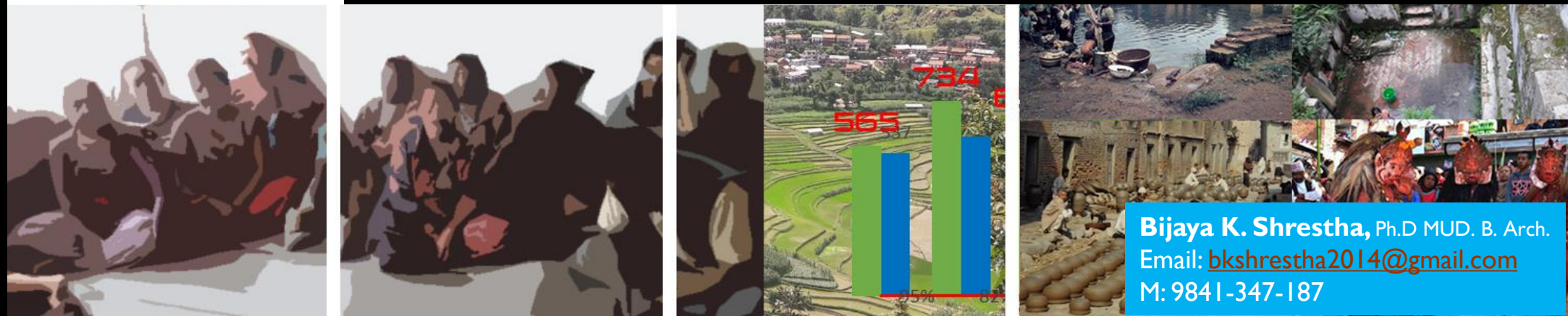
Talk program to mark 175 year of establishment of IIT Roorkee organized by IIT Roorkee Alumni Association, Nepal Chapteron 25th June 2022 at Nepal House Restaurant, Kathmandu

Post earthquake housing reconstruction in Nepal:
Lessons to be learned and way forwarded



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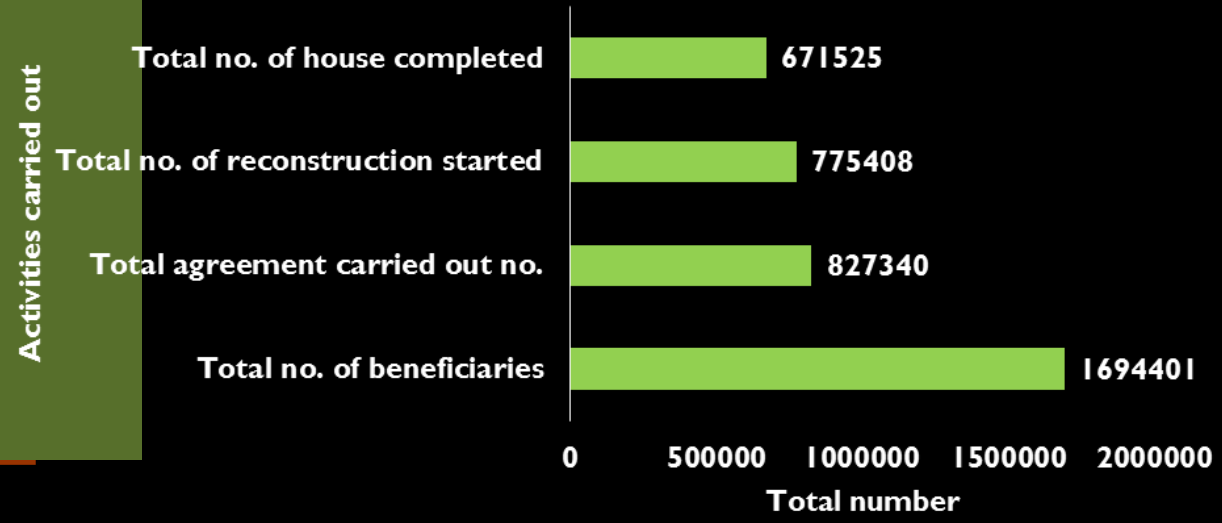
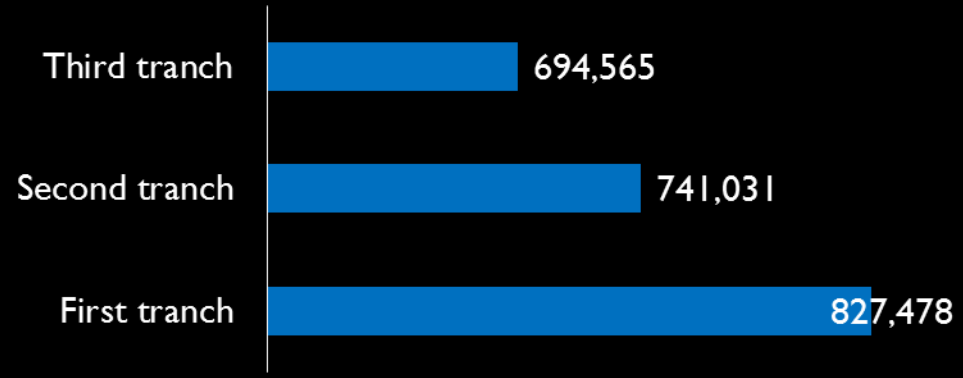
Contextual background

