

**INNOVATIVE LIGHTWEIGHT 'LIFT' / 'INDLULAMITHI'
HOUSE FOR INCREMENTAL UGRADING OF
STEEP SITES IN ETHEKWINI MUNICIPALITY**

AND

**ALTERNATIVE 'SERVICES FRAME' SERVICING
APPROACH**

IQHAZA LETHU LEARNING EVENT WEBINAR

02 June 2022



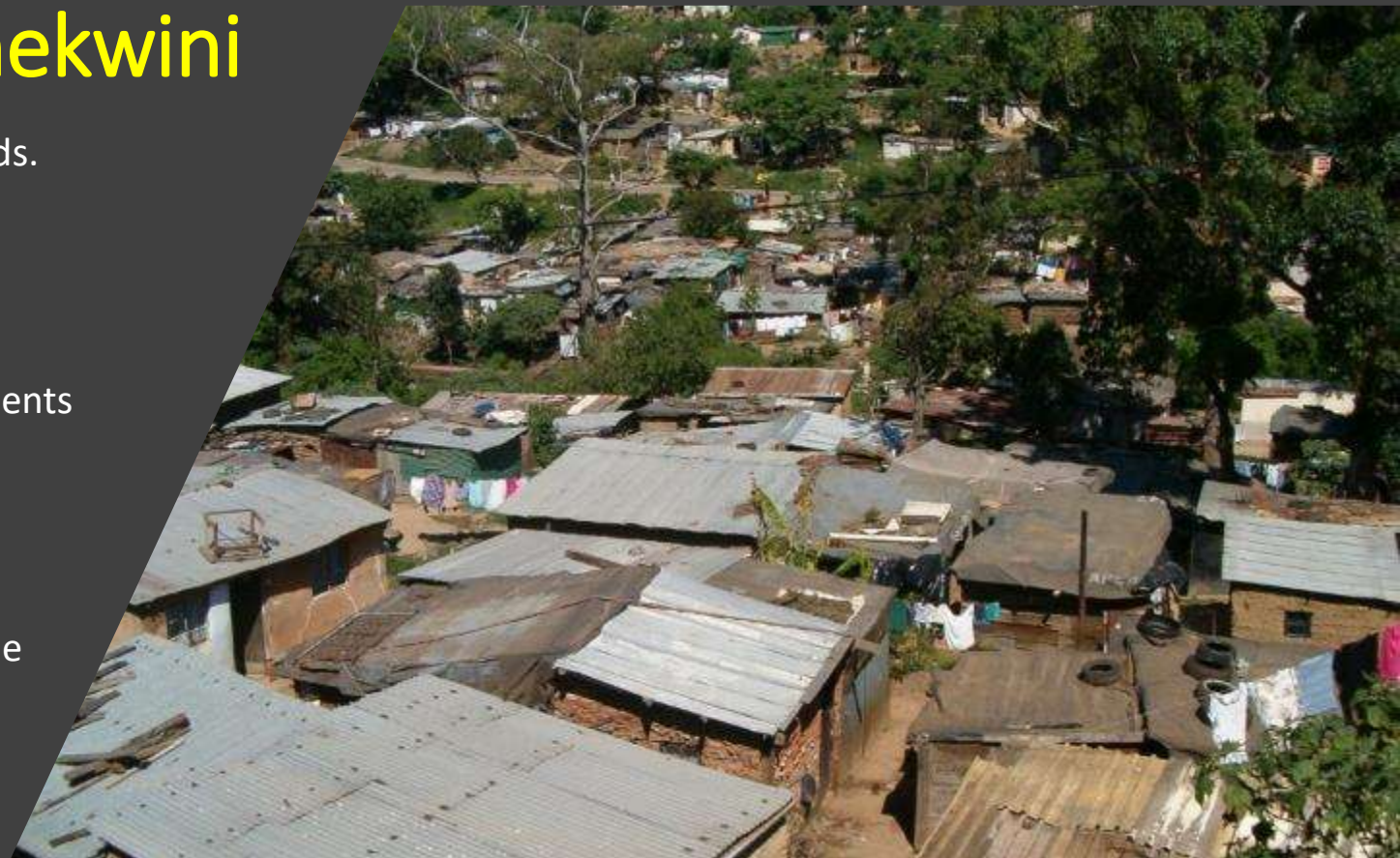
Take home messages

- 1. Alternative housing typologies which can function safely on steep slopes and can be built by local residents are a strategic necessity** for city-wide upgrading, spatial transformation and urban inclusion (conventional housing and servicing non-viable in these environments)
- 2. The value of these typologies is their ability to unlock scarce land & spatial transformation** – well-located land which can otherwise not be made functional for human settlement. **LOCATION!**
- 3. Steep slopes are developable and safe IF appropriate housing technology and appropriate engineering standards are utilised** – but this requires innovation and flexibility (e.g. pedestrianised access, alternative lightweight double-story housing designs)
- 4. Essential ‘levers’ required in order to unlock owner-driven housing improvements** within informal settlements include:
 - a) Incremental planning arrangements (agreed land use norms between muni & community)
 - b) Alternative forms of individual tenure security e.g. municipal tenure certificate
 - c) Adequate basic services (preferably the potential over time to achieve individual service connections)



Informal Settlements in eThekweni

- Over 587 urban informal settlements, 312,741 households.
- Nearly a quarter of the City's population.
- Continued urbanization and scarcity of well located land.
- Over 90 years to overcome just the informal settlement backlog by means of conventional housing delivery.
- Challenging topography, high densities and many settlements within environmentally sensitive areas
- **78% are category B1 (incremental in-situ upgrade with essential services) - 352 settlements, 246,348 hh.**
- **Many are very dense (200+ du per hectare)**
- Less than 3% of households earmarked for relocation (due mainly to sites being unsafe for habitation)
- **41% of land is privately owned (only 18% city-owned)**



Settlement Overview eThekweni – The scale of the challenge

The scale of informal settlements in the Municipality is a key factor informing eThekweni's City-wide Strategy. This has significant strategic implications including the impossibility of addressing the 'backlogs' by means of formal housing provision or comprehensive upgrading and the necessity for an optimized incremental approach.

Summary of settlements by NUSP category

NUSP Categorisation	No. settlements	Est. households	% Settlements	% households
A (full conventional upgrading i.e. housing project)	56	22 131	9,5%	7,1%
B1 (Incremental upgrade with essential services)**	352	246 348	60,0%	78,8%
B2 (Deferred relocation with emergency services)	135,5	33 009	23,1%	10,6%
C (Imminent relocation)	34,5	10 954	5,9%	3,5%
Under investigation	9	299	1,5%	0,1%
	587	312 741	100,0%	100,0%

**** 35% of B1s are best located (inside PIC and urban zone) - 202 settlements, 97,113hh, 35% of all settlements, 31% of all hh. Note household numbers as at July 2021 at time of pipeline analysis – there has been a slight increase subsequently.**

Differentiated Pipeline Approach

See pages 7,8 and 53 of Strategy

The incremental upgrading approach needs to be appropriate to the type (category) of settlement. The objective is to reach all informal settlements as rapidly and effectively as possible within the prevailing constraints (budget, land, bulks etc.). Settlements should therefore be differentiated into the following main pipeline categories. Some settlements will have a split categorization (e.g. part of the settlement suitable for ins-situ upgrading (B1) and part requiring eventual relocation (C)).

