborhood [within approximately 5 years, only]." (Tager, 1982 cited in Cohen, 2007) This factor illustrates the enormous cost savings that can be achieved from point of view of the public sector. However, it also demonstrates both the willingness and ability of poor households to contribute, according to their needs and

preferences (see Turner, 1968 & 1976).

In summary, to ensure the financial and political viability, housing policies ought to balance four scalars: (i) available resources, (ii) magnitude of housing demand, (iii) development standards and (iv) social norms (Figure 2).

When calibrating housing standards according to social norms, the experience of some early sites and service projects may provide valuable lessons. Some projects were judged as a failure because of gentrification, after the poor sold their units to better-off households. However, judging this as a failure does not consider the macroeconomics of housing supply and demand: the selling-out rather reflects the success of the project (catering to high demand) in a market where even middle-class households crave for a scarce goods, for which they are willing to pay a premium. Alternatively, the event may be the result of too high standards, forcing poor households out who cannot afford the required payments.

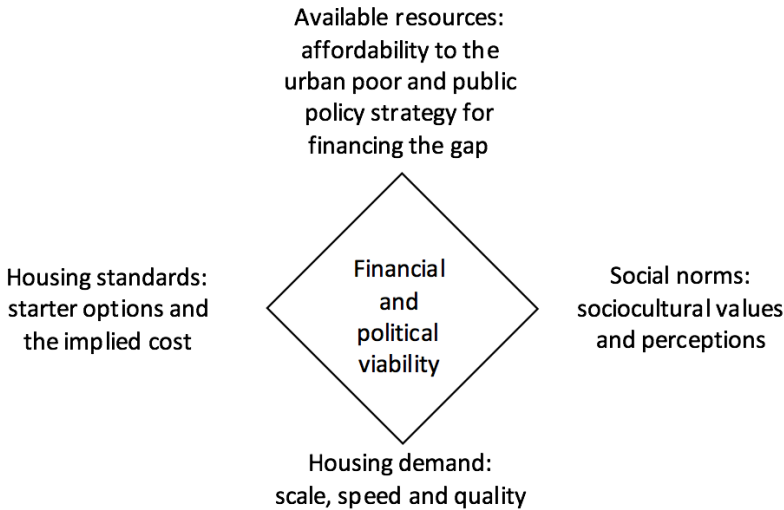


Figure 2: Normative considerations for designing low-income housing programs that address rapid urbanization at a meaningful scale

In December 1974, President Leopold Senghor visited the site and declared that all households in the project should have private water taps and toilets, both of which were clearly unaffordable by the majority of the intended low-income population. This signaled government interest in settling a wealthier population on the site. (...) The absence of loans for construction meant that poor households were unable to start, much less sustain, the construction process. The costs implied in moving to a vacant site, with new construction and transportation costs, as well as the likelihood that food and other essentials were also more expensive, meant that poor households simply could not afford to move to the site. Even when a loan program was finally established, the different terms for loans were not sufficiently favorable to the poor, while being more accessible for civil servants. Cohen, 2007

Under this alternative explanation, the policy shift from 'incrementally expandable starter cores' with 'completed units' however throws out the baby with the bath water, as it worsens the affordability for households and/or the state. Instead, the better policy responses are: (i) significantly expanding low-cost housing supply by generating much more starter units to cater to the real magnitude of the need and to reduce the push-out effects, and (ii) possibly simplifying the standards slightly to improve affordability, within risking the loss of political support.

Enhancing the political viability

Multiple strategies exist for making incremental housing projects more attractive, including:

Firstly, providing access to affordable financing allows the provision of better starter homes that are more cost intensive, without exhausting public funds or unduly stressing household budgets. In addition, access to affordable finance for home improvement can significantly speed up the incremental construction process. Notably, when early sites and service projects were evaluated, slow observed progress led to the conclusion that projects were not successful.

However, today many experts agree that the projects were simply evaluated too early (Cohen, 2007). Looking at the projects today suggests that they have been highly successful: settlements with minimum starter cores have grown into mature urban districts (Wakely & Riley, 2011).

"This process, however, actually had its roots in the original design of the project. By providing land, secure tenure, and infrastructure, project designers believed that the necessary conditions were in place to lead to investment in housing. In fact, these features of the project were necessary but not sufficient. The absence of loans for construction meant that poor households were unable to start, much less sustain, the construction process. Cohen, 2007.

Therefore, speeding up the incremental process with access to pro-poor financial products ought to be considered an essential ingredient of any incremental project. To 'bank the unbankable' with low, irregular and informal incomes may require innovative strategies – such as social underwriting and collateral through community-based systems, short lending cycles matching incremental construction (to keep borrowers dependent on the next disbursement), product graduation with increasing loan amounts per loan cycle (to build a credit history and to reward performance), or alternative land tenure such as leases to collective ownership to emulate collateralized loans.

Secondly, technical assistance ensures construction quality during home expansions and thereby mitigates risks, particularly in disaster-prone areas. Such technical assistance may be paired with the delivery of finance, as lending institutions have a natural interest in assuring the quality of their investments (e.g. by monitoring construction process).

Thirdly, starter homes can receive improved external finishing (e.g. plaster and paint) in order to improve their image and political acceptability. In addition, the starter can be positioned along the streets and alleys so that the incremental expansion, which under con-

struction may provide a less attractive image, occurs on the backside of the plot and is less visible. Through these strategies, improved facades provide an attractive image and streets are well defined.

Fourthly, scarce resources can be allocated to shared infrastructure and amenities (such as schools, clinics and recreational facilities), thereby providing a better image and giving the housing development a better status. This is also a good policy because (i) it is proven that households will invest into their own homes but it tends to be harder to mobilize private capital for collective properties; and (ii) higher standard public amenities increase at least the perceived, if not the real security of tenure and thereby increases the resources that the poor invest into their housing, thereby speeding up the incremental construction process and improving the image of the settlement more rapidly. This positive cycle will again improve de-fact tenure security.

Fifthly, the settlement plan can position housing options that provide a better image along prominent public space, such as main and access roads and public squares. Such more attractive housing options are, for example, revenue-generating commercial projects, public rental and incremental residential units that are more complete or that use a different construction technology or design, including multi-story buildings. In the contrary, smaller starter cores and those without finishings can be positioned off the main roads and in private alleys.

Lastly, government agencies tend to prefer walkups to traditional incremental projects because the capi-

tal cost of infrastructure (roads, water, sewer, etc.) is high: a single-story core unit, as in traditional site and services, does not produce enough density (initially) to justify the fixed cost for infrastructure and amenities. In contrast, a multi-story incremental project does reconcile the advantages of both approaches. This rationale was the key driver of the session, showing strategies for how incremental designs meet cost and density requirements.

Well-designed multi-story incremental housing provides one effective means for slowing new slum formation and improving existing slums

Thus, multi-story options can aid in improving the political viability of incremental housing projects. As other vertical housing solutions, multi-story incremental housing aids in reducing cost within an environment of high land prices, by pooling land acquisition costs amongst a larger number of households. However, multi-story housing is by default harder to expand — and construction is significantly more capital intensive and technically complex (e.g. in regard to structural safety). These characteristics require careful planning and implementation in order to (i) balance the increase of construction costs with the amortization of land costs and (ii) support the technically challenging expansion process.

In addition, the pooling of land prices through higher densities is limited through cultural preferences and economic necessities. For example, many urban poor households rely on street-based commercial businesses operating out of the ground floor of their homes.

Note: For example, assume that a household's subsistence consumption is \$150. (To simplify, this includes the cost of transportation.) If the household would spend 15 percent of household income of \$200 on housing: this is \$30. This implies that the household has \$20 left for investment (e.g. business development, higher education, etc.) and/or luxuries. Now, assume that the household income reduces by 10 percent to \$180. The household can either completely halt investments and above-subsistence consumption or reduce the payment for housing. In practice, the household will balance the two options: for example reducing investments/luxuries to \$6 and housing to \$24. Now \$24 is only 13.3 percent of the new household income of \$180: this is a relatively smaller share of household income than the original 15 percent. As a lesson, the result of depressed livelihoods on housing affordability is usually dramatic. Inter alia urban form and location affect income opportunities and expenditures, e.g. in resettlement projects, and are therefore fundamental parameters determining the success of housing projects.

Stacking such households into multi-floor apartment buildings may constrain the households' income opportunities and reduce the capacity to pay for housing. Typically, if household income reduces the capacity to pay for housing usually shrinks drastically, as poorer households not only have lower incomes but also tend to afford a relatively smaller income share for housing (also see top of Table 4).

In summary, amongst other planning and fiscal tools – such as traditional incrementally expandable starter units and neighborhood improvement (e.g. Caminos & Goethert, 1978; Davidson & Payne, 1990), mobility investments (e.g. GIZ, 2007), or land value taxation and land value capture instruments (e.g. Dye & Richard, 2010; Smolka, 2013) – multi-story incremental housing can contribute to mitigating potentially adverse effects of rapid urbanization.

Content and purpose of the networking and training sessions

At the World Urban Forum 6 in Naples, Italy, we assessed strategies for overcoming these difficulties in designing both expandable and affordable incremental housing options that can effectively respond to urban growth pressures—given that urbanization is both unavoidable and desirable. The networking session presents case studies of multi-story incremental housing from multiple southern countries that rapidly urbanized in the second half of the twentieth century. Any of these cases can only provide a notion of an ever-ongoing process. Whether or not the multi-story approach chosen will work as intended, at least in case of the recent projects, only time will show. Further, to exemplify strategies for anticipating user-driven incremental adaptations, a training session discusses the policy and design trade-offs of incremental housing in general and of multi-story incremental housing in particular.

Claudio Acioly from UN-Habitat kicked off the networking session, highlighting the importance of incremental housing as a powerful, largely informal process that provides viable alternatives for urban residents to access affordable shelter, to improve it over

time, and to eventually live in decent housing. Given its outstanding achievements at a very large scale, Acioly highlights the fact that the UN considers it as a key housing strategy for its 'Global Shelter (Housing) Strategy 2025'.

Introducing the case study presentations, Acioly frames them under multiple questions including whether it will be possible to maintain the enthusiasm, power and dynamics of the informal sector in a multi-storey situation, and how the increase in construction costs and the reduction in flexibility compare to the savings in land and infrastructure costs?

Multi-story Incremental Housing Cases

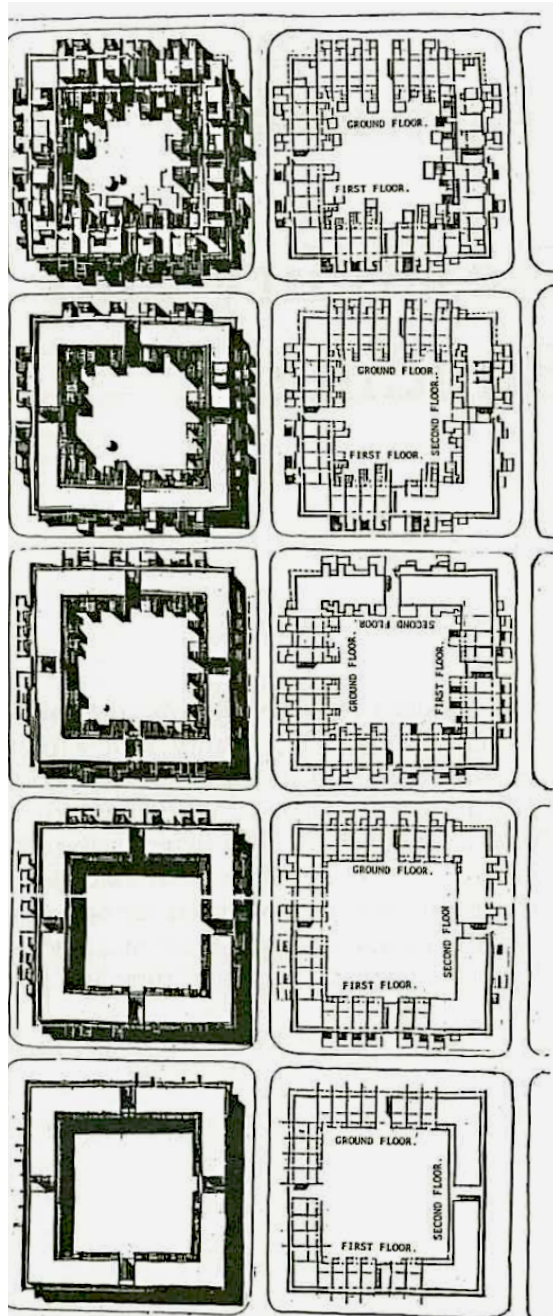
Graham Tipple presents the worker's housing project in Helwan, Egypt with 'transformations' of existing buildings never intended to be modified. He contrasts his findings with the other presenters who discuss public-sector or NGO-initiated projects, which were all planned to be incremental. The worker's housing project in Helwan illustrates the inevitable: regardless of what has been designed or what the legal framework prescribes, incremental expansions take place and dwelling environments are shaped to respond to changing household needs and to market conditions. Other cases from India and Brazil show similar modifications. Figure 3 shows informal, locally negotiated additions, extensions and improvisations to public housing blocks in Bhogal, India (in Hamdi, 1995). Figure 4 shows the same for Rio de Janeiro, Brazil (Solari, 1999).

Even though the worker's housing project in Helwan was never planned for incremental expansions, the public support extended afterwards made it rather effective. The project also raises the question if it would have been even more effective if planned for it or if an organized expansion would improve the political viability of such processes? For example, anticipatory design may avoid the emergence of rooms locked in the interior of the expanded building, without natural light and ventilation as in Helwan (even though the occupiers may not think negatively about locked rooms,

given the particularities of the hot desert climate). Further, Solari shows the potential outcomes of supportive regulations for guiding expansions in Brazil (Figure 5). In summary, incremental modifications in public housing projects are rational and demonstrate socioeconomic and land use efficiency. Therefore, they should not be obstructed, at least, but better be welcomed and supported. The planners' and decision makers' task is to make this process of adaptation even smoother.



Figure 3: Modifications in Bhogal, India 1952-1984 (Source: Soloman in Hamdi, 1995)



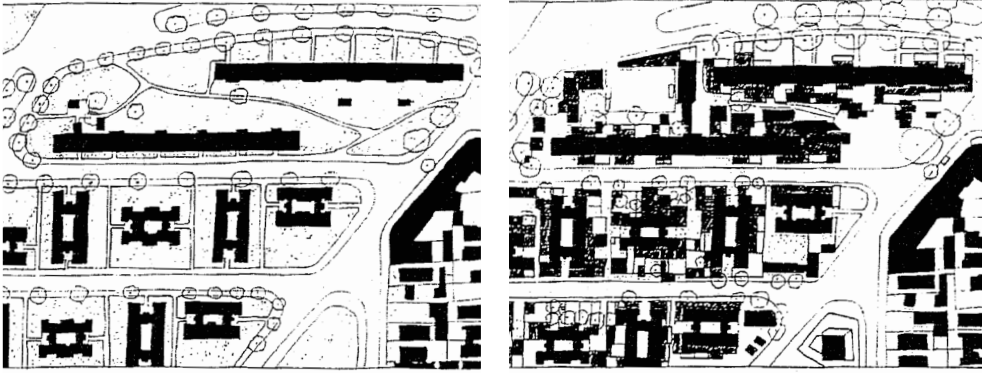


Figure 4: Unplanned Modifications in Brazil.
 Left: the original public housing project in 1975.
 Right: the housing project including unplanned modifications in 1996.
 (Source: Solari, 1999)

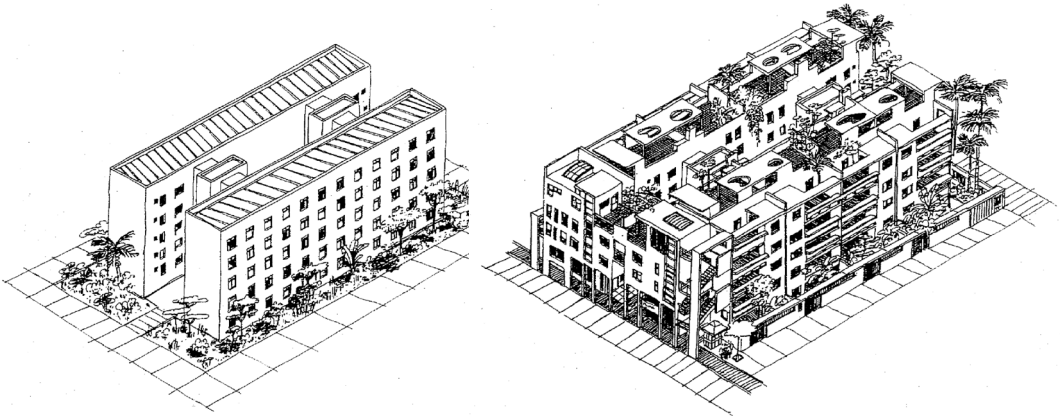


Figure 5: Potential result of inclusive regulations and technical assistance supporting extensions
 Left: the original public housing project.
 Right: modification scenario according to proposed rules and with assistance of an architect.
 (Source: Solari, 1999)

Ahmed Shalaby portrays the Build Your Own House Programme, also from Egypt, with a closer look at the Housing Prototypes in 6th of October New City in Greater Cairo. The case is interesting, as densities tend to be very high because of Egypt's geography: thus even incremental housing is strictly multi-story. The program encourages families to build their own houses on a serviced plot provided by government according to three sample designs of 75 sqm on the ground floor and two additional upper floors.