Earthquake damage	Life lost = 8,898 and injured = 22,309; Economic loss = US$ 7 billion: private sector 76% & public sector 24%; Social sector loss = 58% and housing sectors alone covers 86% of social sector
Impact	High in rural areas : communities, livelihoods and basic infrastructure
Time	7 years after Gorkha earthquake of 25 April 2015
Institutions	NRA is collaboration with government departments and various (I)NGOs and communities
Approach	Top down approach with 'owner driver' reconstruction system (Financial and technical supports)
Modality	Variety of modality adopting GON's policies, rules and regulations
Progress	Rural area of Nepal compared to urban areas





Aims and objectives

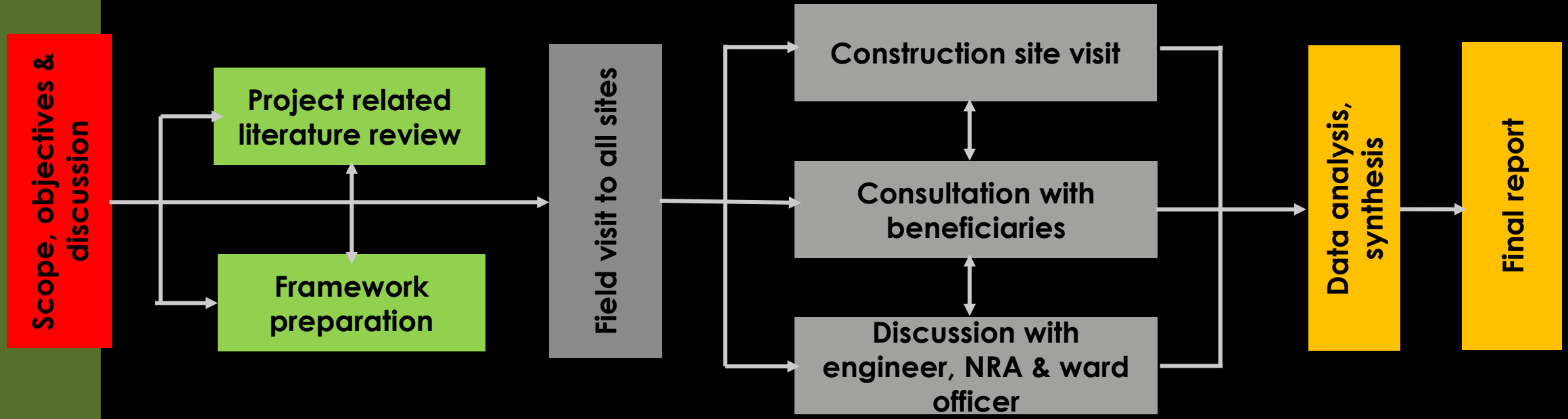
Aim

- to examine the post-earthquake housing construction in Nepal

Objectives

- to prepare a framework of post-earthquake housing construction for Nepal;
- to carry out detailed case studies of rural (Sindhupalchowk, Dolakha and Kavrepalanchok districts) and urban (historic core of Kathmandu valley) areas;
- to draw lessons to be learned and way forwarded