- **Best-located category B1 settlements (in-situ upgrades within prime investment corridor (PIC) and urban zones) – 31% of all households (97,113hh/202settlements).** The strategic objectives are to promote spatial change, improve services, and build assets over time. The focus is on reworking space (partial re-blocking), improving services access by means of an internal services frame, providing incremental planning and tenure arrangements, encouraging households to build their own improved housing.
- **General category B1 settlements (in situ upgrades outside PIC and urban zones) – 48% of all households (149,235hh/150settlements).** The strategic objective is initially to improve services whilst at same time laying a platform for longer term spatial change and asset building. The initial focus is mainly on improving services and working towards incremental planning and tenure arrangements.
- **B2 settlement (deferred relocations) – 11% of all households (33,009hh/136settlements).** The strategic objective is to relocate the settlement (or portion thereof) with a short term focus on addressing imminent health and safety threats and providing emergency basic services as an interim measure.
- **Category C settlements (imminent relocations) – 4% of all households (10,954h/34settlements** - although further analysis of these areas is required). The strategic objective is to relocate the settlement (or portion thereof).
- **Households at severe risk** – an undetermined number of households (further assessment and analysis required). The strategic objective is to rapidly assess, identify and address and/or mitigate imminent threats to human life through whatever response measures may be appropriate (e.g. flood mitigation, fire protection, relocation).

But current interim approach not sustainable (despite large scale services delivery)

The historical interim services approach was temporary in its orientation. Given the significant delays and constraints with rapidly providing formal housing for all informal settlements, an optimised incremental upgrading approach is therefore required in order to overcome the following challenges:

- **High and unsustainable capital and operating servicing costs:** The cost structure of temporary and communal services is prohibitively high. For example, if an alternative to CABs is not found, then R5 billion will be required to fund the remaining 3,123 pairs of CABs required to meet the remaining backlog and once all settlements have been serviced there will be a total of 4,103 pairs of CABs with a combined annual operating cost of approximately R400 million (including caretakers, supplies, maintenance and recapitalisation/refurbishment after 10year lifespan).
- **Limited spatial transformation :** There has been limited or no re-working of space (partial re-blocking) especially in well-located B1 settlements in order to improved access, services quality and layout.
- **No incremental planning arrangements:** Informal settlements currently fall entirely outside of all municipal planning frameworks even though SPLUMA dictates that they need to be accommodated in an incremental fashion.
- **No individual tenure security:** Residents lack individual tenure security. This represents a significant obstacle to owner-driven housing improvements and ultimately individual services connections and payment for services. If residents have tenure security and can transact (sell) their properties, this is expected to produce significant gearing of investment in improved housing stock and increased property values.
- **Limited owner-driven housing improvements :** Due to the above impediments, residents make limited effort to improve their own housing in start contrast to what is occurring rural/peri-urban areas. This represents a major lost opportunity.

Overview of optimised Incremental Upgrading Approach

The objective is to reach all informal settlements ('city-wide') as rapidly as possible with improved basic services and tenure security whilst at the same time starting to address spatial transformation and asset building. Incremental planning and tenure arrangements and optimised servicing approaches will be utilised to enable and empower people to invest in their own housing improvements (it being accepted that the formal housing programme will not be able to provide everyone with a state-funded house in the short-medium term). This is expected to take approximately 14 years given current ISUPG availability (approx. R1billion per annum). There are also additional O&M and bulk services implications to be considered.

- 1. Basic municipal services for all settlements** at various levels appropriate to the pipeline category (typical services include communal ablutions, household electrical connections, roads, footpaths & storm-water controls, solid waste containment and collection, fire hydrants and improved fire response).
- 2. Incremental planning arrangements for all B1 and B2 settlements** including designation in the SDF and incremental land use arrangements such as incremental or temporary development areas (i.e. IDA1 or IDA2 for B1s, or TDA for B2s).
- 3. Functional tenure security for all B1 and B2 settlements** in the form of administrative recognition based on categorisation, and with the intention of investigating alternative locally-administered individual forms of tenure at IDA2 level (e.g. municipal tenure certificate) subject to successful pilots and the available capacity to administer.
- 4. Partial re-blocking and establishment of services frames in best-located B1 settlements.** Establishment of services frames along with reworking of space / partial re-blocking. Typically involving the relocation of a limited number of households either within the settlement or to adjacent/nearby land. This lays the platform for owner-driven housing consolidation and asset-building over time as well as possible individual services connections and eventual payment for services (it being noted that in the long term it is critical for the municipality to be able to recover some operational costs).
- 5. Fast-tracked mitigations or relocations for households at most-severe risk** e.g. due to severe flood risk or slope instability (landslide), active railway line reserves, on fuel lines, fire.

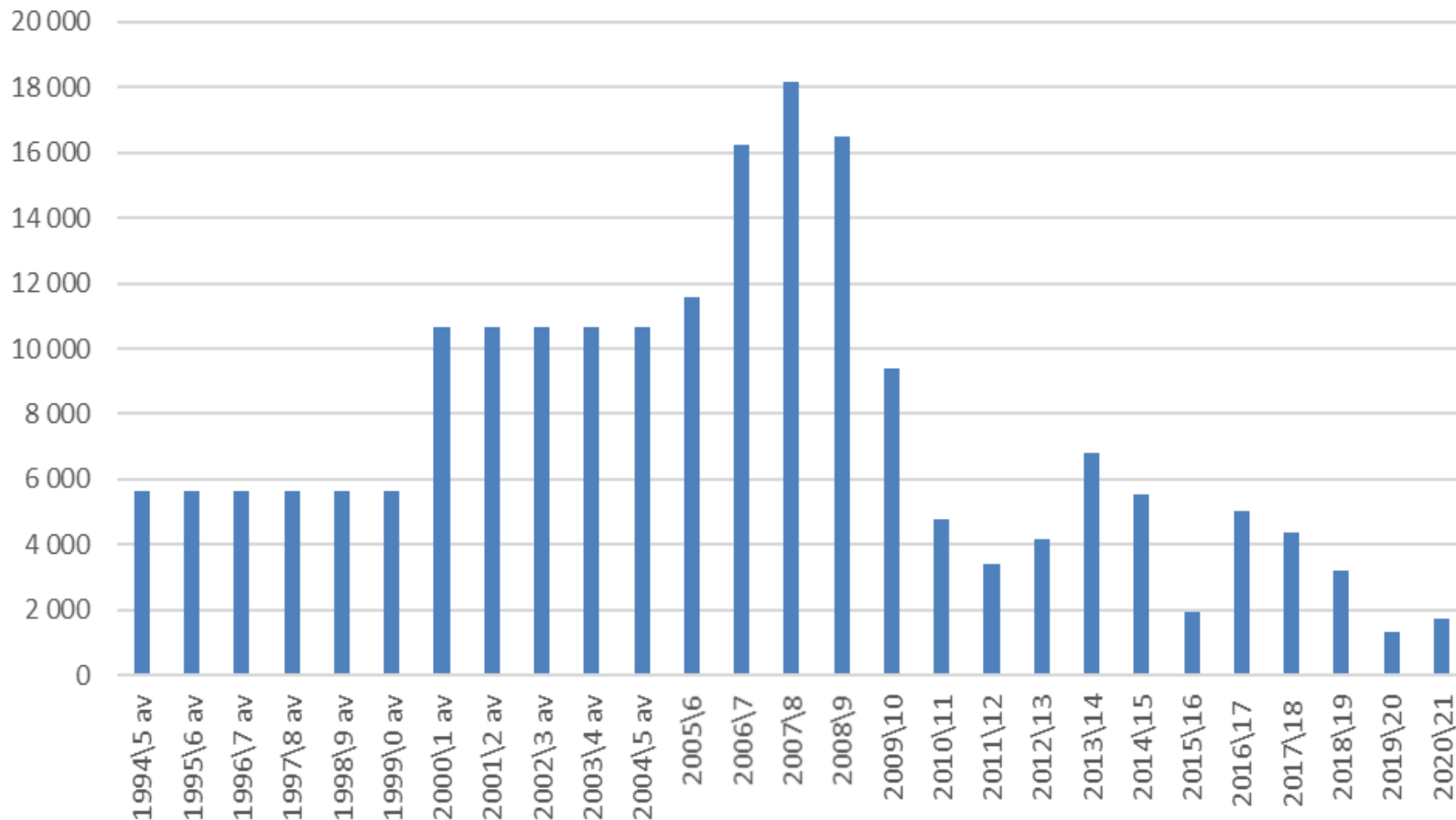
Housing Approach within Incremental Upgrading Programme