The design also considers rental situations: for example, the stairs are placed next to the entrance so that the upper floors can be rented separately. Beneficiaries receive a subsidized lot and concessional finance for the land. To promote timely construction, beneficiaries' debt is cancelled after completion of the house. In addition, any ground floor that is completed within 9 months is supported with another grant of approximately 25 percent of construction cost.

The program appears to be successful in producing a larger number of housing units, quickly, and with a modest subsidy, only. However, in our opinion the program also faces several challenges: for example, roads and other infrastructure are not provided as promised. (Incremental infrastructure development may be strategic; however, if opted for the approach it should be announced and actions should be taken for bridging the temporary gap in service delivery.) Further, given the minimum income requirement (e.g. \$180 for single applicants, which is above the average per capita income) the program appears to rather cater to the middle class. It is therefore possibly not an effective instrument for poverty alleviation. Multiple deadlines, related to eligibility to subsidies, reinforce this character, as poorer households are more likely unable to meet a deadline so that they cannot enjoy the redistributive policy. A positive aspect, though, is that the upper floors may cater to low-income tenants eventually.

In summary, *Build Your Own House* provides interesting lessons, such as how to produce a large number of units rapidly, and with few modifications (e.g. targeting and adaptation of standards) it could effectively reach the urban poor.

Claudia Blanco presented a 2-story expandable unit from El Salvador. The NGO Fundasal developed the prototype of 53.2 square meters in order to increase the density in Las Palmas, a low-income community of 1,300 inhabitants where Fundasal worked on risk mitigation, basic infrastructure and housing. The incremental house consists of a single-story starter core unit for US\$3,400 that was co-financed in proportion to household income. The second floor was added in accordance to family preferences.

The presentation concludes, inter alia, multi-story units offer an excellent model for higher density urban development, which contributes to mitigating pressures on urban expansion and offers effective use of higher value, serviced urban land. The inhabitants improve their houses constantly to provide additional space for their own use, for rent or for small businesses. The issue of legal land tenure is central to the incremental process, securing the people's right to housing and mobilizing their investment.

In our opinion, the model is a positive example. However, it is limited in the incremental expansion and use of the unit by being designed for only two floors, lacking clarity how the structure would support additional floors, and locating the staircase in the back, making it harder to rent out rooms. The case however shows the positive impact of Fundasal working with and in the community for a long time, facilitating the mutual-help in construction and ensuring quality technical solutions and cooperation with the city.

Ann Lee presented the neighborhood improvement project Katye that provided two-story transitional housing units in the community of Ravine Pintade, Port-au-Prince, Haiti after the 2010 earthquake. The project, supported by USAID and carried out by CHF International, addressed a particularly challenging situation: 30 percent of the population was killed and 60 percent of houses were severely damaged; in addition, 70 percent of the population lived under the poverty line.

Given the large need, Katye opted for a two-story transitional housing that allowed higher densities and taking in of additional beneficiaries. Given the damage caused in the previous earthquake, the units were constructed of steel columns and coated with weather resistant plastic covering.

In our opinion, the adapted housing model may not lend itself well to incremental modifications. The structure was designed to withstand hurricanes, but modification and expansions by the inhabitants would be difficult. As noted in the training session presentation, local materials – also considering local skills – would be good criteria for choosing a construction approach. The ingenuity of inhabitants may find a way to expand, and review of the project in 5 years may offer lessons on the appropriateness of this design approach.

Susana Rojas Williams presented lessons from Independencia, a former squatter neighborhood in Lima, Peru. Established in the beginning of the 1960s as a peripheral squatter settlement, it is today a middle-class neighborhood in one of Lima's multiple centers, with a high concentration of population and services. The presentation shows the power and capacity of the informal sector, which includes an inherent ability to build multi-story housing resulting in higher density urban development. Construction successfully relies on local materials and local skills.

As units expand with examples of up to 5 and even more floors, concerns of structural safety exist, which become critical in earthquake-prone areas. Secure land tenure is considered critical in mobilizing development. Funding appears to be a limiting factor, often secured from remittances or informal income producing efforts. In this regard, well-designed public sector support, through affordable access to credit and technical advice recognizes the incremental approach and informal variations of land tenure would be desirable to support the incremental construction.

Margarita Greene focused her presentation on the history of housing and neighborhood improvement programs in Chile. Her key findings are already discussed above. Greene concludes with a design proposal for multi-story incremental housing, suggesting that this may be one next policy innovation, combining the advantages of the two characteristics.

Finally, a training session raised the awareness for incremental housing, showed the range of incremental housing options and their implications, highlighted basic guiding principles for planning incremental housing and explored the use of various 'incremental starters' as a development tool, using a multi-story public housing project from Manaus, Brazil as an example.

Conclusion

To address growing housing demand we need to generate as many housing units as possible, quickly. The alternative is surging informal settlements on the urban periphery or overcrowding in central slums, with high socioeconomic cost to cities. In this context sites and service projects reemerge as a promising solution. The historic reasons for the abandonment of the strategy are today judged as a mistake. Understanding incremental housing is not possible without understanding the notion of time. The judgment that early sites and service projects were not successful was based on the false evaluation methodology: the projects were evaluated too early after project completion so that incremental progress was not yet traceable. However, we know that today the neighborhoods have evolved into mature urban districts, successfully. Similarly, most examples shown during the networking session are relatively young, and it remains to be seen how families personalize and adjust their homes. It is too early to assess if the starter unit provided offers a successful model embraced by families. Moreover, even if looking at a larger set of experience we do not know for sure what works everywhere.

However, we know good examples that have worked somewhere, at least that performed well in some important aspects of housing provision and incremental adaptability. In our opinion, these examples provide sufficient direction to act now. Table 5 summarizes our reflection on the cases presented during the networking session. In addition, many more cases can be found on <http://web.mit.edu/incrementalhousing>.

Furthermore, all cases presented in the networking session rely on the government to provide the public infrastructure: water, sanitation, roads, electricity, schools, and clinics. Well-managed governments who are relatively wealthier have the capacity to provide these in a timely fashion, but in most cases, the infrastructure seriously lags behind the expansion of the housing, and families are forced to seek other, often less desirable, means for basic services. Maybe incremental infrastructure provision, possibly involving the community similarly as in the case of KKB (see above), is a viable alternative, particularly in low-income countries.

	A financially-sustainable program <i>must</i> provide	A financially-sustainable program <i>may</i> provide	Cooperating partner with the highest competency
Social	Check social collateral of informal borrower	Build strong communities as development platforms	MBO, CBO, NGO, social movement
Financial	Check capacity and willingness to pay	Train in financial literacy Assist in budget allocation Provide insurance Combine credit and savings	Bank, MFI, NGO
Technical	Check structural safety of the house	Improve structural safety Increase disaster resistance Reduce construction cost	Technical NGO, developer, university, local government
Legal	Check de-facto tenure security	Assist in obtaining more secure or full de-jure tenure	Public administration, technical NGO

Table 5: Compulsory and optional housing program components

To ensure financial sustainability some housing components are compulsory. Optional activities have the potential to create additional impact on poverty reduction and may further enhance the financial sustainability. The additional activities tend to profit from economies of scope and agglomeration and may be viable in conjunction with the obligatory services, even though they might not as a stand-alone activity.

Source: Nohn & Bhatt, 2014

The requirement of keeping housing projects/programs simple is of particular importance, as housing delivery is a complex process: it is not limited to the construction process itself, but also involves the social dimension (e.g. community mobilizing and organizing), finances (e.g. shelter microfinance) and legal aspects (e.g. security of tenure). Other habitat dimensions beyond housing can be overwhelming. Almost all of the examples focus on the importance of the community, and the community layout. In some cases, the community development has taken priority to the detriment of the expandable core-starter unit. On the other hand, addressing the other habitat dimensions can aid in creating an enabling environment for incremental growth (e.g. perceived security of tenure as a precondition for housing expansion). Table 5: shows components that must or may be considered to ensure financial sustainability.

In conclusion, given the pressure of rapid urbanization on land prices vertical housing development is increasingly common. Further, given the affordability advantages of incremental development, we argue that the time is ripe for piloting innovative multi-story incremental housing solutions. The above cases provide good directional sense of how such projects may be structured. All examples require some user-led construction before move-in. However, design studies of multi-story shells exist, which do not require any user-involvement before move-in. They are flexible in adding space through other means, for example by interior insertion of floors. An advantage is that the critical structure is complete. This is important in bad soil conditions, which require special effort, but still offer the flexibility to accommodate growth, albeit constrained.

Numerous early examples propose user-completion of units on platforms with services. Essentially, these are elevated 'site and services' projects. In contrast, other strategies are based on the insertion of internal floors within shell or envelope units. The added cost is the increased ceiling height/external wall, but the total is less than if building a new unit. All proposed designs are clearly less costly for user expansion, compared

to traditional sites and services, as either only internal walls or only internal floor and stairs need to be added. This way the multi-story incremental designs support redistributive objectives, speed up the incremental process and provide an attractive image as of project start. They encourage the addition of rooms, increasing the supply of urban housing.

The following case studies illustrate the early thinking on multi-story incremental housing:

- With *Maison Dom-ino* LeCorbusier proposed a multi-story incremental housing prototype in 1914 to bridge the gap between industrial and user-driven fill-in. In the spirit of Boudon (1979), Corbusier provided an ideal platform for user-driven adaptation of his five elements (roof terrace, free plan, free façade, horizontal windows and pilotis). (Figure 6)
- In 1968 Jan Wampler's 'platform' proposal for La Puntilla in San Juan, Puerto Rico, won the First Prize Award in the annual design competition sponsored by Progressive Architecture magazine. Inspired by the urban structure of Old San Juan, Wampler proposed a flexible 5-story mat framework with interior courtyards of different sizes and hierarchies, within which residents would complete their unit according to their means and preferences. (Figure 7)
- In the push for shifting urban growth to the desert areas outside of Cairo, one of the Port Said New Community Projects, Egypt, proposed a 3-story structure. Provided was a concrete frame for simple platforms and a common staircase, 4 units per floor. Toilets and water supply was provided from a central core. (Figure 8)
- The designs for the Mkalles Public Housing Project in Beirut exemplify the incremental expansion through insertion of internal floors. The design proposed both single-family shell units and multi-story shell units, providing for insertion of floors effectively doubling unit area. (Figure 9)
- The firm SITE provoked thought with their futuristic proposal of elevated, layered suburban houses: "This experimental high-rise housing

proposal is composed of fifteen to twenty stories to be located in a densely populated urban center. It is intended for mixed income residents and includes shopping, parking and residential facilities. The configuration of the structure is a steel and concrete matrix that supports a vertical community of private houses, clustered into distinct village-like communities on each floor. Every level is a flexible platform that can be purchased as separate real estate parcels. A central elevator and mechanical core provide services to the individual houses, gardens, and interior streets. The philosophical motivation behind this concept is a critique of the Twentieth Century tradition of homogenized and faceless multi-story buildings,

which eliminate the possibility for urban dwellers to demonstrate any evidence of their presence in the cityscape. As an alternative, the High-rise of Homes offers residents a unique opportunity to achieve an individual statement of identity. The purpose is to shift the premises for aesthetic evaluation in high-rise buildings away from orthodox design continuity, in favor of the artistic merits of collage architecture, based on indeterminacy, idiosyncrasy and cultural diversity.” (Site, 1981 to 2005: Traveling Exhibition ‘The High-rise of Homes’) Even though tongue-in-cheek, Site’s proposal may not be too unrealistic, as is illustrated through the successful extensive construction of rooftop communities in Phnom Penh

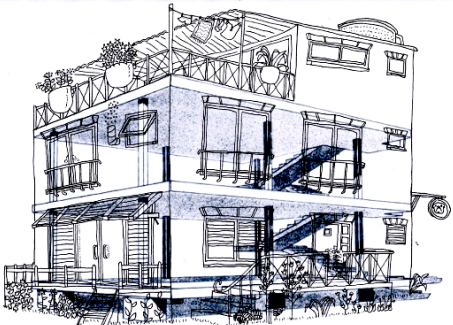
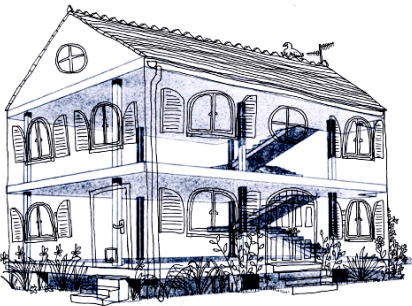
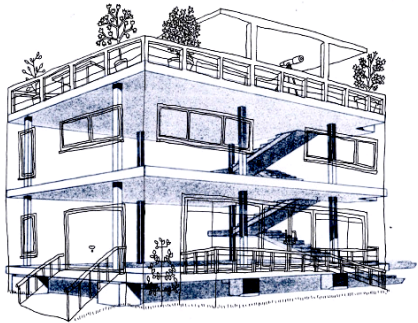
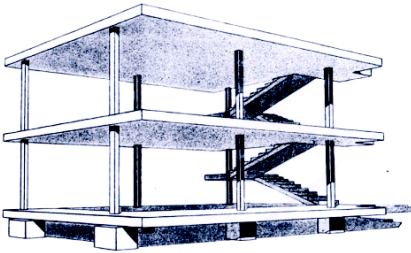


Figure 6: LeCorbusier’s Dom-Ino (top left) and hypothetical user-driven in-fills
 Source: FLC 19209 (original) and modifications by Cotter (undated) found on <https://hotcharchipotch.wordpress.com/2013/03/31/readapt-the-habitat/>.

(SIGUS Workshop, 2000: pp.16-17) and international efforts to construct greener cities. Further, recent press coverage shows peculiar examples of rooftop construction in China, including on a high-rise tower (illegal) and a shopping mall (legal). Lastly, informal settlements on rooftops in Cairo, Egypt (baladis) and Mexico City (cuartos de azotea) are other mainstream examples of incremental extensions on roofs. (UN-Habitat, 2003)

- Ciudad Bachué in Bogotá, Colombia (Figure 11) is an inspiring example of a multi-story incremental housing project that was actually designed and built to be incremental and then expanded successfully. "Begun in 1977 by the government housing agency Instituto de Crédito Territorial (ICT), the incremental housing project has two components: firstly, low-rise terraced housing of concrete post and beam construction with pre-cast wall and floor slabs can be extended by building a second floor; secondly, high-rise apartment blocks with pedestrian access in the front provide two-story maisonettes in which the ground floor can be extended in the rear; second-story flats, accessible by an open gallery, can be extended by building on the roof."

(Wakely & Riley, 2011: pp.24-25) This way, Ciudad Bachué is a good example that shows how the top-down provision of safe land tenure and structural safety matches the user- and community-driven construction, thereby balancing public and private investment. The higher density achieved also illustrates how to justify the installment cost for infrastructure and amenities in an incremental project, one key concern for improving the political viability of incremental projects, the latter being an important motivation for the University Consortium for Incremental Housing's sessions at the World Urban Forum in Naples.