Study methodology



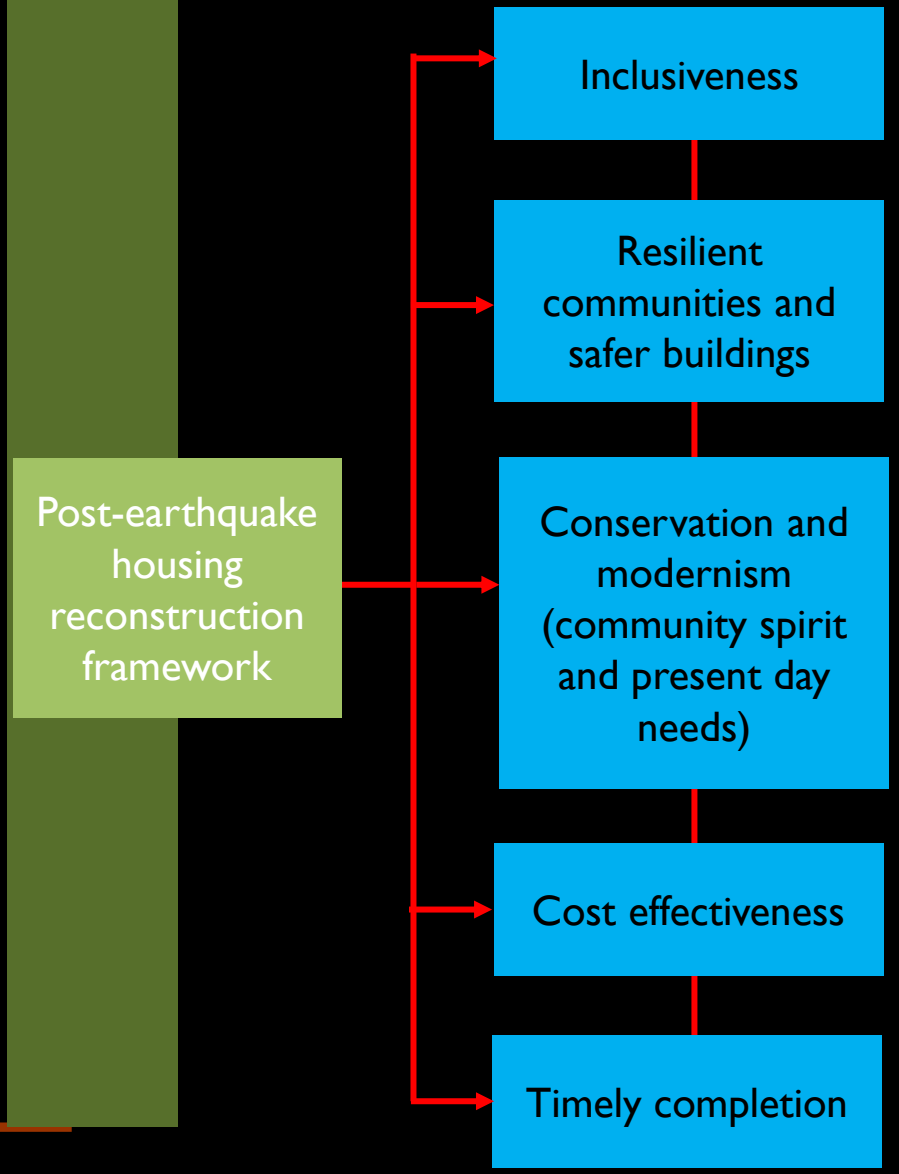
Desk review & framework preparation

Field visit, data & information collection

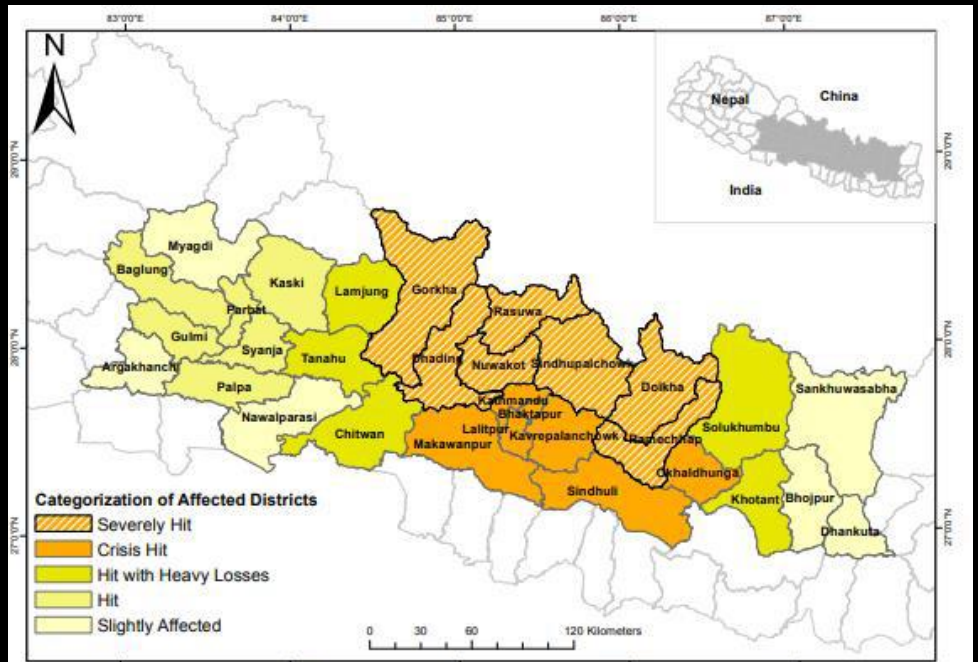
Data analysis & report preparation

Literature review	2018-2019
Site visit	Multiple site visits
Consultation	Beneficiaries, involved engineers, social mobilizers, ward and municipal staffs, site office staffs