See pages 11 and 64 of Strategy

- **State-funded mass housing:** The conventional full upgrading pipeline (Category A) will continue utilizing available HSDG funding. At current funding levels, (disregarding limiting factors such as suitably-located land and bulk services), this programme will take more than 50 years to address the full housing backlog including all informal settlements. Public realm investment (e.g. municipal services) and regulatory innovation (e.g. incremental planning and tenure solutions) aim to create an enabling environment for people to improve their own housing. Consideration should be given to linking alternative individual tenure security (e.g. a municipal tenure certificate) to a requirement that the recipient builds housing of an acceptable and/or improved quality.
- **Relocations housing:** In cases where relocations are required (e.g. to make way for services for partial relocations and re-blocking on B1 settlements or the imminent relocation of category C settlements), then historical TRA-type housing should be avoided wherever possible. Alternative housing typologies (see below) or site and service could potentially be considered, given the high costs associated with conventional housing and its unviability on steep sites.
- **Alternative housing typologies:** The use and promotion of alternative (improved and appropriate) low-cost housing typologies should be considered. It is accepted that conventional housing is unviable on many steep and geotechnically challenging sites and that solutions such as lightweight, double-story structures which optimise limited space may also be appropriate (e.g. the LIFT or 'Indlu-lamithi' house developed and piloted via the iQhaza Lethu Programme). The Municipality may assist in exploring, testing and utilising such alternative housing typologies, both for use on relocation sites as well as for use by residents in communities as ways of residents building more optimally for themselves.
- **Housing support:** Ways of supporting residents to build their own improved housing should be explored. This may include: providing information (e.g. housing designs, including those for alternative typologies); some technical support to residents; improved building materials access. This could potentially be linked to the People's Housing Process (PHP) programme, housing support centres and collaborations with communities and civil society support organisations (subject to funding availability).

State-funded housing cannot meet the scale of needs

eThekweni RDP/BNG Housing Delivery since 1994



To date 201,191 formal houses delivered (massive and positive achievement).

Delivery has been slowing – now at an average of 3,210 over the past seven years due to numerous constraining factors (fiscal, land, bulk service, regulatory, escalating housing costs etc.)

At this rate, it will take 95+ years to address only the current informal settlement backlog (of 312,000+ households), notwithstanding other housing needs and further population growth/urban influx.

Alternative servicing approach ('services frame') for dense B1 settlements - why is an alternative approach needed?



- **Significant numbers of these settlements**
- **High level of vulnerabilities** - typically the most vulnerable e.g. fire, disease, overcrowding, flooding, squalid living conditions.
- **Most are old, well established and in prime locations** (work, social services).
- **Incremental services approach currently 'reactive'** – CABS on edges, minimal footpaths on existing alignments, no reworking of space, limited/no internal water and sanitation.
- **Conventional upgrading not possible** due to densities, non-qualifiers, lack of alternative land, steep slopes, geotech., costs and other factors
- **Settlements are developmentally 'locked'** UNLESS there is an alternative approach

What does the revised services 'frame' approach consist of?

- Main priority is to **establish the main services access ways (main 'frame')** which breaks the settlement up into more manageable 'blocks' and brings essential services into the settlement so they are more accessible, instead of being located at the edges.
- **Typical services provided on the frame** include: footpaths, storm-water controls, mini-communal ablutions, fire hose points, standpipe wash facilities, electricity, solid waste containment bins. All except services electricity are communal, but the potential for individual connections is created for the future. Informal structures are electrified once the frame is established.
- **Limited re-blocking, relocations and reworking of space sufficient** to establish the frame (compared to conventional, formal upgrading)
- **Consolidation of intra -blocks occurs as a later phase** including housing improvements and possible individual connections. Use of the alternative housing typology developed can assist in more functional consolidation over time.

Parkington,

informal settlement, eThekweni
municipality, Ward 34,
Incremental Upgrading Service
Upgrading Concept Plan



"iQhaza Lethu"

*An informal settlement upgrading
partnership initiative co-funded by
the European Union*