- The Solanda project in Quito, Ecuador, built in 1980 (Figure 12), is a good comparison with Ciudad Bachué. A government project with funding by USAID, 1 and 2-story starter cores ranging from 20 to 78sqm were incrementally expanded. The architect-designed cores were frequently demolished during the expansion, suggesting that units need to be jointly designed by the families. It was seen as a successful integrated experiment and many innovations were adopted.
- More cases can be found at:
<http://web.mit.edu/incrementalhousing>

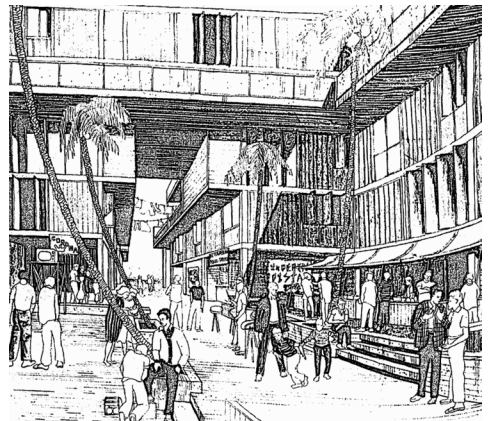
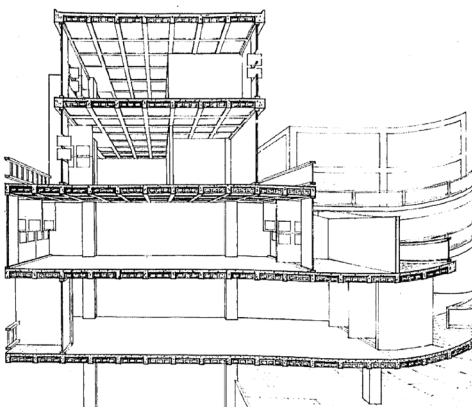


Figure 7: Jan Wampler's 'platform' proposal for La Puntilla, San Juan, Puerto Rico
Left: structural frame to support multi-story. Right: proposed new housing after incremental construction
Source: Wampler, 1968

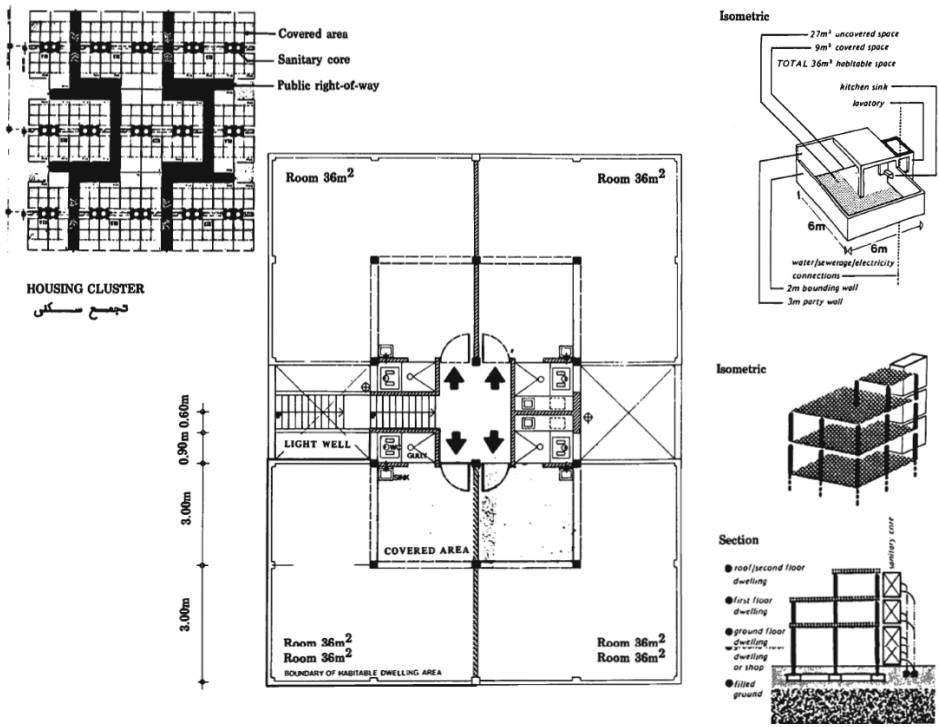


Figure 8: Port Said New Community Projects Proposal by Bullen and Partners, Shankland Cox Partnership, Binnie and Partners, Peat Marwick, Mitchell and Company, Hanna and Partners.
 Source: Republic of Egypt, 1979: p. 43

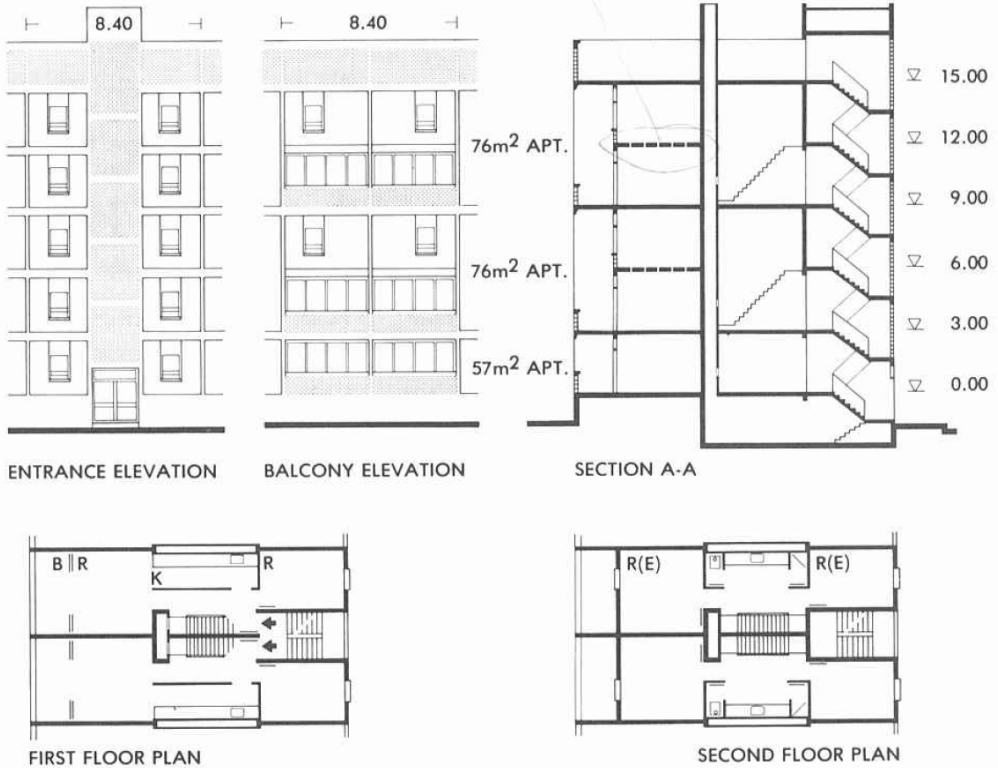


Figure 9: Mkalles Project, Beriut, Lebanon
 Source: Caminos et al., 1974: p. 23

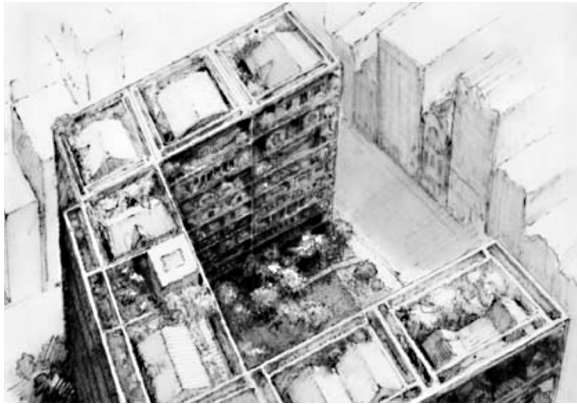


Figure 10: The firm SITE proposed elevated layered suburban houses.
Source: Site (1981 to 2005)



Figure 11 a through b: Ciudad Bachué, Bogotá Colombia (Source: UNAL, undated)
Above: structural frame to support vertical extensions of up to 5 floors (approx. 1978)
Below: structural frame with wall panels (approx. 1979)

Note: the bare frame illustrates the starter's structural strength, but is not the initial product handed over to inhabitants. Strength is required to carry a regular 2-story house: the vertical expansion can be built with local technology on top of the rigid parking-garage-like structure. Lower floors can expand horizontally, equally using local technology for building 2-3 stories. In contrast, no 5-story expansion is built, which would require advanced engineering, due to earthquake exposure, and tough coordination between households stacked on top of each other.



Figure 11 c through 11 d: Ciudad Bachué, Bogotá Colombia (Source: UNAL, undated)
Above: early modifications, immediately after hand-over to the community (approx. 1981)
Below: cleaned and well-maintend community court yard, after early expansion (approx. 1981)



Figure 11 e through 11 f: Ciudad Bachué, Bogotá Colombia
Above: consolidated community court yard, 2008 (Source: Wakeley)
Below: consolidated public space and buildings, 2016 (Source: Nohn, Rapid Urbanism)



Figure 12 a through 12 b: Solanda Incremental Government/USAID Project, Quito, Ecuador (1980 Est)
Above: Aerial view of green/play area. (2016 - SIGUS Survey)
Below: Note unplanned buildout from original starter core units. (2016 - SIGUS Survey)



Figure 12 c through 12 d: Solanda Incremental Government/USAID Project, Quito, Ecuador (Est.1980)
Above: Main street commercial spine in community. (2016 - SIGUS Survey)
Below: Play/green areas are located in the interior blocks.. (2016 - SIGUS Survey)

Comparison of incremental expansion possibilities

These charts focus on key conditions that constrain or facilitate incremental expansion of the housing. Four areas of issues are assessed related to incremental issues: (Note: field studies are underway or planned to revisit the projects and assess the incremental expansion.)

Ratings are as follows: Indicators are only approximate, but are sufficient to show the general pattern. Number of dots indicates strength.

●●● **Favorable** – facilitates incremental expansion, in terms of sufficient space, materials and construction, and layout of the units

●○ **Marginal** – could be better, but positive aspects

○ **Lacking, poor** – no benefit or impedes incremental expansion

The following four basic criteria are considered essential for incremental development:

Relation to user:

Are the move-in provisions affordable, beneficial and helpful to the users? (i.e. dwelling space, basic amenities, orientation and other support before move-in)

Relation to providers of starter house/core:

Does it lower costs significantly to make the effort worthwhile, and therefore more families could be accommodated?

Relation to city development:

Would it result in higher density and lower cost of providing services, and thus help to mitigate urban peripheral expansion (sprawl)? Are there appropriate zoning and building codes to support owner-built housing programs?

Relation to physical design and construction:

Does the core house and subdivision layout design facilitate expansion? Does it use appropriate local construction practices and materials that are readily accessible to all?
- Does the starter core facilitate user built expansion or build-outs by providing critical jointing details to accommodate varied and least-cost expansion elements, ideally local?

PERU INFORMAL ALTERNATIVE



A completely informal, self-managed, often self-built approach demonstrates that given sufficient time, generally over several years, without intervention of authorities. Construction relies on local materials and local skills. Secure land tenure is considered critical in mobilizing development. Funding appears to be a growth factor, often secured from remittances or informal income producing efforts.

●● *Move-in Provisions:*

Simple but limited, usually one-room makeshift unit as determined by user.

●○ *Funder cost advantage:*

No initial cost, but potential substantial future cost penalties: future upgrading tends to be considerably more expensive.

○ *City development:*

Often on the periphery, or in dangerous or undesirable areas.

●●● *Unit expansion:*

Based on local materials and skills; a pay-as-you-go process

Concerns of structural safety as units expand, with examples of up to 5+ stories noted, which become critical in earthquake prone areas. Compare to the professionally designed option of Haiti.

HAITI TWO-STORY REBUILDING AFTER DISASTER



A sophisticated contractor-built structure with a steel column frame and rubberized fabric cover, designed to withstand recurring hurricanes.

●○ *Move-in Provisions:*

Very small if one family/floor

○ *Funder cost advantage:*

None, expensive units.

●● *City development:*

Location areas selected by city

○ *Unit expansion:*

Non-traditional materials and skills, and export materials in cost and availability penalty

The sophisticated structure does not lend itself to expansion or ready modification, but is earthquake resistant and offers higher density. It cannot be considered a viable incremental model: uncustomary materials are not generally available - few have the necessary skills to work with the materials, too small lot and expansion unlikely. Local materials would be good criteria for choosing a construction approach. The ingenuity of inhabitants may find a way to expand, and review of the project in 5 years may offer lessons on appropriateness of this design approach.

EL SALVADOR TWO-STORY EXPANDABLE



An initial core unit of one large room and kitchen/ toilet and stairs for expansion are provided, built through mutual aid, with co-financing and technical assistance by FUNDASAL. The second floor is anticipated to be 4 rooms for family members. Assumed that the first floor is built following FUNDASAL plans.

●● *Move-in Provisions:*

One multi-purpose ground floor room

●● *Funder cost advantage:*

Possibility of expansion allows small less costly initial unit per family

●● *City development:*

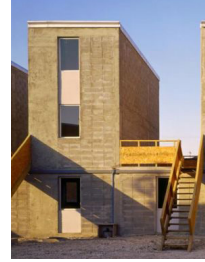
Location determined by city

●● *Unit expansion:*

Based on local materials and skills; limited to vertical expansion - could foundation accommodate 3 potentially four stories?

Unclear how second floor is built - mutual aid? - and if there is required adherence to the suggested plans. Unclear if structure is adequate for a 3rd or 4th floor, or how families could brace the 1st and 2nd floors if additional floors are desired, and if families go higher than formally anticipated.

CHILE MULTI-STORY EXPANDABLES



High subsidies and a well-managed government administration have resulted in a variety of models for multi-story incremental units. Three-story shell units of 30 sq.m. per floor are common, and recently proposed are 6-story units with a bathroom per floor.

●● *Move-in Provisions:*

Single room for each family

●○ *Funder cost advantage:*

Marginal, since expensive foundation built and approximately 2/3 of full unit

●● *City development:*

Location determined by city.

●● *Unit expansion:*

Seemingly limited to fixed expansion, little variation possible?

Subsidy allows construction by professionals for good quality, and pleasing aesthetic image. Reflects country situation with more available funds and concern for structural safety, along with more control of final product and image.

**EGYPT
TRANSFORMATIONS
OF MULTI-STORY
PUBLIC HOUSING**



Not satisfied with what was provided in multi-story older public housing projects, families often modify and expand their units.

Surprisingly well built - generally by contractor - it requires active collaboration of the families to allow not uncommon multi-story additions.

**EGYPT
HOUSING
PROTOYPES
6TH OCTOBER
NEW TOWN**



'Build your own house'

A family is given a 150 sq. m. plot, pre-approved plans and technical assistance, and they expand the units vertically through a self-managed approach by engaging private contractors. The building footprint is 75 sq.m. limited to three floors. Financial incentives encourage fast completion and compliance with the pre-approved plans.

— *Move-in Provisions:*

Not applicable

●●● *Funder cost advantage:*

No additional cost to funder

●● *City development:*

Increases density and quality of life for family

● *Unit expansion:*

Limited interior, and limited external additions; based on local materials and skills and cooperation of neighbors

○ *Move-in Provisions:*

Requires construction of building

○ *Funder cost advantage:*

Possibly some lower cost, but increased administration; savings essentially through informal contracting

●● *City development:*

Location determined by city

● *Unit expansion:*

Limited flexibility within given design

Approach modeled after informal expansion of older public housing while still offering high density and controlled development, and the self-build success of the vast informal sector.