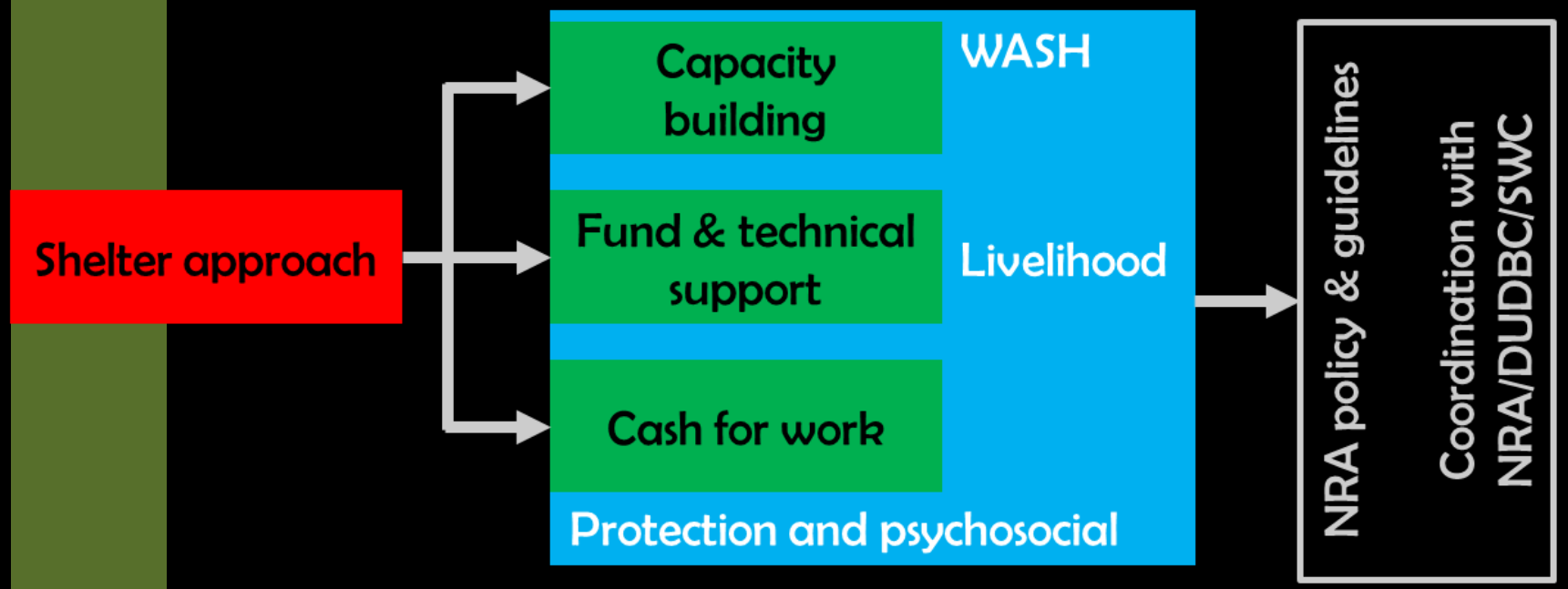
Analytical framework



- Program components
- Planning activities
- Implementation process
- Post-reconstruction period