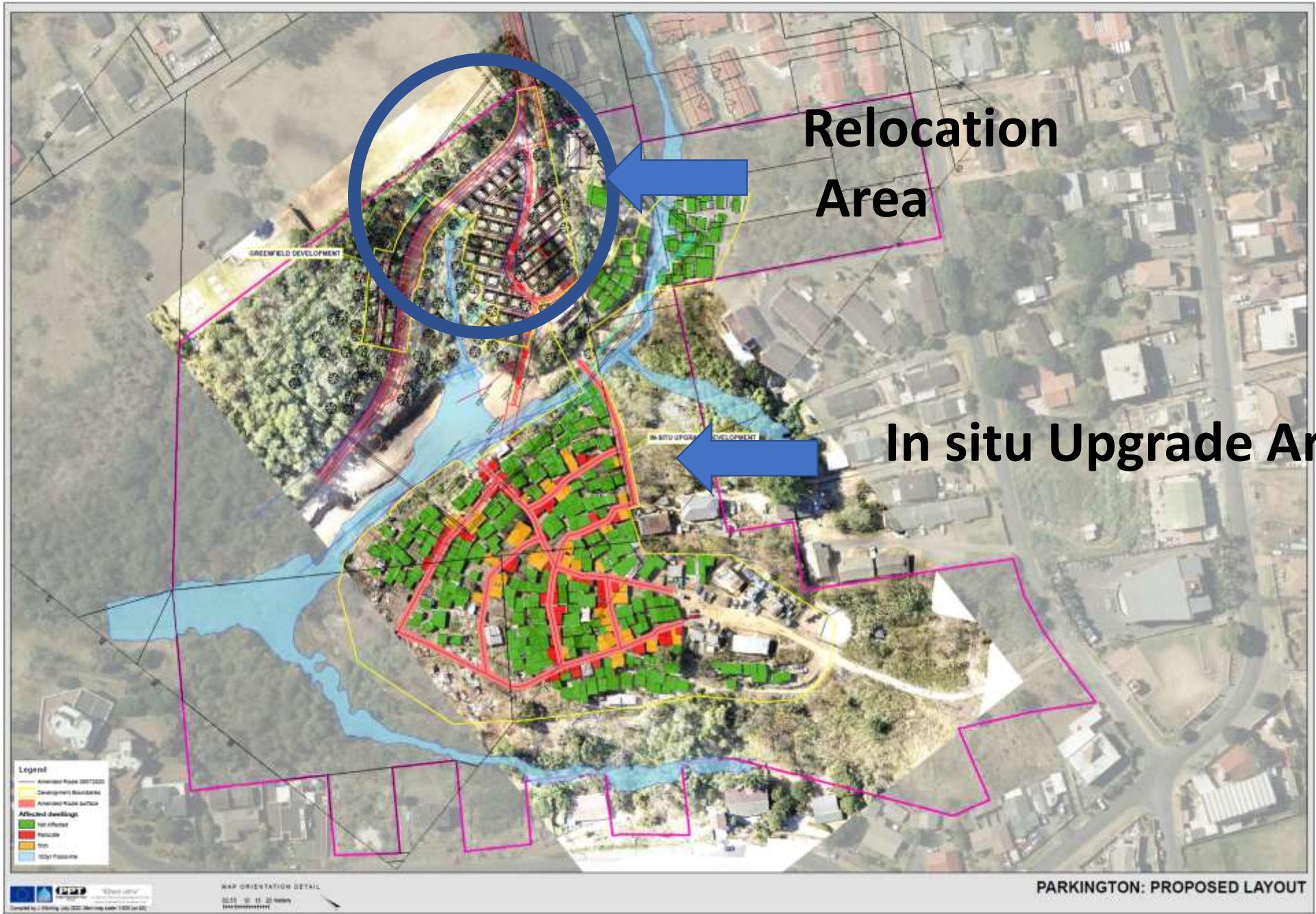
Proposed upgraded services

Roads	
Footpaths	
Lighting	
Water pipes	
Sewer pipes	
Water hose points	
Standpipe Drainage Facility	
Existing Sewer pipes	
Existing communal ablutions	
Mini communal ablutions	
Solid Waste bins	
Solid Waste Containment area	
Bridge	
Project Boundary	
Fire Hydrant	



Date : February 2020
Drawn by : iQhaza lethu - team

100 m



**Relocation
Area**

In situ Upgrade Area

Legend
Affected dwellings
Not affected
Partial
Yes
City Footprint

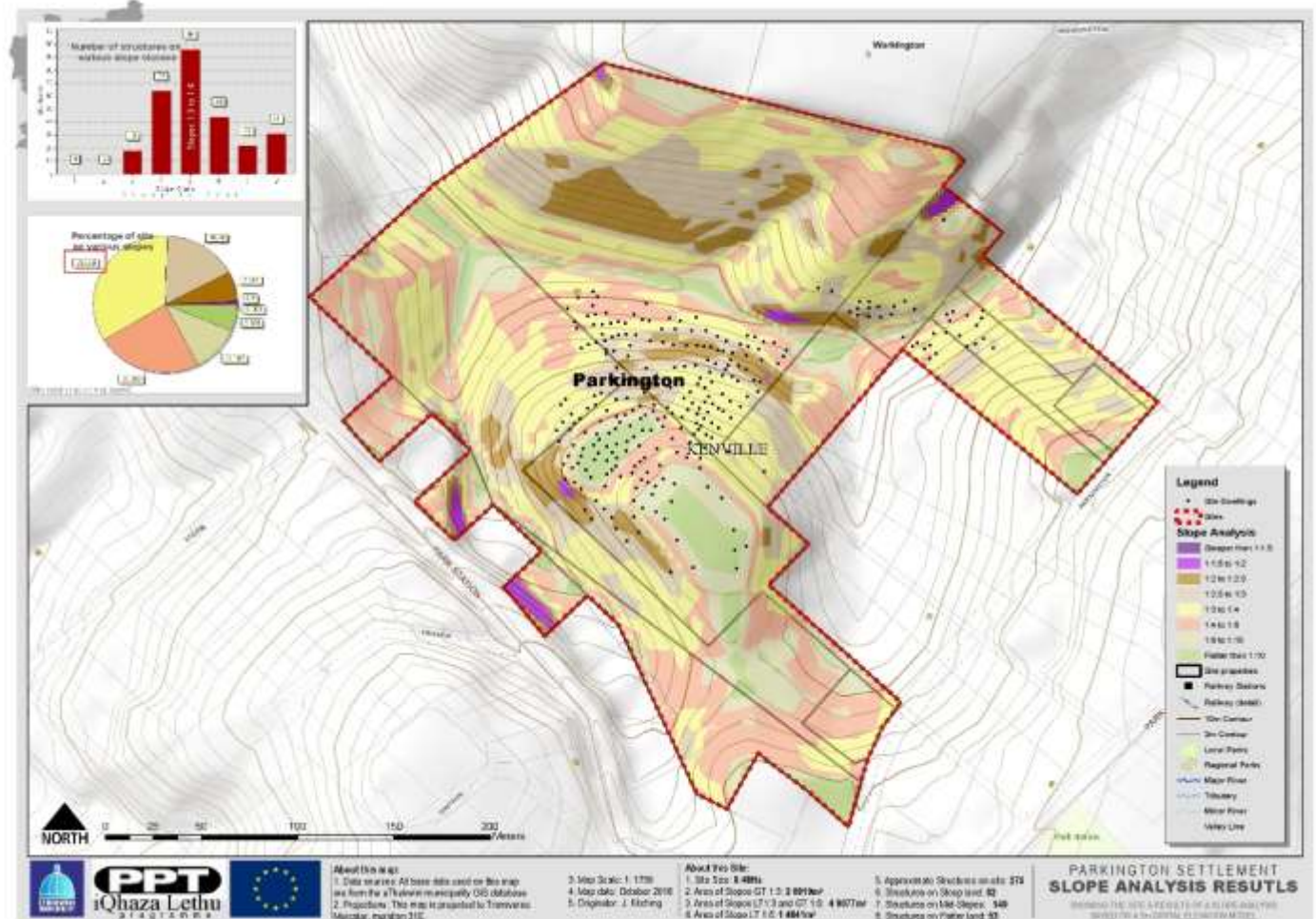
Map Orientation Detail
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PARKINGTON: PROPOSED LAYOUT

Distribution of housing on slope categories - Parkington

80% of households reside on slopes steeper than 1:3 (1:3 to 1:1.5). 75% on slopes 1:3 and 1:2.5)