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OVERVIEW - A PARADIGM SHIFT IN GLOBAL HOUSING STRATEGY

Claudio Acioly Jr., Head, UN-HABITAT Capacity Development Unit

Summarized by Venkata Narayanan A.L, Mundus Urbano

The WUF Networking Session on Incremental Housing focuses on the growing interest on this emerging proactive housing strategy. The debate is being pushed forward by the support of incremental construction in informal settlements and the expansion of core-houses in 'sites and services' projects for redirecting urban growth or for responding to disasters. The focus on vertical incremental housing responds to the increasing need to deliver affordable solutions in the face of increasingly valuable urban land due to rapid ur-

banization. This session shed light on existing practices and lessons learnt, drawn from a global sample, in order to raise the awareness of what may work or not. Questions addressed included:

- 1) Is incremental housing a viable option to meet the demands of an rapidly growing urban population?
- 2) Is it possible to maintain the enthusiasm, power and dynamics of the informal sector in a multi-storey situation—or does it only work in squatters,

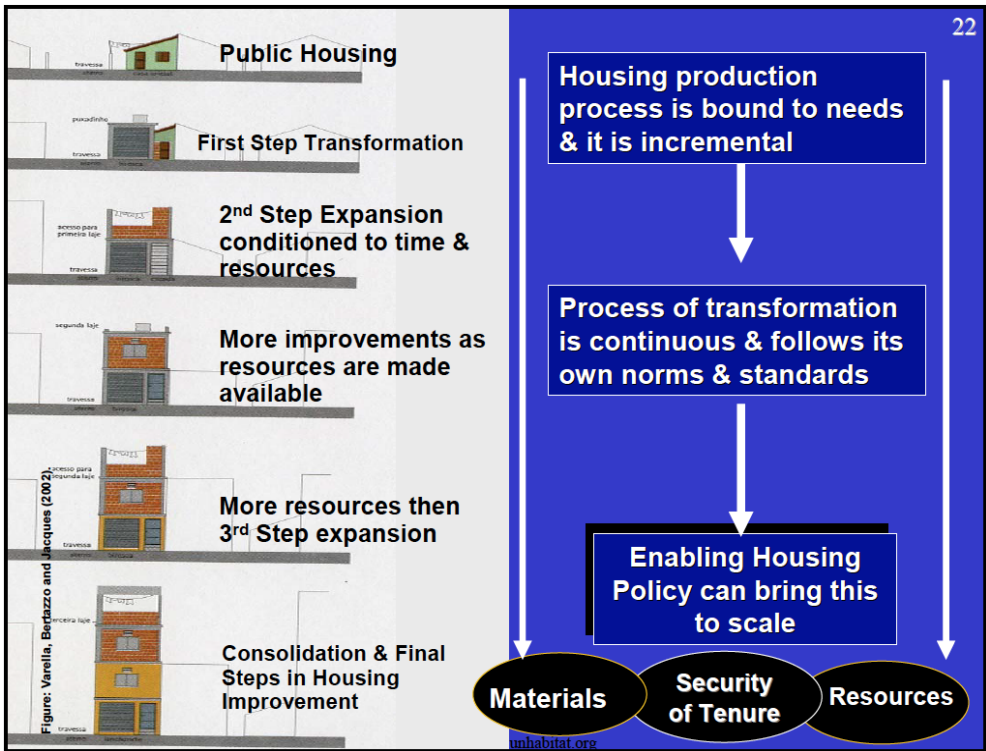


Figure 1: Steps of incremental housing in case of publicly provided core housing, Source: Varella, Bertazzo and Jacques (2002)

'favelas', low-rise 'sites and services' projects, or similar situations? When making policy choices, do we support vertical incremental housing? ...and, if so, even in the case of informal or squatter settlements?

- 3) How does the increase in construction costs, due to heavier multi-story structures, and the reduction in flexibility, due to limited expandability of upper floors, compare to the savings in land and infrastructure costs, due to higher densities. How do these trade-offs change if infrastructure development is also incremental or if densities change over time?

This introductory presentation by Claudio Acioly, Head of UN-HABITAT's Capacity Development Unit, highlighted the importance of incremental housing as a powerful largely informal process that provides viable alternatives for urban residents to access affordable shelter, to improve it over time, and to eventually live in decent housing. Given its outstanding achievements at a very large scale, the UN considers it as a key housing strategy for its 'Global Shelter (Housing) Strategy 2025'.

Taking stock of housing policies across continents and studies of present city growth shows that cities are growing differently than expected: first people occupy

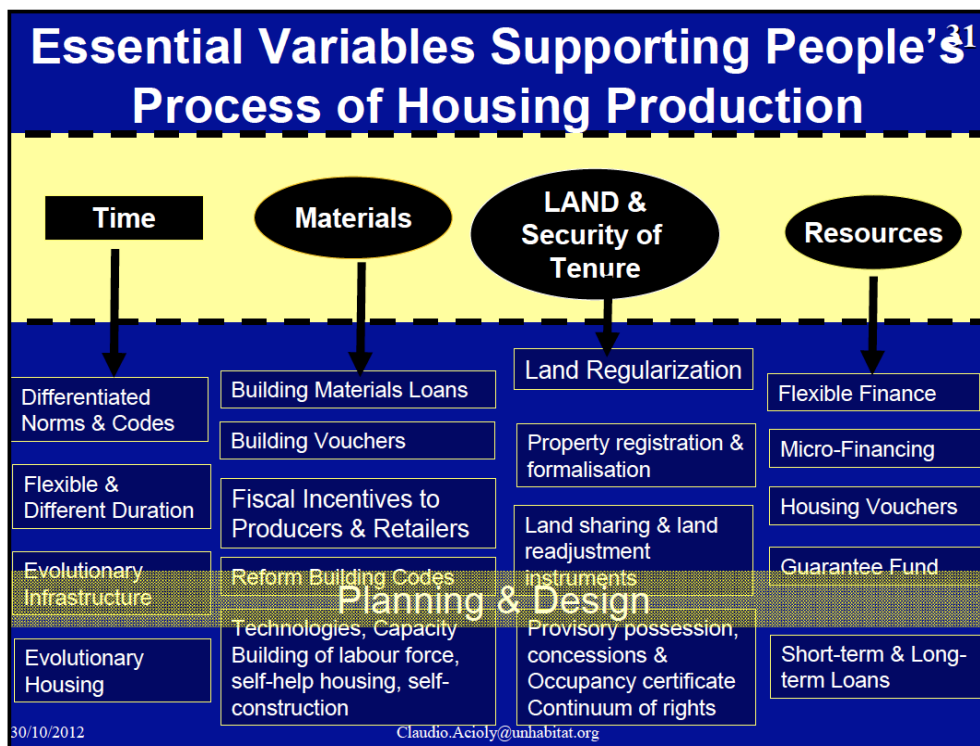


Figure 2: Essential variables and ideas to support people's process of housing production, Source: Claudio Acioly Jr.

and build, then they consolidate, finally they develop neighborhoods through negotiating services and infrastructure. Often only during this last step "planning" is done, possibly accompanied with or followed by regularisation and legalization.

We see different cases and realities of incremental housing construction—such as people building for rent, undertaking vertical extensions, constructing a provisional place for the next generation, or using their home for economic purposes. All strategies result in densification. And each strategy should be supported with appropriate policies. In sum, housing production tends to be an incremental process, paralleled with the successive consolidation of land rights.

People building incrementally can be seen in the case of public housing projects providing a small core house that initially may not meet the full needs of the inhabitants. (As used here, "public housing" refers to the initial govt starter core, which is then modified by the inhabitants.) Figure 1 illustrates that, step by step, the inhabitants transform the starter core unit and expand horizontally and vertically. The expansion process depends on family

needs and available resources over time. Improvements increasingly take place as resources become available. This incremental transformation process is continuous and follows its own socioeconomic norms and standards. In most cases, this process takes place without any architect or engineer, nor technical assistance.

From such examples, we see that time, land, materials and financial resources are key variables in the people's housing process. By identifying specific solutions for each variable, we can design innovative affordable housing programs. Some possible strategies are displayed in Figure 2.

Well-designed housing policies can bring the incremental process to scale, speed it up and improve the process—provided that the policy makers understand the process. Innovative policies are inclusive of the informal practices (that have proven successful), rather than integrative (pressing the informal into the formal system). The case studies from Haiti, El Salvador, Chile, Egypt and Peru shown in the following papers from the session illustrate built examples as references for developing incremental housing schemes.

PERU - THE INFORMAL ALTERNATIVE

Susana M. Rojas Williams; Director, International Shelter Initiatives;
Habitat for Humanity International, Washington, D.C.

Summarized by Lia Brum, Mundus Urbano



Project Summary

An informal, self-managed process, build by owner-builders, which after sufficient time, results in 'standard' multi-story housing, providing needed affordable housing units. Construction relies on local materials and skills. Generally self-funded in a pay-as-you-go process. Infrastructure services tend to be provided many years after initial settlement, when settlement becomes too big to ignore. Secure land tenure is considered one of the critical elements for mobilizing investment by the owner-builder.

Editors' Reflections

Encouragement of the self-settlement process provides needed affordable housing units, particularly when they add floors. Sometimes 4 or more floors are noted. However, later upgrading of the area tends to be costly and disruptive. Guidelines for self-settlement would facilitate later incorporation into the city and provision of services – a 'Good Squatter' guidelines policy.

The informal settlement process was adopted by the development community and 'site and services' projects became the standard housing strategy starting in the '70s. They essentially mimic self-settlement, offer a legal frame and provide basic infrastructure. Thereby, they create an enabling environment for self-provision and improve public health.

PERU – INFORMAL ALTERNATIVE		
<i>Project</i>	Young Town' Indendencia Lima	The start 
<i>Starter</i>	Settled by land invasion 1959-60. Small 1-room shelter of woven reed panels	
<i>Area</i>	Lots divided into 140/160 sq.m	Expansion today 
<i>Type of spaces</i>	Once settled, single room with kitchen, wash area, latrine; slowly expanded into 2-3 story 'standard' building	
<i>Construction process and materials</i>	Once settled, brick load-bearing walls, concrete roof. Often concrete post+beam with brick infill; informal self-builders, relies on social networks, no formal support	
<i>Tenure</i>	From squatting to legal title after 25 years	
<i>Facilities</i>	Basic services provided 10 years after formal recognition of community	
<i>Support for incremental improvements</i>	Self-builder continued focus on expansion; columns extend for future vertical expansion, roof openings for future stair access, etc.	
<i>Who will occupy expansion</i>	Children as they form families; often small shops, other income generation uses: repair, etc.	

This presentation highlighted the lessons learnt from self-help housing and upgrading at Independencia, a former squatter neighborhood in Lima, Peru. Established in the beginning of the sixties as a squatter settlement in the outskirts of the city, it is now considered a middle-class neighborhood in one of Lima's multiple centers, with a high concentration of population and services. This presentation shows the power and capacity of the informal sector, which includes an inherent ability to build multi-story housing resulting in higher density urban development.

Ms. Rojas Williams interviewed 31 families with members from three different generations, in order to investigate the trajectory of Independencia. She identified challenges that the families faced when seeking to improve their living conditions over multiple generations as the settlement formalized.

Most families were able to incrementally improve housing in varied levels. Some families upgraded the structural quality of the dwelling and used more permanent construction materials (e.g. through building concrete walls); others were able to increase the number of rooms and floors and installing permanent roofs, representing the main cost of incremental building. Internal changes in the houses were also noticed according to changes in the families over generations. Most of the houses started in the front of the plot, with no more than three rooms serving as bedrooms and living areas. Over several decades, units were often subdivided and new rooms were added.



Figure 1: Independencia in the sixties... (Urban Dwelling Environments, Caminos, Turner, Steffian; The MIT Press, 1969, pg 141.)

Figure 2: ... and in the early 2000s,;





Figure 3: The process of expansion and improvement of two families' houses in Independencia, observed by Rojas Williams between 1960 and 2005

Just one of the families interviewed barely upgraded, still living in a shack of temporary materials (e.g. metal, wood, plastic sheets, cardboard). Five families of the sample had transitioned from temporary shelter to the first stage of a permanent home by building permanent walls. Eight families were in the phase of building a concrete roof slab, while another five families had begun a second story by adding permanent walls on this first concrete slab. Eight had added a second roof slab, making the addition of a third floor possible, and four were already building permanent walls on the third floor, 8 years after originally settling in the area.

The different levels of development observed were directly related to the ability of generations to invest on the improvement of their living conditions over the years. The researcher identified clusters of investments between the decades of 1970 and 1980, when the second generation was in a position to work and contribute to the income of the (extended) family, while the first generation was still productive. The investment coincided with the installation of water, sewerage and electricity between 1968 and 1975 and of paved streets provided later. The installation of basic infrastructure, increasing the social and economic returns on any housing investment and stimulating a sense of security of tenure, apparently triggered the investments in expanding their homes, from single story starter homes to 3-5 story units.

A second wave of investments was noticed between 1980 and 1990 when the third generation started working

abroad and sending remittances to their families.

In addition, economic growth during the 60s and 70s created a favorable labor market and opened economic opportunities that resulted in higher income and allowed families to invest in their homes. In the beginning, entrepreneurship was represented by stores adjacent to the housing rooms (e.g. grocery and beverage shops), and later shifted to workshops and to the renting of spare rooms as the houses were expanded.

Government support and challenges

As of the late 1990s, the government started programs for facilitating the access to building materials. The programs were concentrated on loans, mostly for building permanent roofs, which represented the most expensive investment, and basic kitchen and bathroom units. The credit was associated with technical assistance to improve structural safety, which also gave assurance for the safety of building multi-story units.

Housing subsidies provided by the government were conditional on land titles. However, the land usually belonged to a single family per plot. Thus, subsidies were not accessible in the case of multi-family, multi-story and other tenure systems, which discouraged higher density development. Furthermore, the research suggests that, despite the intention of public programs to support self-help housing, investments for housing improvement have been largely influenced by family income.

Conclusion

Independencia shows that construction in informal settlements successfully delivers housing to the urban poor through incremental processes. It successfully delivers multi-story units with little investment by the government, and adds a considerable number of units to the urban housing stock, while also improving their income situation by room rental. Eventually after the informal start they result in higher density, multi-story areas.

These processes, however, usually do not comply with official regulations, as the latter tend to result in prohibitively expensive construction. Public sector support, through affordable access to credit and technical advice that consider the incremental approach, is able to mitigate incremental construction problems. In addition, self-help housing only addresses immedi-

ate needs according to family changes and to their ability to modify their houses. It does not focus on the planning of long-term improvements.

Furthermore, evidence from Independencia suggests that public investment in basic infrastructure and improvements of the security of tenure, even if only perceived, accelerate grass-roots investment into incremental construction and resultant higher density urban development.

In conclusion Ms. Williams remarked that it is still crucial to promote new forms of ownership, legal tenure, credit, financing mechanisms and technical assistance, as well as to provide access to economic opportunities, education and health facilities, in order to guarantee the continued successful integration of settlements as Independencia into Lima's fabric.

FUNDASAL'S TWO-STORY EXPANDABLE UNITS

Claudia Blanco, Directora Ejecutiva, Fundasal

Summarized by Manuela Pinilla Rodriguez, Mundus Urbano

Project Summary

An initial core unit of one large room with kitchen and toilet, with stairs for future expansion is built with mutual aid. The pace-setter NGO 'FUNDASAL' provided co-financing and technical assistance. From the start, a second floor is assumed, which is intended for family expansion.

Editors' Reflections

Concerns over unanticipated expansion if over two floors, a common trend. Would the foundation be adequate? Further, the design seems to limit expansion possibilities to only one option. It will remain to be seen how the ingenuity of the families affects the buildouts. Anticipating a third, and possibly a fourth floor would allow more additional units and take advantage of the infrastructure provided.

LAS PALMAS

<i>Project</i>	Las Palmas Project, San Salvador A part of a neighborhood improvement approach.
<i>Starter</i>	A single story, 1 multi-purpose room with bathroom and kitchen. Includes stairs at back for future expansion
<i>Area</i>	Initial unit of 25.6 sq.m; with expansion anticipated to 53.2 sq.m with the addition of a second floor
<i>Type of spaces</i>	Second story anticipated with 4 rooms, typically intended as bedrooms for family
<i>Construction process and materials</i>	Concrete block loadbearing walls; concrete floors. Concrete column and beams with block infill generally in second floor expansion. Built through mutual aid and FUNDASAL technical land financial support.
<i>Tenure</i>	Legal title
<i>Facilities</i>	All services included.
<i>Support for incremental improvements</i>	Technical assistance continued by FUNDASAL
<i>Who will occupy expansion</i>	Intended for family; however, renting of rooms or small stores considered in ground floor.



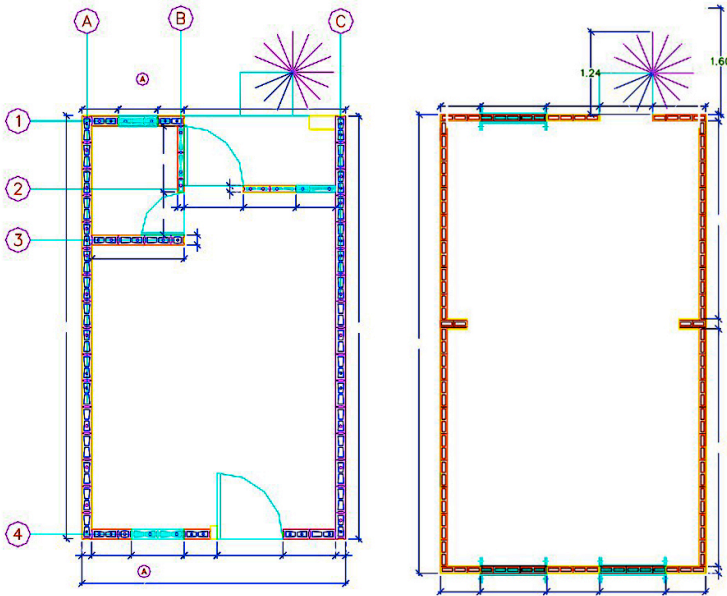


Figure 1: Plot of the basic housing unit (a), ready to be expanded to a second story (b) (Drawing from Fundasal, 2012)

Fundasal is a non-profit organization with more than 40 years of experience in land rights and housing in El Salvador. The fact that 58 percent of the Salvadorian population does not have access to quality housing and lack one or more basic services explains the growing demand on the informal housing market, suggesting that public policies have yet to meet the needs and priorities of the people.

With the overall goal to empower communities to overcome poverty, Fundasal has carried out several programs that support people's right to the city, offering viable alternatives to the poor that aim toward the removal of barriers to access land, housing and credit. In the years of their experience with incremental housing, an approach that comes from within communities has been proved to be the most

effective tool to develop neighborhoods and empower its inhabitants. In addition, the model of 2-story incremental housing has proved a useful strategy for higher density urban development.

In this context, Fundasal analyzed the incremental housing strategies in seven low-income settlements over a period of 30 years, relating incremental housing dynamics to political and economic development over time. Among them, Las Palmas became an example of intervention that was replicated in El Salvador and Central America. Las Palmas had a starter core intended to expand to multi-stories, generally to 2-stories.

Founded approximately 60 years ago, Las Palmas is a settlement of 1,300 inhabitants. Between 1997 and 2001, Fundasal developed a neighborhood improvement



program that focused on physical improvements (risk mitigation, basic infrastructure and housing) and community organization. Key feature of the new houses is that they have been designed in order to be incrementally extended to two stories. The basic units had an area of 25.6 square meters in a single-story starter core unit. They were co-financed with families saving 10 percent of their monthly household income over a period of 8 months. The building of the second floor was added in accordance to the resources of each family. Eventually, the completed house—i.e. the core unit plus second-floor extension—has an area of 53.2 square meters, double the starter density.

Before

Figure 2/3: Evolution of housing in Las Palmas (Fundasal, 2012)





After

Figure 4/5: Evolution of housing in Las Palmas (Fundasal, 2012)



The basic unit consists of a main multi-use room (for living and dining), a bathroom and a kitchen. The stairs—ready for a second story—are located on the back of the plot, in an unbuilt area of 6.40 meters that is usually closed in once the construction of the second floor begins (Figure 1). Fundasal envisioned the construction of four rooms on the second story. These rooms could be used according to the needs and desires of each family, typically bedrooms to accommodate its family members.

The cost of the basic unit was about US\$3,400 and it was estimated that the complete construction of the first and second floor of the house was about US\$6,200. Fundasal has provided technical assistance within a mutual-help framework, which required a high level of community organization. The evolution of the housing conditions in the area were remarkable (Figure 2), as well as the strengthening of community ties and organization. The success of supporting incremental housing efforts within impoverished populations proved to be successful for Fundasal, and the project was reproduced in other areas of the country and throughout Central America.

One of the most important results of Fundasal's work in Las Palmas was the creation of neighborhood upgrading policies by El Salvador's central government. In addition, the presence of international organizations was a key element for the national and regional replication of the project.

Some general reflections:

1. The inhabitants improve their houses constantly, due to their desire of bigger rooms for their own use, or for renting rooms or for small stores to augment their income. The issue of legal land

tenure is central to the incremental process, securing the people's right to housing and mobilizing their investment.

2. The concept of incremental housing encompasses much more than the physical enlargement of the dwelling unit. It also deals with the creation of housing designs that are flexible and efficient and that allow easy expansion by inhabitants, the development of the individual, the family and the community, and a strong and sustainable community organization.
3. Finally, the initial improvement of individual houses and entire neighborhoods enables a broader socioeconomic development with the potential to improve the quality of life of a large population of El Salvador and other Latin American countries with similar economic, social and political challenges. The ability to develop multi-story units offers an excellent model for higher density urban development, which contributes to mitigating pressures on urban expansion and offers effective use of higher value, serviced urban land.

HAITI - THE T-SHELTER: 2-STORY REBUILDING AFTER DISASTER

Ann Lee, Project Director, Katye Project, Haiti.

Summarized by Lia Brum, Mundus Urbano

Project Summary

A 2-story building with 1-small room per floor, built of sophisticated steel columns covered by plywood with rubberized waterproof cover. The requirements of high density, difficult site conditions, and hurricane safety were met, but generally resulted in an unsatisfactory unit for incremental expansion.


Editors' Reflections


The overriding concern for hurricane safety resulted in a sophisticated structure, which made incremental expansion by owner-builder unlikely. Two stories offered higher density, but the small unit size may be considered not sufficient.

The transitional model constructed of steel columns and weather resistant plastic covering may not lend itself well to incremental expansion. The structure would undoubtedly withstand hurricanes, but modifications/expansions by the inhabitants would be difficult.

Haiti	
<i>Project</i>	Katye Project in Ravine Pintade community
<i>Starter unit</i>	2-story T ("transitional") shelter, with latrines adjacent. Also some single-story wood frame shelters. Strong focus on community participation in planning
<i>Area</i>	Unit: 12 sq/m. (increased from 8 sq/m)
<i>Type of spaces</i>	1 room each floor in 2-story structure; also some single story single room wood frame T-shelters
<i>Construction process and materials</i>	Concerns of safety from hurricanes were overriding considerations. Sophisticated structure of steel columns, plywood sheathing, covered with heavy rubberized fabric were contractor built.
<i>Tenure</i>	Condominium title
<i>Facilities</i>	Water via communal tank; rain water harvesting; latrines provided outside adjacent to building; solar powered path lighting
<i>Support for incremental improvements</i>	Unclear, if any. Structure maybe too sophisticated for ready owner-builder modification; but other single story wood frame shelter encourages customary skills and materials
<i>Who will occupy expansion</i>	(Not applicable) Potentially small stores could be opened on ground floor.

Site planning with strong community inputs was key goal of the project.





Space between buildings could potentially provide expansion space.

As noted in the presentation, local materials - also considering local skills - would be good criteria for choosing a construction approach. The ingenuity of inhabitants may find a way to expand, and review of the project in 5 years may offer lessons on appropriateness of this design approach.

The context and outcomes of Katye were presented, which means „neighborhood“ in Haitian creole. Supported by USAID, Katye is a housing program carried out by CHF International, a consulting firm, in the community of Ravine Pintade, in Port-au-Prince, after the earthquake that devastated Haiti in 2010.

The earthquake made the project team deal with a worst-case scenario, which consisted of severe physical damage, weak government and absent infrastructure. With 30 percent of the population killed, 70 percent of the population living under the poverty line and 60 percent of houses severely damaged, the initial scenario in Ravine Pintade was fragility and violence, in a landscape defined as a wasteland of rubble.

Transitional housing with holistic approach

After observation of the conditions of the housing stock in the area, which collapsed due to poor construction practices, use of sub-standard materials and construction on unstable disaster-prone lands, the project staff took this opportunity to learn how to plan and prepare for future disasters. In this regard, the goals of Katye were three-fold: (i) to build a safer and healthier neighborhood with basic public services, meeting basic humanitarian needs; (ii) to create the conditions for the upgrading of essential services; and (iii) to reduce the risks to property and personal



Figure 1: From left to right, stages of the construction: the concrete foundation is resistant to seismic and wind stress, neighbors erect the steel frames which constitute the structure, which is then covered with plastic sheeting on the exterior and plywood in the interior. ▸

safety in the event of future disasters. Therefore, instead of splitting different activities among different actors, the project took a holistic approach, which combined humanitarian assistance with the development of community ties, and included the following main areas of work: enumeration and community mapping, rubble removal (eventually ten thousand cubic meters of rubble were removed), participatory planning and two-story transitional shelter solutions.

Compared with a single-story design alternative, the two-story structure allowed a relative increase of the housing stock, optimizing land use. The higher density al-

lowed taking in additional dwellers in dire need for shelter.

Residents, named "partners", not only worked on the construction of the houses themselves, but also decided on the best configuration of the new parcels, latrines and water points. Five water tanks with the capacity of 3,000 gallons each were installed in five different zones, meeting most of the community's potable water needs. For sanitation, each shelter has a latrine that is connected to septic tanks.

Since many people had died from the collapse of buildings, attention was given to an evacuation plan of the new neighborhood, with the rehabilitation of roads and the creation of new footpaths. Additional



retaining walls brought new stability to the landscape and allowed an increase in the public area of five percent, for the development of common infrastructure, and solar lights were erected to contribute to street safety. Combined with training and education, such improvements resulted in understanding and acceptance of a condominium-type of sharing, which had formerly existed in Haiti, but was not very well known by the community.

Project limitations

The full program required an investment of around 9.7 million US dollars, mostly funded by USAID. The Katye project was implemented over a period of 17 months, provided 386 shelter units and assisted 1984 families in and around Ravine Pin-tade. Caravan Engineered Structures, the company that developed the two-story housing model, is now able to replicate the design – however, given the high price of locally unavailable material and technology, other neighborhoods of Port-au-Prince are unlikely able to afford it.

Although CHF considered the program as highly successful in providing post-disaster housing, other limitations were identified, such as the low involvement of local government agencies, the impossibility of supporting small businesses and the lack of electrification of individual shelters.

Conclusion

When compared to camps provisionally built in the aftermath of a disaster, transitional shelters show to be a more stable response to emergency situations, providing better conditions for people to rebuild their lives. On the other hand, the absence of an incremental development plan with perspectives of housing expansion and upgrading may negatively affect the long-term development of the community. Finally, the use of non-local material and technology may be considered costly, especially given the short life span, and an obstacle to impact at scale and sustainability.



Figure 2: The two-story houses were designed to last for two or three years. Each building is able to host two families.

Before



After



Egypt - HOUSING PROTOTYPES - 6TH OCTOBER NEW TOWN

Dr. Ahmed Shalaby, Cairo University, Egypt

Summarized by Sandra Michel and Larissa Gocht, Department of Architecture, TU Darmstadt


Project Summary

A family is given a 150sq.m. plot, for building a 3-story pre-approved building by self-help with limited small contractor support. Financial incentives encourage rapid construction. Floors may be rented or sold to others. Essentially the owner-builder acts is the contractor, similar to informal developments, but with guidance and incentives from govt.

Editors' Reflections

Foundations are designed for 3-story construction. It remains to be seen if families go higher, as common in informal areas. Incremental self-help construction is limited to the pre-approved process, little variation seems possible. A 'transformation' process as seen in existing public housing projects may equally feature in the future.

EGYPT – 6th OCTOBER PROTOTYPE

<i>Project</i>	6 th October New Town Housing Prototypes under 'Build Your Own House' Program	Impression from the Neighborhood under construction
<i>Starter</i>	Must build three-story building; assumed to be able to move in after ground floor completed (75sq.m unit)	
<i>Area</i>	75m on ground floor of building, on a 150sq.m. plot. Three floors max for a total 225sq.m. Assumed one family per floor.	
<i>Type of spaces</i>	'Standard' apartment plan by govt: living room, 2 bedrooms, kitchen, bathroom	
<i>Construction process and materials</i>	Land provided by govt, ground floor construction subsidized by govt: excavation, foundation, ground floor columns' subsidy given after completion of each additional floor; standard concrete frame with brick infill, plastered; built by self-help or with small contractor support.	
<i>Tenure</i>	Freehold title	
<i>Facilities</i>	All services considered, but considerable delay in public infrastructure networks	
<i>Support for incremental improvements</i>	Govt provides complete pre-approved plans of 3 options; facilitates financing with financial institutions; and subsidizes ground floor to speed process; financial incentives for timely completion of floors	
<i>Who will occupy expansion</i>	Owners allowed to rent or sell finished units; assumed some to be saved for immediate family.	

Three-story building completed under the program

Build Your Own House

The project Build Your Own House is a national governmental program to deliver low-income housing while addressing the problem of increasing densities. The provision of affordable housing units is one of the major problems that all sequential Egyptian governments since the mid of the twentieth century are facing. This long period of dealing with this problem resulted in a huge quantitative deficit in the housing units needed for low-income groups. Meanwhile, responding to unmet demand, the huge informal housing sector in Egypt has proved the ability of the low-income groups to build by themselves. Build Your Own House encourages low-income families to build their own houses on a serviced plot provided by government. This program is considered a tool

to encourage the participation of low-income groups in the construction process of their own houses within a planned and controlled environment. Build Your Own House was started by the government in 2005 to provide more than 96,000 plots that are distributed across 13 new cities all over the country.

6th of October City

In 1979, the Egyptian government started the development of Sixth of October City as part of the new cities program to address population growth in the Greater Cairo Region. On an area of 5,000 hectares, approximately 1,100,000 inhabitants live there today with a target population of 6 millions in 2027.

The case is interesting, as densities tend to be very high because of Egypt's ge-

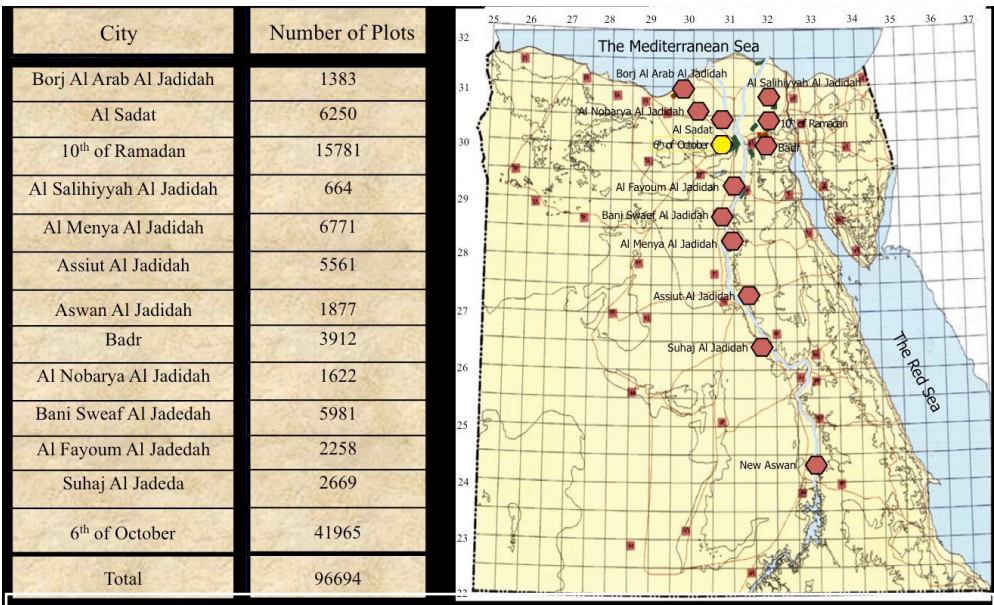


Figure 1: Location and Number of Plots at Each Location of Ebny Baitak Project in Egypt including 6th of October City (yellow)



Figures 2a and 2b: Housing prototypes provided by government with typical ground and upper floors and elevations

ography, constricting human settlements mainly along the river Nile and the coastal areas. As a consequence, housing developments, even incremental ones, are strictly vertical. The following examples document buildings that were built by the beneficiaries on the plots given to them in the year 2008.