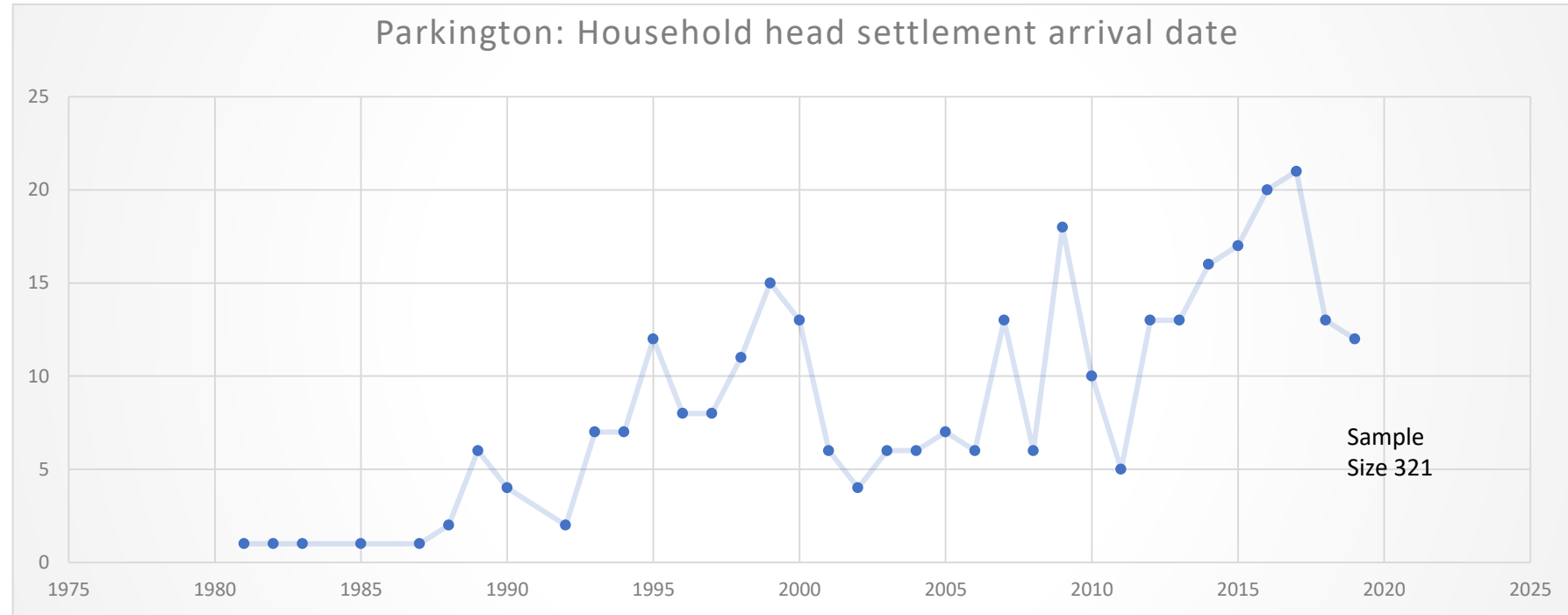
- 6.5% on slopes between 1:1.5 to 1:2
- **22.9% on slopes between 1:2 to 1:2.5**
- **50.9% on slopes between 1:2.5 to 1:3**
- 7.6% on slopes between 1.3 to 1:6
- 11.3% on slopes between 1.6 to 1:10
- 0.7% on slopes flatter than 1:10



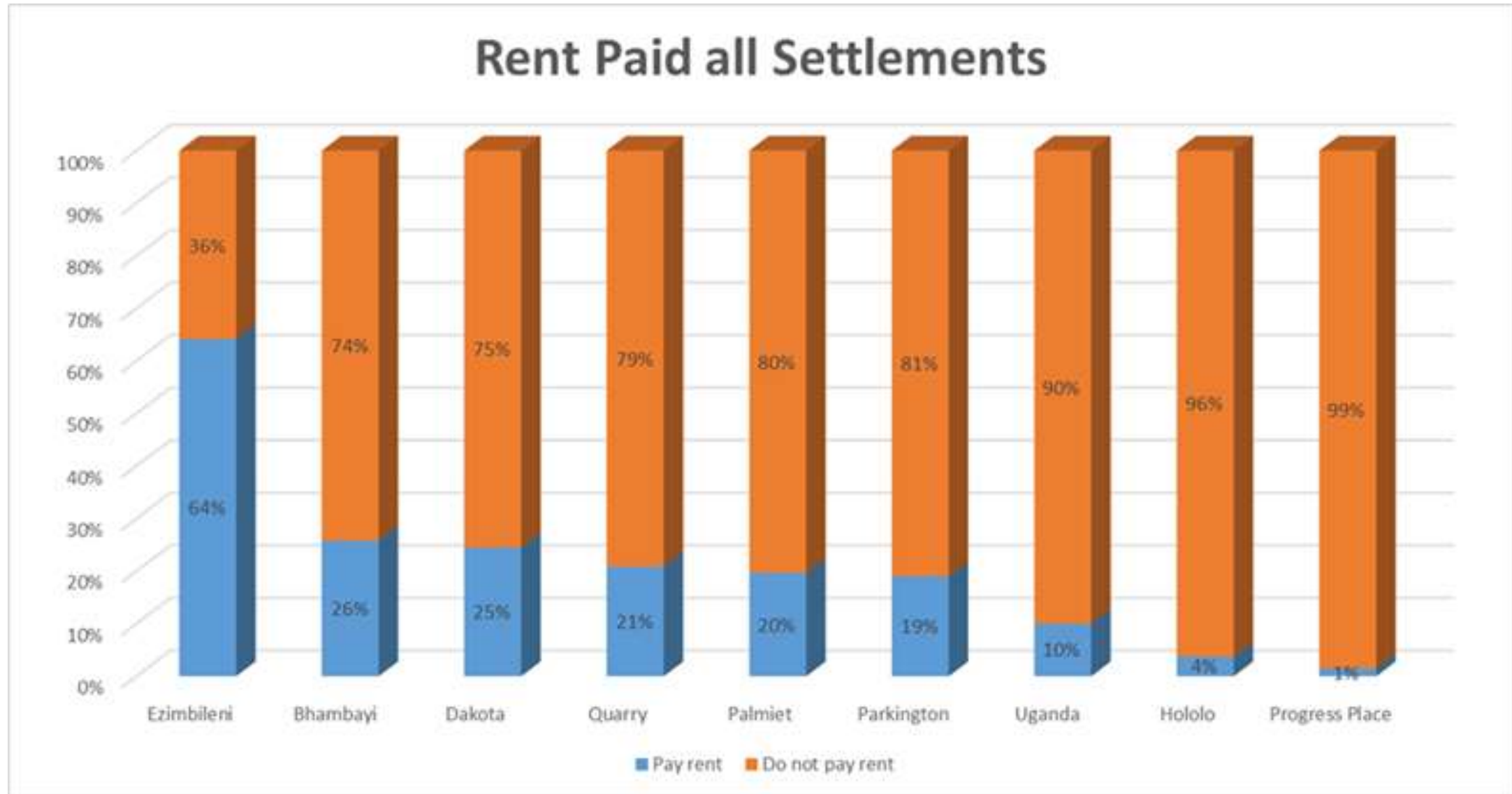
Parkington – an old and well established settlement

2019 survey-over half of the settlement household heads have been living in the settlement for over 10 years,

Only a quarter of the heads have been in occupation for less than 5 years.



In most settlements rental is around 20% - most people 'own' and have incentive to invest subject to....



LIFT or
'Indlulamithi'
Demonstration
unit at Parkington
built in 2020 –

30sqm, double story,
fire-safe, utilises
materials and
methods which are
familiar and locally-
available

LIFT = lightweight,
improved, fire-safe,
timber frame

Indlu-lamithi means
'the wood frame
house which stands
tall' and also the word
for a giraffe





Demonstration LIFT / 'Indlu-lamithi' house at Parkington Informal Settlement Dec. 2020



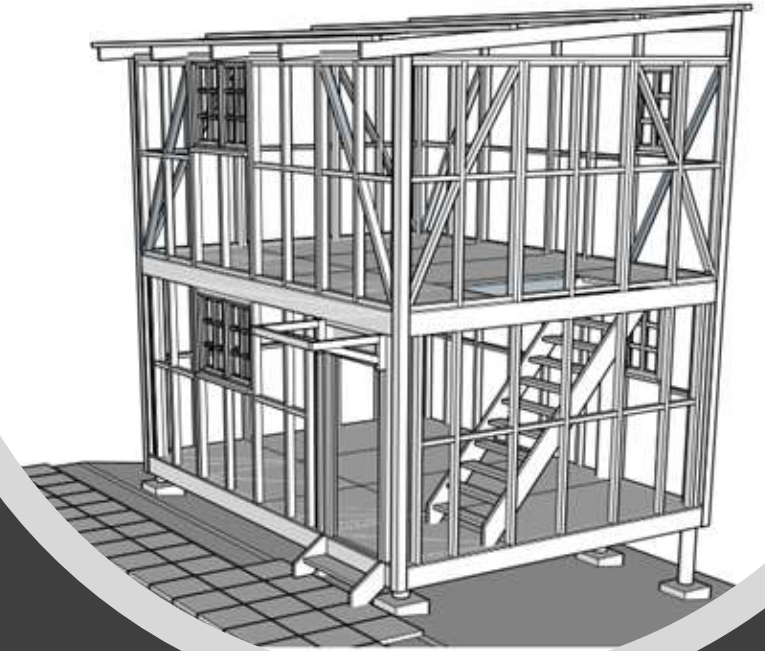
Performance criteria utilised in developing LIFT house?