Housing design and construction

To economize on infrastructure, plots are usually located back to back. Three sample designs (with variants for regular and corner plots) are proposed. Each proto-

type contains 75 sqm on the ground floor. The designs consider rental situations: for example, the stairs are placed next to the entrance so that the upper floors can be rented separately.

Six predefined construction steps exist for the multi-story incremental house (Figure 3).

Public support system

The allocation of appropriate land and physical planning of the districts are the government's core responsibilities, including the arrangement of the plots and the



Step 1: Land Preparation and Excavation



Step 2: Building Foundations



Step 3: Ground Floor Columns and Walls



Step 4: Ground Floor Completed with External Finishings



Step 5: Second Floor Completed with External Finishings



Step 6: Three-Floor Building Completed with External Finishings

Figure 3: Construction steps as predefined by government



Figure 4: Infrastructure construction in 6th of October City—de facto this often happens long after the allocation of plots and construction of housing units.

provision of main infrastructure and services – such as access to water, electricity and sanitation.

To limit support to those people who clearly depend upon assistance, beneficiary selection is based on four criteria:

- They have to be between 21 and 40 years old.
- They must be a resident of the same city zone as the project site.
- They may not have been recipients of any previous governmental housing projects.

Successful applicants receive a 150-square-meter plot for EGP 10,500 (\$ 1,890), priced at EGP 70 (\$ 12.60) per square meter. The applicant has to pay down 10 percent of the total amount. The rest is lent at zero interest and to be repaid in seven equal annual installments. In order to promote timely construction, beneficiaries are exempt from repaying any outstanding installments, once the three-floor house is completed and externally finished. (In addition to the land cost, the household needs to pay a construction permit fee of EGP 300; to get the permit takes up to four months.)

Beneficiaries are allowed to build a house of ground floor and two additional upper floors according to certain prototypes on 50% of the plot area, implying a floor space ratio of 1.5. The government provides complete engineering drawings for pre-approved prototypes and facilitates financing options with financial institutions. The construction costs for the whole building semi finished from inside and completely finished from outside is about

150,000 EGP (\$ 27,000). To speed up the construction process and to get beneficiaries on the ground quickly, the government subsidizes the construction of the ground floor unit with up to EGP 15,000 (\$ 2,700). [This is approximately 25% of the cost for the ground floor unit and foundations strong enough to support three stories.] The subsidy is released in three steps according to the construction process. The beneficiaries receive EGP 5,000 against the excavation, foundation, and ground floor columns if completed in 3 months. The second installment of EGP 5,000 is paid against the completion of the ground floor roof if completed in 3 months. The final installment of EGP 5,000 is released after successful completion of the ground floor with external finishing if completed in 3 months. Thus, to get the subsidy, the ground floor has to be completed in a total of 9 months and if the beneficiary is behind the schedule in any stage, he/she loses the subsidy of that stage and the following stages. The government provides oversight through 6th of October City Council that is the governmental management body of the city.

Beneficiaries are not allowed to sell or rent the plot. These requirements seek to avoid exploitation of the support and skimming off the subsidies, then potentially continuing in poor housing conditions. However, beneficiaries are allowed to sell or rent any finished housing units. [Reviewer note: presumably, it is expected that the beneficiaries would not sell all housing units and not move to precarious housing conditions, as they would firstly earn enough monies to be able to afford one unit after having sold two units and secondly not be eligible to benefit from another housing

project again. Thereby, even if the state allows skimming off the subsidies, it arguably achieves two major objectives: (i) the improvement of housing conditions for the beneficiaries and (ii) market-based provision of further housing units to a larger target audience.]

Challenges

Even if the project is a success in the construction of the houses, some problems remain: for example, the delay in public infrastructure and service provision, and poor security need to be addressed. The lack of effective management for the project slows down the development of a functional community. To counter this and to emphasize local solutions by the community, participatory planning may be considered. In addition, the government should provide effective public transport. Furthermore, as no walls around the plots exist, as long as people have not built a house that they can lock, it is prey to robbery. This is problematic, as the crime rate is higher than in other poor neighborhoods. After previous cases of violence, largely attributed to poverty, harmonious living of people with different backgrounds should not only be possible but become mainstream. Ultimately, it is the duty of the government to create an inclusive 'well-working' society where no gangs or separated groups exist. "How to achieve this", is the challenge.

Conclusion

In April 2012, 80 percent of the inhabitants had already completed the construction of the ground floor. In this regard, this project is a real success. As seen in many government projects worldwide, several problems remain: for example, roads and

other infrastructure are still lacking. However, Shalaby argues that the problems can be solved with better engagement of government, low-income beneficiaries and society at large. For example, if these parties involved work together roads could be finished before the house building begins. That would also facilitate the whole construction process.

Summing up, the Egyptian example is a powerful example for a successful vertical incremental housing project. It may be fur-

ther improved, if adequate infrastructure and services are provided in time.

Figure 5: Completed Incremental multi-story housing units in 6th of October City, Egypt



Informal Public Housing Expansions:

Transformations of Multi-story Public Housing in Egypt

Dr. Graham Tipple, Consultant in housing and urban policy in rapidly developing countries;
Visiting Fellow, School of Architecture, Planning and Landscape, Newcastle University, England.

Summarized by Lillith Kreiß, Department of Architecture, TU Darmstadt

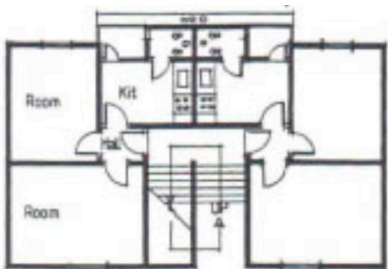

Project Summary

Defying what was provided in multi-story public housing, families modify and expand their units. Surprisingly often well built – generally by contractor – it requires active collaboration of the families to allow not uncommon multi-story additions.

Editors' Reflections

This project demonstrates the inevitable: even if not planned, occupants will seek options for improving their residential buildings according to their needs and preferences so that incremental expansions will take place.

TRANSFORMATIONS – EGYPT WALKUPS

<i>Project</i>	Helwan Worker District, Cairo, Egypt	<p><i>Before incremental extension</i></p>  <p><i>After incremental extension</i></p> 
<i>Starter option</i>	A row of walk-up apartments in a multi-story building with two different types of flats.	
<i>Area</i>	Aprox. 30 sqm originally Aprox. 45 sqm expanded (+50%)	
<i>Type of spaces</i>	Flats include two bedrooms, kitchen, toilet and a separate bathroom.	
<i>Construction process and materials</i>	Concrete frame construction with brick infill In the extension process, the owner used a simple post and slab construction with brick infill. Usually slabs overdesigned	
<i>Tenure</i>	Freehold title, secured prior to transformation	
<i>Facilities</i>	Electrical and water service for kitchen, toilets and bathrooms	
<i>Support for incremental improvements</i>	Not planned originally.	
<i>Expansion by families</i>	Addition of rooms by owner for separating boys and girls at night Extension of balconies Unlit and unventilated rooms as a result of adding rooms Alter kitchen space	

Consequently, in case of existing buildings not designed for incremental expansion, governments should seek ways to improve such informal expansions e.g. through improving tenure, providing access to finance or technical assistance. (Preventing/demolishing such expansions would actively deprive the living standard of residents and, thus, should be considered a poor policy.)

Equally important, new projects should consider the incremental expansion to take place in the future.

The Helwan Workers' Housing Project

A team led by Dr. Graham Tipple studied a worker district in Helwan, Greater Cairo Region in Egypt. The case, showed how a multi-story low-income housing project, which was never intended to be adapted by its inhabitants, was incrementally extended, in order to better respond to the user families' needs.

The Helwan housing project was finished in 1965. The project consisted of a row of walk-up apartment blocks offering several kinds of apartments, each with similar facilities: one to three bedrooms, kitchen, toilet and bathroom (Figure 1).

The first visit to Helwan took place in 1983 and revealed overall deteriorated conditions of the exterior of the housing and within the apartments themselves (Figure 2).

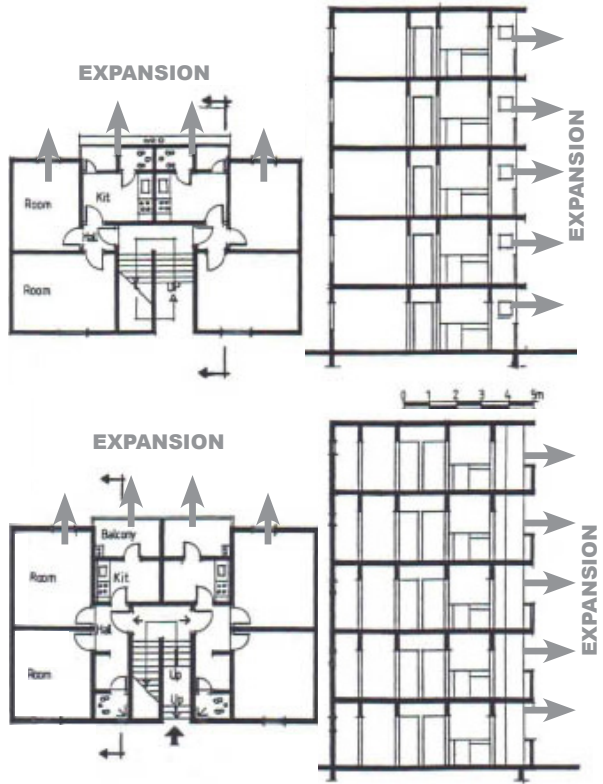
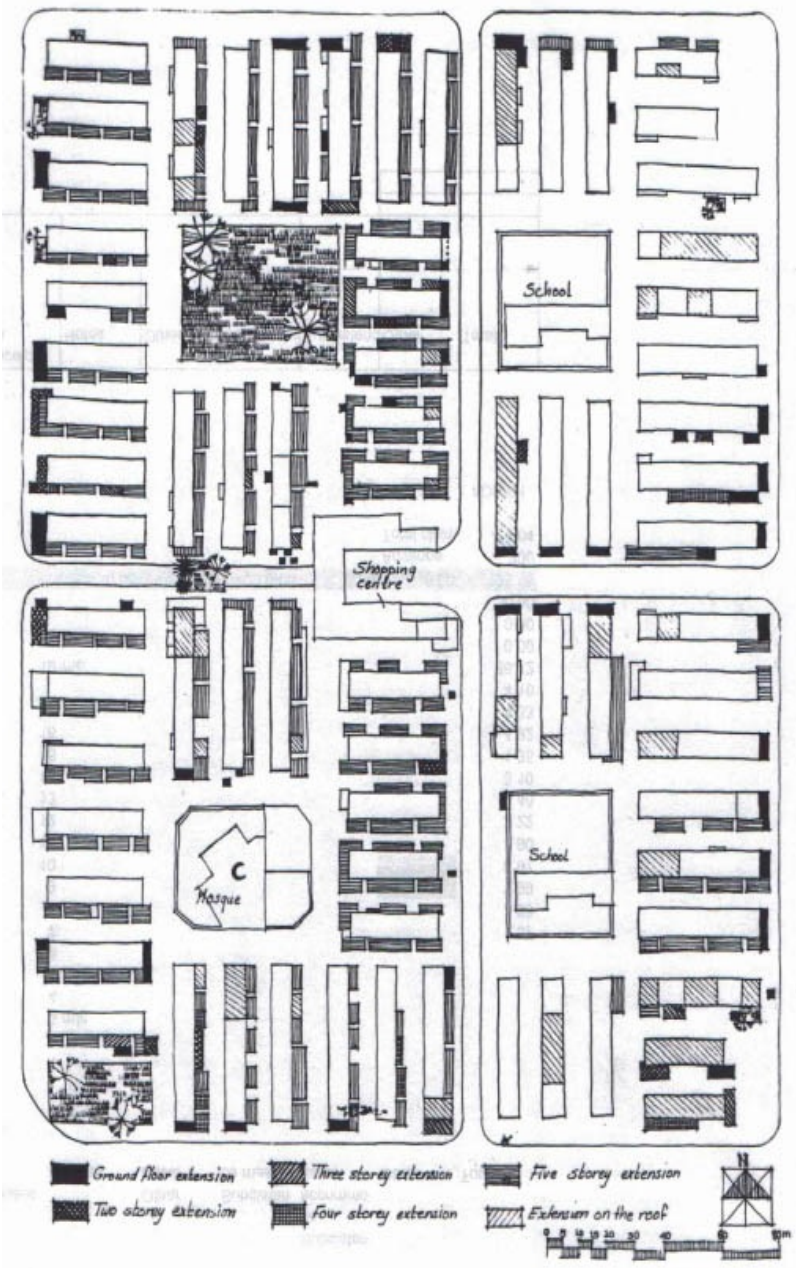


Figure 1: Ground plans of two apartments, as originally constructed, with arrows showing the direction of later-added typical incremental expansions

Figure 2: Example for the deteriorated conditions found in 1983



Figure 3: By 1983 the large majority of buildings have been incrementally extended: the plan shows the original buildings with a white footprint; expansions are hatched, with variations by the number of floors, (by Hala Kardash).



Incremental expansions

Despite the deteriorated conditions, many residents had transformed their living space and constructed rooms. The transformation had to take in account the neighbors beneath and above. Remarkably, up to an additional 50 percent of living space was added, and only one in five of the owners did not transform their space (Figure 3).

According to Dr. Tipple, security of tenure of the apartment was a precondition for the incremental process to occur. After securing tenure, the families spent the equivalent of one annual household income to transform their homes. The inhabitants hired informal private sector contractors who added a concrete frame with brick in-fill construction and individualized it according to the families' needs (Figure 4).

Overall, the strategies used for expanding the dwelling unit may be categorized as follows:

- Plans break out through balconies
- Alter kitchen space (becomes a pass-through space)
- Add new room(s) and often a larger balcony
- Often results in unventilated and unlit rooms
- Often express individual personality with decoration, etc.

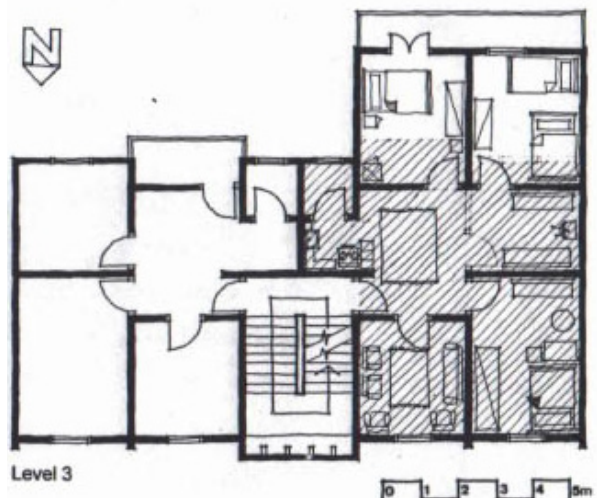
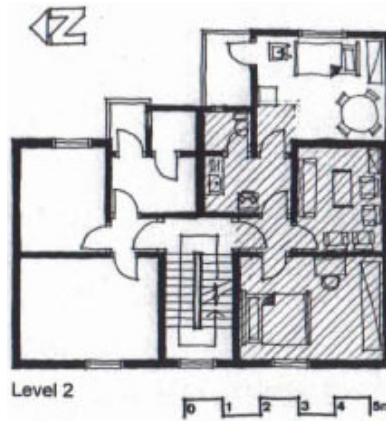


Figure 4: Examples for additional rooms (some unventilated and unlit) and the kitchen as a pass-through space. (Shaded areas show the original apartment in the extended unit.)



Figure 5: A building with early extensions in 1993

Figure 6: Approximately the same view of the further incrementally extended building in 2000



The reasons for transformation were mainly growth of the family (quantity change) and improvement of the living situation (quality change). Additional rooms, for example, allowed girls and boys to sleep in separate rooms. Some families, living on the ground floor started home based enterprises in the late 1990s, which gave commercial use to the area between apartment blocks.

In addition the extended housing units' value was significantly larger than the invested capital, making the process very attractive to residents.