(developed collaboratively by iQhaza Lethu, PPT, HSRC, eThekweni)

1. Can function safely on **steep slopes** – i.e. lightweight, no major excavation / cut-and-fill which can destabilise the slope
2. Can be **built by local residents/builders** – i.e. utilises materials which are available from local hardware stores and building methods which are familiar to local residents/builders. As ‘low tech’ as possible. Does not rely on proprietary technology, materials and methods.
3. Can be **built without vehicular access** – i.e. materials must be light and easily be carried in on foot
4. As **low cost** as possible
5. As **compliant as possible** with national building regulations – especially requirements relating to safety
6. **Fire safe** – made extensive use of a fire safety specialists
7. **Replicable and scale-able as an owner-driven housing technology** not relying on direct state support

Alternative LIFT double-story typology – 146 units to be built on 3 re-blocking-relocation sites (Parkington, Havelock and Ezimbeleni) to release space for the services ‘frame’ in the adjacent settlements

- **Acute scarcity of well-located land** in eThekweni. Most dense settlements are well-located but the land is steep. Conventional housing on these sites is not viable or cost-effective.
- **Double-story, low-cost, lightweight, timber-frame structure**, micro-pile foundations & external metal cladding – can function effectively on steep slopes.
- **Enables use of well-located land** and in-situ upgrades on sites which would otherwise not be possible.
- **Imbeds within communities a different way of building for themselves** (either organically or via with PHP-type support). Units are built on-site by local builders, artisans and workers utilizing materials readily available from any local hardware store.
- **Units are safe and engineer-certified**, developed by an experienced team of architects, supported by a fire report from a fire specialist and informed by inputs from municipal building inspectors and numerous other stakeholders. Units are structurally strong, safe in terms of fire, and meet SANS codes for a timber structure in all material respects.



Steep, well-located sites can and must be upgraded in-situ provided appropriate methods are utilised



- **Significant numbers of these settlements** (97,113hh/202settlements)
- **High level of vulnerabilities** - typically the most vulnerable e.g. fire, disease, overcrowding, squalid living conditions.
- **Most are old, well established and in prime locations** (work, social services).
- **Typically steep slopes & high densities** – need to liberate space to establish services
- **Conventional upgrading not possible** due to densities, non-qualifiers, lack of alternative land, steep slopes, geotech., costs and other factors

no. fires	settlement	date	shacks destroyed	hh affected	deaths	Rebuild with city materials
1	Uganda	10-Jun-19	3	3		
2	Uganda	20-Jan-20	1	1		
3	Dakota	25-Nov-19	8	13		
4	Quarry	04-Nov-20	106	106	3	
5	Quarry	in dec 2020	13	13		
6	Ezimbeleni	dec in 2018	3	3	2	
7	Ezimbeleni	june in 2018	3	3		
8	Ezimbeleni	sept in 2020	5	5		
9	Ezimbeleni	in dec 2020	23	23		23
10	Ezimbeleni	in jan 2021	4	4		4
11	Ezimbeleni	13-Nov-20	35	35		
12	Bhambayi	2018	5	5	2	
13	Bhambayi	2019	4	4		
14	Bhambayi	2020	1	1		
15	Bhambayi	29-Jan-22	2	3		
16	Progress	in feb 2020	4	4		
17	Progress	in june 2020	3	3		
18	Havelock	Dec-19	220	220		227
19	Parkington	Dec-18	60	60	3	60
20	Palmiet	Mar-20	108	60		108
21	Palmiet	May-22	23	23		
		total>	634	592	10	422

Incidence and impact of fires in iQhaza Lethu informal settlements – 21 incidents in three years with 634 structures destroyed and 10 deaths within 9 out of 10 IL pilot settlements



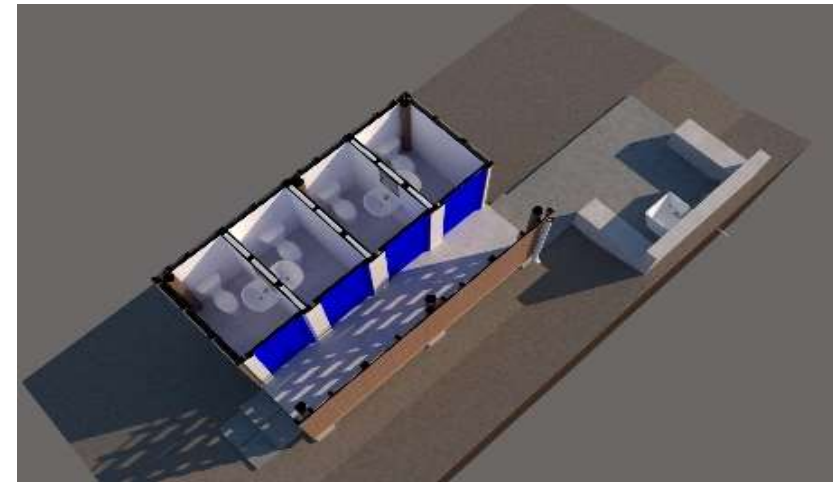
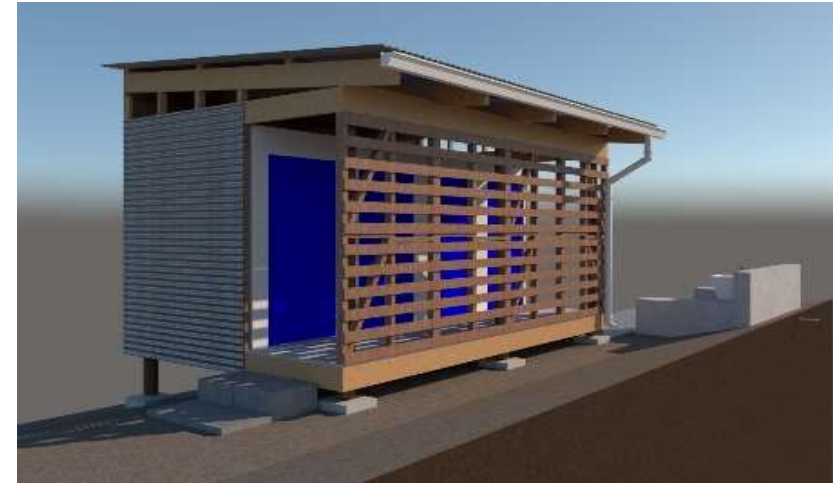


	Unit Cost	Materials	Labour
30.7 sqm LIFT house (Double Story)	102 158	71 511	30 647
15.4 sqm LIFT house (Single Story)	55 796	39 615	16 181
34.5 sqm LIFT house (Double Story)	100 741	71 526	29 215
44 sqm LIFT house (Double Story)	122 878	87 243	35 635

Sub-type	Cost (materials + labour, excl. P&G, VAT)	Enclosed floor area (m2)	Footprint area (m2)	Cost per (m2)	Required site area (m2)
Intermediate single storey, 15m2 <i>(single-person households, extendable upwards)</i>	55 796	15,4	15,4	3 630	30,70
Intermediate double storey -internal stair 31m2	102 158	30,7	15,4	3 323	30,70
Medium double storey – internal stair 34m2	106 340	34,4	17,9	3 091	34,52
Large double storey - internal stair 45m2	123 153	44,6	22,3	2 761	41,12

Mini CABs on a services frame

- Compact communal ablutions typically located inside an informal settlement (as opposed to large, conventional CABs at the edges).
- Situated along the alignments of a services frame which includes footpaths, storm-water controls, solid waste bins, fire hydrants.
- To be piloted soon in three settlements utilizing a lightweight, micro-pile timber frame structure which can function safely on steep slopes with no necessity for cut and fill and consequent slope destabilization.
- Each mini-CAB consists of four toilet cubicles with hand-basins in each, with an adjacent open-air standpipe wash facility with a wash-basin and standpipe. Can be subdivided into separate male and female units (2 each).
- Pros – better service, services are closer to residents e.g. women and children at night; easier to connect individual households later when re-blocking occurs; likely more responsible use being closer to user households.
- Cons – concerns over possible illegal connections with introduction of water and sewer pipes inside settlements; sewer pipes on steep gradients or requiring shallow trenching



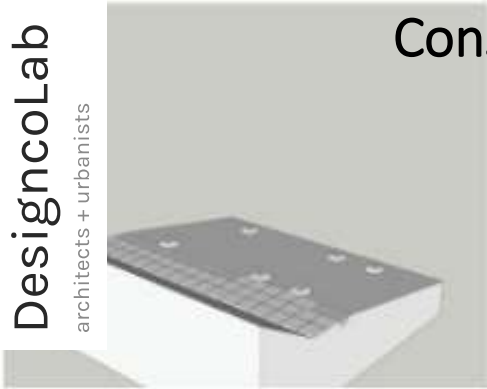


What the future could look like over time with owner-driven housing improvements overlaid on an optimised services frame utilising the alternative, lightweight, low-tech housing typology

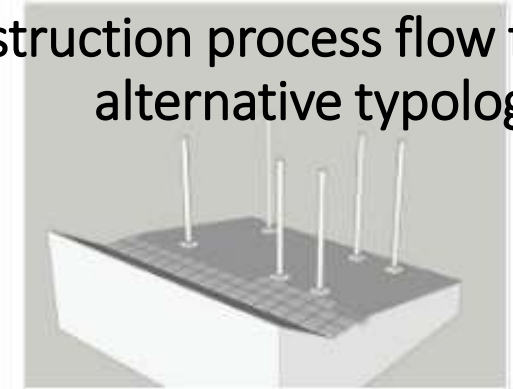


ADDITIONAL REFERENCE SLIDES

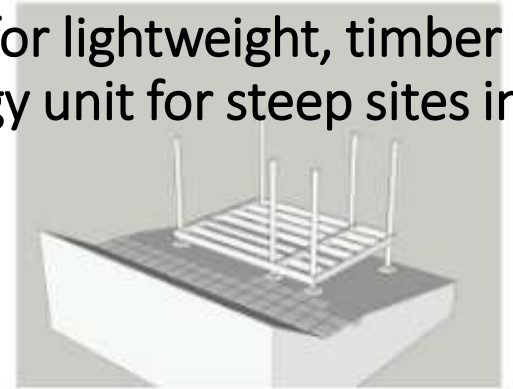
Construction process flow for lightweight, timber frame, double-story alternative typology unit for steep sites in eThekweni



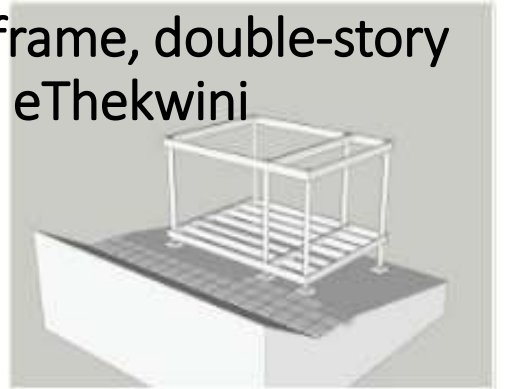
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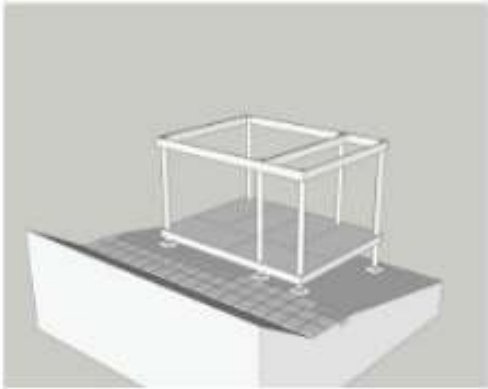
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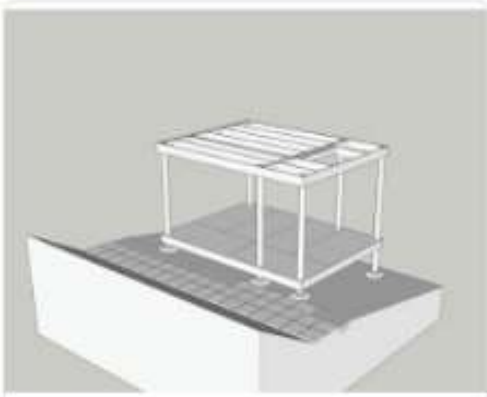
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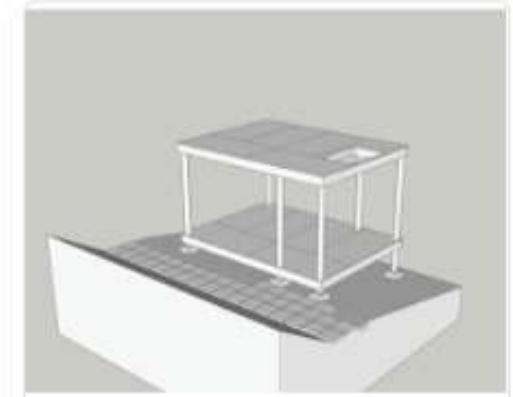
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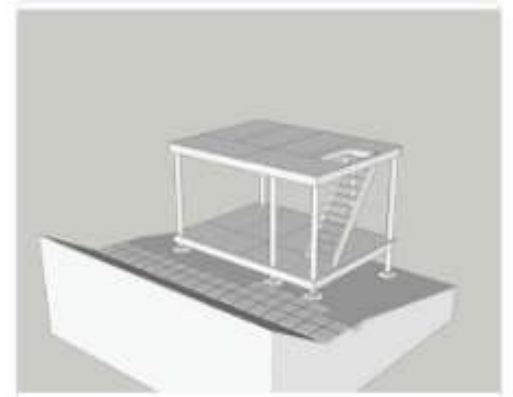
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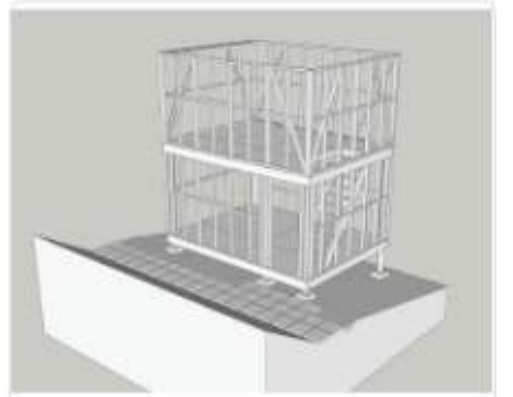
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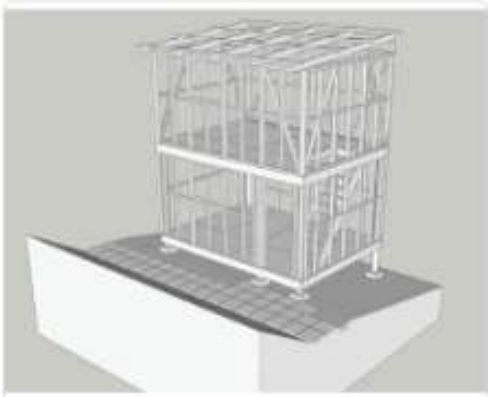
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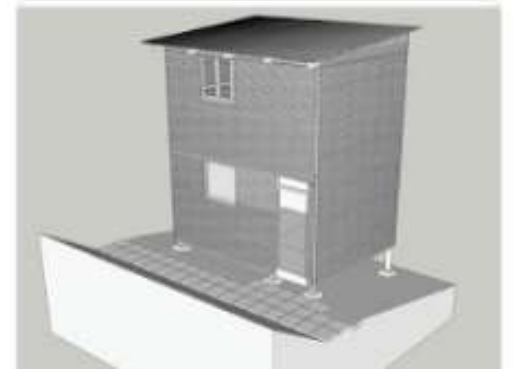
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Framework for ground floor and first floor