Finally the transformation brought not only benefits for the owners but also improved the use of (previously under-utilized) land in between the apartment blocks. The resulting higher building densities permit higher population densities, reduce relative land costs and, arguably, aid in reducing urban sprawl.

Challenges observed

Unlit unventilated rooms tended to create problems, causing mildew and poor air quality. The plan could have been arranged differently in order to prevent this. It is questionable if the problem would have been solved through provisions for later incremental expansions since some rooms do not necessarily require natural lighting, such as storage rooms and often even bedrooms.

Finally, a family that extended their home because their daughter or son started their own family and moved in with the parents could often not create separate entrances. (However, Dr. Tipple highlighted that even with better planning it might not have been possible to mitigate this problem.)



Support for incremental growth

As the land immediately adjacent to the building was used for extending ground-floor units, some owners paid additional fees to local governments. The households in a vertical stack collaborated to pay for the whole structure together.

Conclusion

Dr. Tipple showed how the people found self-help channels for informally improving their housing even in multi-story blocks.

The settlement showed a transformation process which was not foreseen by the builders and local authorities. Some of the problems occurring in the Egyptian case did also happen in other regions. For example: insufficient sanitation seemed to be the case in most incrementally transformed projects.

Finally, the Helwan project showcases an opportunity for incremental multi-story housing, with apartments allocated to different families, and highlighted how interaction within the community had been necessary and helpful. The involvement of on-site 'barefoot-architects' has been found to be important in order to support the building process and to construct better and safer housing.

Figure 7: Individuality is expressed through varying combinations of color, material and form. Collaboration is also evident. In recent years, ground floor rooms here have been opened up as shops.

CHILE – Examples from Widespread Experience

Prof. Margarita Greene, Pontificia Universidad Católica de Chile.


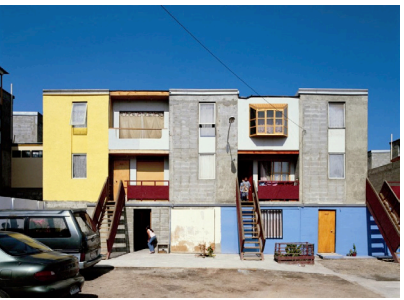
Summarized by Manuela Pinilla Rodriguez, Mundus Urbano

Project Summary

The 3-story concrete block ‘Elemental’ type of unit has become a model for multi-story incremental housing, but several other similar types are also offered. The importance of including the neighborhood in project is stressed as a vital emerging element in addressing issues of quality in environmental space.

Editors' Reflections

High subsidies and a well-managed skilled government staff have resulted in a successful variety of multi-story incremental units. Three-story shell unites are most common, and recently proposed are 6-story units with a bathroom on each floor in order to increase density and keep costs affordable. Excellent government support ion subsidies and assistance.

Chile		
<i>Project</i>	The ‘Elemental’ type of unit represents a variety of multi-story incremental models in Chile	<p>The Elemental model before move-in:</p> 
<i>Starter</i>	Single multi-use room in 3-story building.	
<i>Area</i>	Initially 40 sq.m. now 30 sq.m. on plots of 60 to 100 sq.m.	<p>The Elemental model after move-in:</p> 
<i>Type of spaces</i>	No interior partitions in a large multi-use room, to be divided by owner. Initial area of 30 sq.m. could be expanded up to 90sq.m.	
<i>Construction process and materials</i>	Concrete block loadbearing walls; concrete floors, roof. Core structure contractor built, with interior to be development by owner.	
<i>Tenure</i>	Legal title	
<i>Facilities</i>	All services included.	
<i>Support for incremental improvements</i>	Subsidies and technical assistance are offered.	
<i>Who will occupy expansion</i>	Intended for family, as as desired by owner.	

Greene's findings suggest that a planned incremental housing strategy with a core house may profoundly benefit the low-income population, which needs to invest fewer resources (compared to starting construction on a serviced but otherwise empty lot) in order to build a decent home, eventually. Thus, this policy may be preferred if governments are able to mobilize sufficient resources for building affordable core units for all urban poor households.

Vertical incremental housing falls into this category. Chile is a relatively richer country with a large percentage of the GNP dedicated to housing improvement, enabling large-scale redistributive housing programs with subsidies for the starter unit, redistributing wealth to the urban poor and accelerating the incremental expansion of the core. Finally, steadily increasing land prices in Chile suggest higher densities so that vertical incremental housing has become an excellent alternative to horizontal development.

On the other hand, Greene's research also indicates that if these resources are not available at scale and at speed then governments may safely concentrate on providing the most essential services (including public transit, basic infrastructure and health and education facilities that require collective action, as well as secure tenure, requiring government sanctioning). In this case, over time the low-income population will build their habitat successively. However, this approach will consume significantly more time and resources of the urban poor. This second interpretation of the research findings may apply to a country that has not yet reached an income and public revenue level high enough to afford the more capital-intensive core housing strategies, especially if the cost of land is still moderate so that a vertical approach is

not yet required. As a result of the initially lower investment, societies would need to tolerate a poorer appearance—however only temporarily. In this case, reducing the time needed to build a minimum habitable space and to guarantee a decent quality of life is a central challenge.

The history of public housing in Chile

In the last 50 years, the public housing policy in Chile has undergone various changes. Economic growth in the 1990s, accompanied with increased resources available to governments and widespread poverty reduction, influenced widely how government and civil society approached the issue of affordable housing.

From 1960 to 1990 the policy focused on securing minimum conditions: tenure, sanitation and, when possible, basic housing. Some of these strategies considered self-building, carrying out sites and services projects in the sixties and eradication of informal settlements in the eighties. Then, during the seventies and eighties, self-building was mainly considered for upgrading existing conditions, but not for the production of new units. In fact during the eighties the main governmental effort was the production of standardized social housing. Although this effort was substantial, the housing deficit continued to increase year by year. By 1990, it was estimated that the housing deficit had reached one million units and that, in addition, 100,000 units per year were needed to cater to new demand. This situation led to a policy shift.

After 1990, incremental housing, as a way of producing massive housing solutions returned as a key government strategy: the focus shifted to the production of core units, ready to be improved and extended. In the following 15-year period,



incremental housing became instrumental in meeting the 100,000 housing units per year target.

In this regard, many housing estates started with core units of approximately 40 square meters on plots of 60 or 100 m², to be extended by self building with little support from the government (see Figure 1). The results were not always good, as families faced difficulties in extending the core units while paying for services (water and electricity) and for basic needs such as food, health care, education, transportation and clothing.

At the same time, new cases with better-designed core units as well as higher initial investment emerged and produced significantly better results. For example, around 1990 a poor neighborhood in the center of Santiago de Chile, was selected for upgrading. Core units were provided in three-story shells without any interior construction. Each household started with an initial 30 square meter area that could be incrementally extended to up to 90 square meters. This Comunidad Andalucía project yielded a very positive outcome, with en-

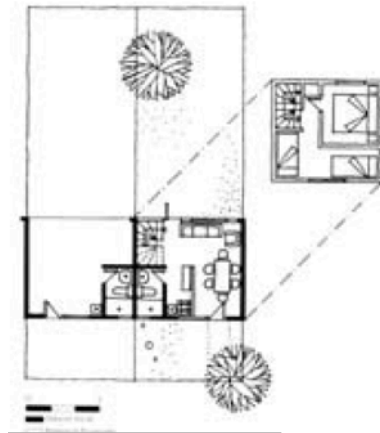


Figure 1 (above):
Villa Colombia, La Pin-tana, Santiago. MINVU, 1994

Figure 2 (right and below):
Comunidad Andalucía, Santiago de Chile



largement and consolidation of the units that were originally provided (Figure 2).

Similarly, the project of Quinta Monroy by the Chilean design firm Elemental used multi-story incremental housing as a solution to the unsanitary and overcrowded conditions of a slum in Iquique. The project included the re-blocking of the neighborhood and the provision of buildings of two independent houses, ready to be inhabited and incremented by the families (Figure 3).

Likewise, projects of densification were implemented in neighborhoods with overcrowded houses, building core units on the back of the plots that were to be enlarged by the inhabitants, usually by family members that were living together in deficient conditions in the main house.

A further change of paradigm occurred in the mid-2000s: the housing policy amplified the focus from the individual dwelling unit to the entire neighborhood. The main reason for this change was that Chilean policy makers perceived the quality of housing no longer as just a function of secure land tenure, habitable space, sound environments and basic services—all within the incremental housing strategy. Instead, a more holistic view also considered road access and public transport, street lighting and safety, as well as social and recreational infrastructure as a way to guarantee a healthy environment and decent quality life of inhabitants (Figure 4). For the neighborhoods that were already built, especially in the times of site and services (1960 to 1990), consecutive neighborhood improvement programs were implemented, building on and improving the urban structure and facilities provided originally: green areas, public squares and community centers were built, all within a participatory planning scheme, on the contrary to the top-down



Figure 3: Evolution of the core unit in Quinta Monroy, Santiago de Chile before the expansion (above) and after (below) (Photo: Universidad Católica de Chile, 2012)

Figure 4: Neighborhood improvements in existing housing estates





Figure 5: What is to come: multi-story incremental housing (Cristian Lavin, Universidad Católica de Chile, 2012)

approach in which these neighborhoods were built in previous decades.

On the other hand, new proposals of incremental housing are being developed in Chile. For example, concepts of massive incremental housing have been proposed. Building six-story buildings where just one bathroom for each house is provided initially, and the construction of the rest is left to the inhabitants (Figure 5). This kind of project is proposed in order to densify well-located areas while offering green and open spaces at the same time. Whether this innovation will succeed or fail needs to be seen. The expected community driven and incremental process may be able to mitigate some of the potential adverse effects of increasing the number of floors—such as the difficulties of collective for operation and maintenance of community facilities and open space.

To illustrate the benefits and challenges of the different housing policies al-

ready mentioned, the Universidad Católica de Chile made a comparative analysis of three of the most common housing strategies throughout these 60 years of learning: self-built, unplanned incremental and planned incremental housing (Figure 6).

Key findings

The time elapsed in achieving minimum habitable space varies dramatically between self-built and expandable core housing strategies. In the sample, the households with dwellings that were completely self-built took an average of 23 years to have the same number of rooms and family members, the proxy measure used for obtaining a minimum habitable space. On the contrary, planned incremental projects needed on average 4 years to reach this ratio. On the other hand unplanned incremental houses needed 8 years. (A fourth project with unplanned incremental flats in a high-rise building al-

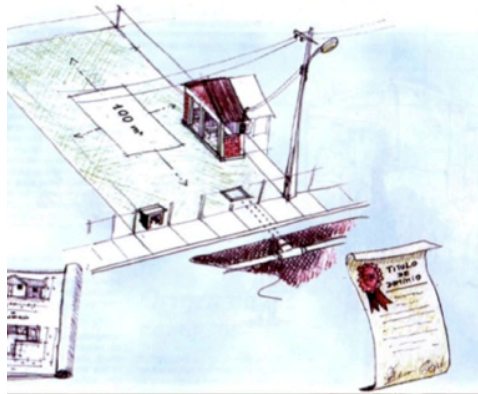
Figure 6: Common housing strategies throughout 60 years of learning in Chile: self-built housing (above), unplanned incremental (center) and planned incremental housing (below) **ORDER OF IMAGES**

ready started off with a higher number of rooms than members in the family.) These results suggest that planned incremental housing achieves habitable expanded space faster than the unplanned options and that self-built housing without external support puts a larger burden in the households that already suffer from economic hardships.

Secondly, self-built housing strategies have the largest private and incremental investment. While the families that had self-built their houses spent US\$14,668 on incremental improvements, families that lived in planned or unplanned incremental projects spent between US\$4,155 and US\$10,705, only.

Thirdly, the total investments are however similar for both completely self-built and incremental housing—regardless of the initial subsidy. Including both the initial outlay for the starter option (including subsidies, savings and loans) and the investment for incremental improvements and expansion, the total investment made over time is similar across strategies (with younger projects lagging somewhat behind). While self-building households spent US\$21,678, families living in incrementally expandable core housing spent between US\$15,776 and US\$21,705.

Finally, the subsidy size is inversely proportional to the occupier's self-investment.



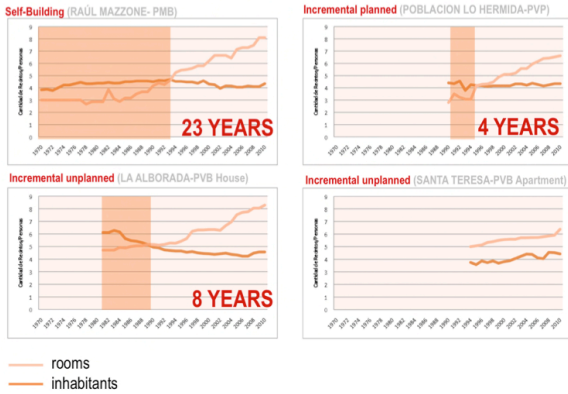


Figure 7: Family and house growth over time

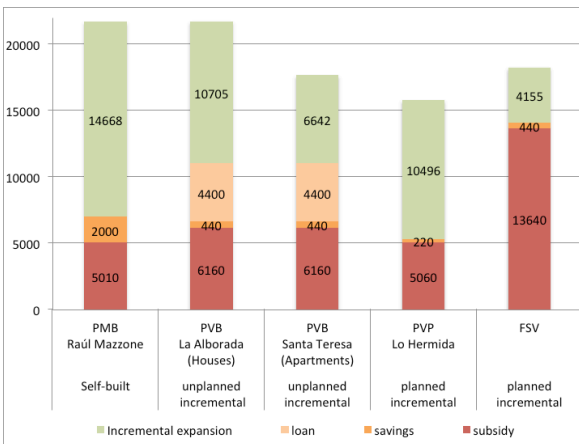


Figure 8: A comparison of final unit cost and funding sources for the different approaches (in USD)

Conclusion

In Chile important lessons have been learned and today efforts to improve the housing strategies are being implemented.

First of all, housing strategies are strongly conditioned by the legal and political framework, the amount of resources available, national priorities and available technology.

Secondly, incremental houses provide the opportunity to use the incomplete starter house but to achieve similar-quality finished houses, eventually. Doing so, (compared with lots without any housing) it reduces the time in precarious conditions significantly and may improve construction quality.

Finally, as mentioned before, it is urgent to incorporate a wider view in the housing policy, moving from the house to the neighbourhood, including issues as location, socioeconomic integration and urban services and equipment, in order to ensure the creation of policies that respond to the needs and priorities of all citizens, guaranteeing their rights.

Incremental Housing Design Strategies to Meet Rapid Urban Growth

Dr Reinhard Goethert, MIT Special Interest Group in Urban Settlement (SIGUS)

Summarized by Blanca Calvo Boixet, Elena Mozgovaya and Daniela Sanjines, *Mundus Urbano*

Editors' reflections

There has been much argument about how to house the 'poorest of the poor' who barely survive and use all their funds for food. Therefore, they have no resources left for housing so that they would not be able to expand and, thus, get stuck in whatever they receive as the starter option. In short, incremental would not work for them they say. Some people argue that they therefore need finished complete units. In some early projects they included blocks of rental units to address the ultra poor.

However, others argue that if they are forced to pay full rent they will not be able to afford it. Alternatively, if they only pay a subsidized rent for (part of) depreciation costs, then they may as well receive a subsidized unit for which they likely care better and which is less of an administrative challenge. In order to reduce skimming off the subsidies and the ultra poor moving back to precarious conditions any such unit would arguably need to be of a more inexpensive standard and/or extremely small size though, raising other ethical concerns.

Introduction

On Wednesday morning at the 6th Session of the UN World Urban Forum in Naples, Italy, people shyly made their way into Room 12 of the 5th Pavilion as they searched for a seat on one of the eight tables arranged for the forthcoming training session on incremental housing. The head of Haiti's Unit for Construction, Housing and Public Works, a representative of a French NGO and a PhD student from Lagos, Nigeria, assembled themselves at one table, as a professor from Trondheim University, Norway, and two NGO representatives from the Philippines at another. Experts on construction materials discussed with government officials, academic researchers, students, NGO representatives and other experienced professionals, bringing a rich and diverse expertise to the tables of working groups.

The main objectives were as follows:

- Develop awareness of incremental housing
- Understand the range of incremental options and their implications
- Become aware of basic guiding principles when going incremental
- Explore the use of 'incremental starters' as a development tool

The session was organized around five challenges and then supplemented with background and resource information.

Typology of incremental houses

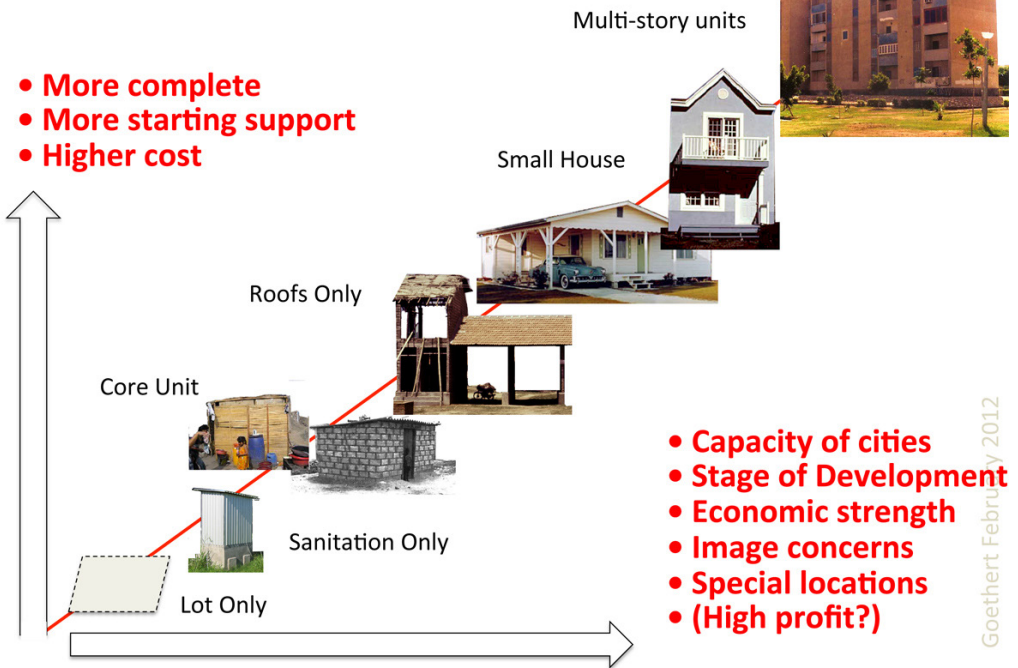


Figure 1: Starter core typology of incremental houses

Challenge #1: Increasing population = increasing demand for housing

To kick off the session, participants were asked to calculate the population growth rate of their cities and to estimate the number of houses needed to be built in the next 20 years.

As numbers began to be voiced, growth rates evidenced the growing challenge for cities to supply sufficient houses and serviced land. For example, Mumbai stood out as one of the fastest growing cities, with a 4.7 percent annual growth rate in 2012, implying a doubling of the population in only 14.7 years. More generally, we are facing the challenge of building in just one generation the same amount of urban housing units that were built in the last 6,000 years.

As housing policies have failed to

meet the growing demand for housing, people have turned to informal means of constructing their homes in an incremental manner over an extended period of time. Families build and expand their shelters according to their necessities and as economic resources become available. This flexible system has proven to be the best option for many and, de facto, the most efficient mechanism for diminishing the housing deficit and, thus, reducing potential slum conditions over the long term.

As a result, policy makers have not been blind to the benefits of this approach and have recognized that instead of controlling the informal process it is much more appropriate to accept and to partner with the energy of the informal sector in the provision of housing. Consequently, policy makers have turned to supporting and as-

sisting the informal sector to improve the construction and in speeding it up. Based on this concept, housing schemes increasingly aim for providing lower-income families with incremental housing options.

Challenge #2: Which housing scheme for which lower income group?

The second challenge asked each group to reflect on the benefits of various policy options when designing affordable housing schemes, and to decide which option is suitable for targeting various income groups. Participants were given three sets of options that may be characterized by the resource intensity of the starter product: empty lot, basic core with utility unit and small house (ordered from low to high intensity). Then, participants were asked to determine which of the three they would offer to which income group, ranging from low income, middle low income to high low income.

Most of the groups chose to provide a core unit to the extremely poor, a small house to the middle low-income group and an empty lot to the higher low-income group. The policy choice is based on the assumption that the somewhat better off will prefer the individual freedom of making their own design and have the resources available to be able to build a home quickly and eventually the house they wish. On the other hand, the very poor do not have any such resources and, thus, prefer a basic shelter to start with, as the latter is ready for moving in. Otherwise, families would have to live in a low-quality transitional shelter on-site while constructing their permanent home or to pay double: the loan for the new site while still renting somewhere else.

This contradicts the conventional theory, according to which very poor people

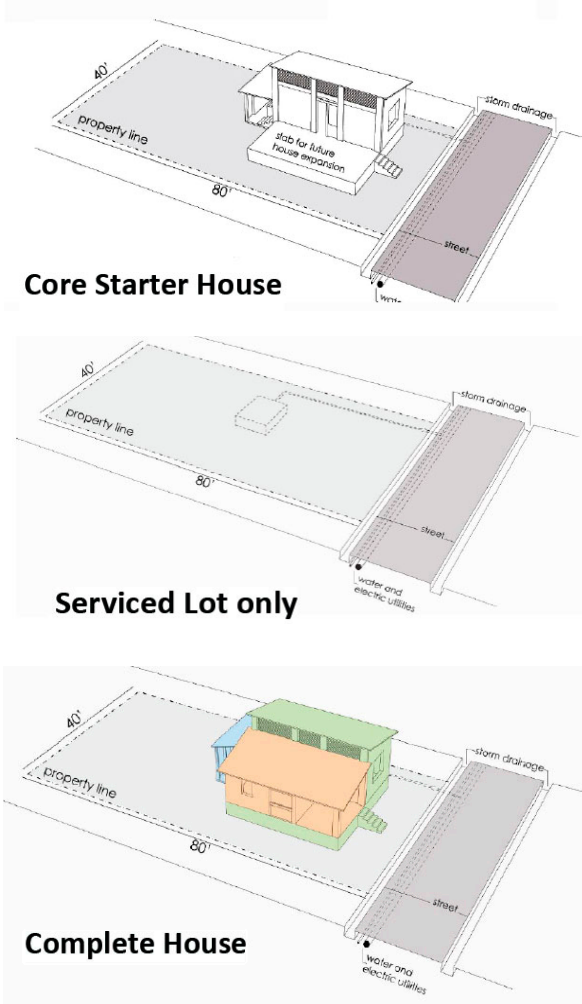


Figure 2: Traditional starter options for incremental housing, exemplifying the range of options offered during early site-and-service projects.
 (Models of affordable housing, Design by George Gattoni, Drawing by Zachery Lamb)

should be given an empty lot or site and services to build a house when they can afford. However, from experience, better targeting different income groups rivals with other policy options—such as the public resources that can be mobilized at scale and speed in order to reply to the large housing demand during rapid urbanization. As a consequence, the very poor continue to move onto land without any core housing. Yet, even though financial constraints may push policy makers in this direction, it is a waste of resources and energy if higher low-income group may be forced to live in a house that they do not like.

Finally, it should be mentioned that the provision of a too-small non-expandable dwelling unit is questionable as it is inflexible and does not give the inhabitants a role in the housing process. Therefore, one group even suggested: “Never give a small house!”

In summary, keep in mind the following trade-offs:

Government control vs. flexibility:

- More completed solutions give government more ability to control and direct the development of the house and to ensure higher livability standards. On the other hand, they are less flexible for the user, have higher initial costs and could exclude more poor. (The formal dominates)
- Less completed solutions are harder to control and direct, they rely more on outside initiatives and are more affordable. (The informal dominates.)

Family move-in:

- Less completed solutions, such as an empty lot with services, require

considerable effort and investment to move in.

- More completed solutions, for example basic core options, are ready to move in but have marginal although sufficient livability.
- Completed solutions, for example a small house or multi-story housing, are ready to move in but are less flexible in the future.

Expansion:

- The more complete the initial provision of the housing solution the more limited it is for future expansion.

Challenge #3: Incremental housing encourages the use of local materials?

In incremental housing accessibility to local resources, including building materials and tailored to local skills is key element. Therefore, for the third challenge participants were asked to rate different housing typologies (sites and services, small houses, and multi-story housing) on a matrix with two variables: flexibility and use of local materials.

Many participants agreed that the incremental process is the most flexible option, as families are free to expand and adjust their houses depending on their needs and income. It is also more likely to use local materials and local skills, being more sustainable (e.g. as materials do not need to be imported and there is no need for training of new skills) and promoting the local economy and jobs (e.g. as the construction allows for local labor). Often in a community that has become familiar with the construction, experienced neighbors and family members build their houses in a “do it yourself” approach.

the first elements to be built, will end up taking the most valuable and productive space of the house.

- Regarding whether the initial unit should be towards one side or in the center, it is important to keep in mind:
- If the initial unit is more central, it provides more flexibility and options for further expansions.
- However, positioning the initial unit towards one side means that it is possible to group two initial core units of adjacent plots together allowing units to share a wall and diminish costs.
- Regarding plot sizes, it is important to keep in mind:
- Small plots meet families' interests as they are more affordable and at the same time benefit the city, as it uses land more efficiently and mitigates urban sprawl.
- However, small plots are likely to be entirely covered by construction lowering adequate livability standards.
- Regarding proportion of plots it is important to keep in mind:
- Narrow and long plots have proven to be the most effective when it comes to designing low income affordable housing projects, as it allows more plots to have access to the street and space in the back to expand. It minimizes the cost of infrastructure fronting the plot.
- Nevertheless, too narrow plots can risk not having naturally ventilated and illuminated spaces and may restrict the possibility of making productive spaces and multiple independent entrances from the street.

Challenge #5: "Incrementalize" it!

By now the training event had addressed some of the main issues concerning incremental housing: the direct relation with rapid population growth; lessons learned from past decades of pilot projects with regards to the different incremental housing schemes; the implications on available local materials; and the importance of an adequate plot size and spatial arrangement of initial core units. The experience of multiple successful and failed pilot projects, planners, architects and policy makers have gained a significant amount of knowledge on the challenges and potential of incremental housing processes. In particular, it is crucial to remember that incremental building processes of houses and neighborhoods can take a very long time.

With urbanization ongoing for decades, another trend is becoming increasingly important: due to increase in land costs in consolidated urban areas, incremental housing projects are often located on the periphery or far outside of the city. However, the isolation of remote sites tends to hinder dwellers to access opportunities (especially jobs) and infrastructure from the existing city. This raises the question of whether it is possible to offer, in more consolidated areas of the city, multi-story incremental housing projects that can ensure higher densities in a shorter amount of time and provide a more efficient use of land.

Therefore, the final exercise presented a real life case of a multi-story affordable housing project in Manaus, Brazil. Participants were asked to imagine how dwellers had informally modified an apparently inflexible model.

Once participants had come up with various possibilities, a research group of students from the Special Interest Group

in Urban Settlement (SIGUS) at MIT presented the actual expansions that inhabitants of this project had ingeniously done. In particular, balconies were closed in and incorporated into the inner house, and available ground-floor open space was quickly replaced with makeshift structures and used as small shops and stores. This clearly shows that no matter how rigid a housing project is and how much it tries to discourage modification, people will find the means to “incrementalize” it!

Finally the SIGUS researchers presented possible alternatives to multi-story incremental housing by offering a shell that ensured the structural safety of the building with multi-story core units that can expand within a prefabricated structure. This planned growth not only enables an eventually denser project, allowing the pooling of land costs amongst a larger number of households and keeping costs low, but it can also ensure an adequate structural system decreasing the vulnerability of the dwellers.

Lessons:

As the world’s population continues to grow at increasing speed, so does the housing deficit and the challenge for cities to efficiently meet the housing demand. The following conclusions may be drawn, when considering incremental housing as a way to address housing issues:

- By now there have been many successful and some unsuccessful projects that take into account the advantages of incremental housing and from which lessons can be learned. Nevertheless, it is essential to always evaluate and reconsider conventional theories and ap-

proaches. An example of this is the often-unsuccessful practice of providing an empty lot for the poorest of the poor or giving away inflexible completed houses.

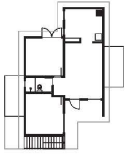
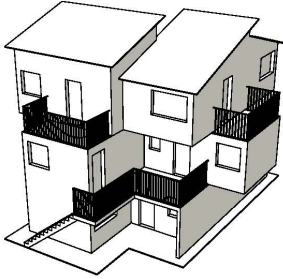
- There is no universal recipe; everything depends on location and context, especially incremental housing projects, since they develop within their socioeconomic and environmental tissue. It is crucial to always develop flexible, rather than rigid projects, so that people afterwards can “incrementalize” as they like.
- Size and proportion of plots, as well as the initial core unit’s position inside it, have a direct effect on the evolution of the incremental house and the impact on the community. The options for each element have advantages and disadvantages and should be taken into consideration depending on the context.
- Incremental housing does not necessarily mean urban sprawl or houses in isolated areas. Innovative approaches, such as incremental multi-story housing, are needed in order to promote denser projects in consolidated areas of the city for a more efficient use of land.

All in all, informal sector supplying the bulk of the new housing for the poor and incremental housing has proven to be a very efficient strategy, as it caters to the needs and resources of the poor. Unfortunately, many times the construction quality of the dwellings is poor and it takes a long time for families to complete their home.

With this in mind, housing policies should support the incremental process by enabling the poor to construct their houses better and faster.

TYOLOGY I

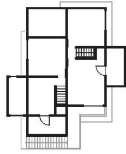
3 Family Unit
 Ground Floor Single Family
 2nd and 3rd Floor Duplex
 54 square meters per unit
 Load Bearing Masonry Structure



Ground floor



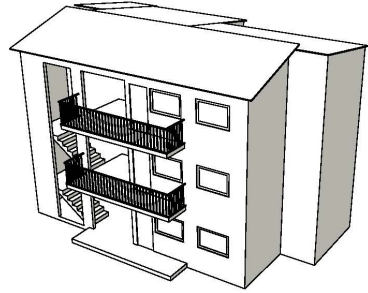
First floor



Second floor

TYOLOGY II

6 Family Unit
 Single Level Units
 46 square meters per unit
 Load Bearing Masonry Structure

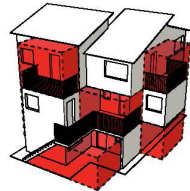


Standard floor plan

Figure 5: Housing Typologies in the Resettlement Program (Source: Harper, Portugal, Shaikley, SIGUS/MIT)

Figure 6: User-initiated incremental expansions (Source: Harper, Portugal, Shaikley, SIGUS/MIT)

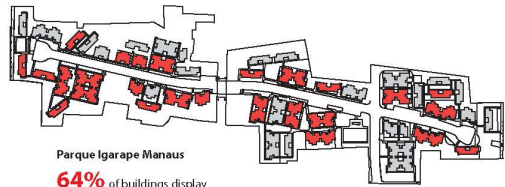
HOUSING TYPOLOGY I



* red indicated observed locations
 incremental expansion

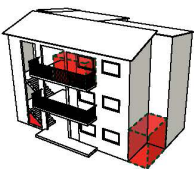
TYPES OF EXPANSION:
 62% Home-base Enterprise
 26% Living Space
 10% Storage

SETLEMENT TYPOLOGY I



Parque Igarape Manaus
 64% of buildings display
 incremental additions

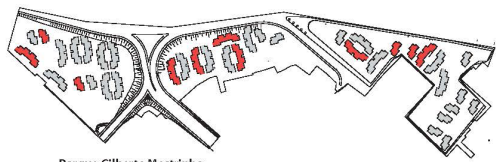
HOUSING TYPOLOGY II



* red indicated observed locations
 incremental expansion

TYPES OF EXPANSION:
 38% Home-base Enterprise
 41% Living Space
 21% Storage

SETLEMENT TYPOLOGY II



Parque Gilberto Mestrinho
 38% of buildings display
 incremental additions

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Presentations of Built Examples at the Network Session
and Documentation of the Associated Training Session
at the United Nations World Urban Forum, Naples 2012

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