Completed unit inside downstairs



Bracing and external cladding



Completed unit drone aerial view

Demonstration unit at Parkington finalised and handed over in September 2020



Demonstration unit at Parkington



Dismantling existing informal structure



Augering micro-pile foundations



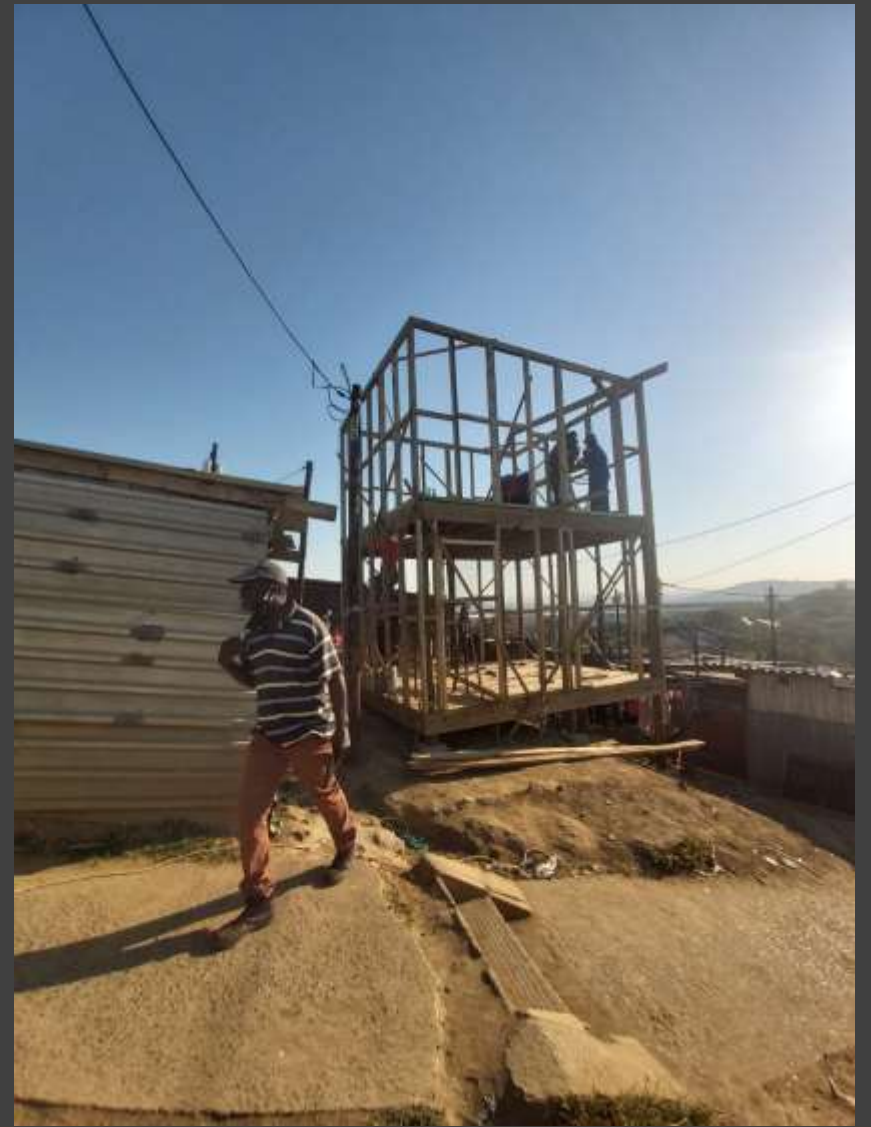
Engineer certifying foundations



Local artisans and workers trained, empowered and supported to build the house



Framework for ground floor



Framework for 2nd floor



Stairs & roof structure in progress- roof sheets, windows, doors, external and internal cladding, and insulation to follow



External cladding being installed



Inside of complete unit with internal cladding

Research and initial development of the typology – timelines (collaboration with the HSRC)

- Identification of need for alternative housing typologies on steep slopes in 2018/9 via iQhaza Lethu (and noting prior collaboration between PPT and HSRC in 2018 relating to informal settlement research including focus groups and surveys relating to densification and related solutions)
- In collaboration with PPT, HSRC appointment of DesignCo Lab in 2020 to develop and build a demonstration unit at Parkington. PPT via iQhaza Lethu assisted in briefing, technical support, alignment with services frame at Parkington, supporting related social process on the ground etc.

Work included:

- Assessment of different materials, methods and typologies and identify a solution optimal for steep slopes typical of well located settlements in eThekweni (funded by International Science Council).
- Development of a design concept.
- Appointment of a service provider (LIMA) to build the demo unit at Parkington.



Key design features of LIFT units: Indlu-lamithi houses consist of: a treated, sawn-timber frame with extensive bracing making the units rigid and stable in severe weather events; micro-pile foundations which minimise site disturbance; suspended timber floors; galvanised metal exterior cladding and gypsum board internal cladding with mineral wool insulation in-between; with internal timber stairs.

146 units to be built on the thee the pilot relocation sites will make use of communal ablutions provided by the Municipality, but the units can all be modified later to include an inside toilet and hand-basin when and if water and sewer pipes become accessible.

The design of the units enables a more functional alternative urban form on eThekweni's typically steep sites, including in respect of improved space utilisation, physical distancing and health and safety.