Case study I: Nepal earthquake Recovery Project (NERP) - Rural



Capacity building: training

Grant distribution

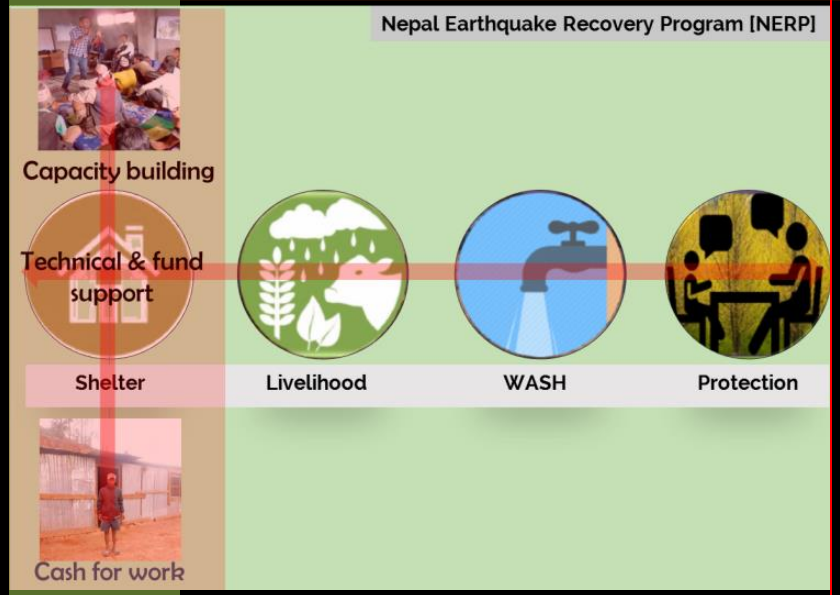
Cash for work

Donor agency	Caritas Internationalis, Vatican City, Rome
Implementing Organization	CARITAS NEPAL (CN)
Project approval from NRA/SWC	5 June 2016/July 2016
Project cost	NR. 1,561,803,203.00 (1.5 billion Nepalese Rupese)
Time	July 2016 to April 2019
Districts	Dolakha, Sindhupalchok, Kavrepalanchok

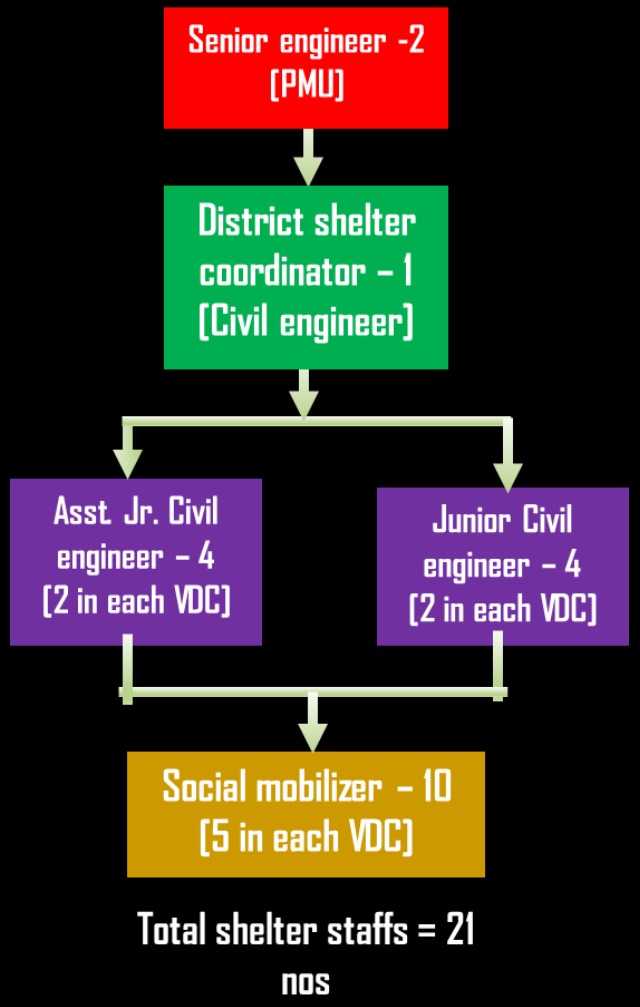
Case study I: Shelter project in three districts

District	Location	Shelter full package, WASH, Livelihood, Protection & Psychosocial		Shelter technical support, Livelihood and Protection	
		Households (HHs)	Population	Households (HHs)	Population
Dolakha	Orange, Bigu - 2	565	2801		
	Orange, Bigu - 3	759	3762		
	Sailung – 6			550	2,726
	Sailung - 7			580	2,875
	Total	1,324	6,563	1,130	5,601
Sindhupalchowk	Kalika, Sunkoshi -3	656	3252		
	Thokarpa, Sunkoshi -1 and 2	1178	5839		
	Sunkhani, Sunkoshi-5			771	3822
	Yamunda, Sunkoshi - 4			473	2345
	Total	1,834	9,091	1,244	6,167
Kavrepalanchowk	Chandenimandan, Mandan Deupur - 10	1065	5279		
	Balthali, Panauti -11	546	2706		
	Sanowanthali, Chaurideurali -1			277	1,373
	Nagregagarche, Chaurideurali - 2			389	1,928
	Majhifeda, Chaurideurali -3			498	2,469
	Total	1,611	7,985	1,162	5,770
	Grand total	4,769	23,639	3,536	17,538

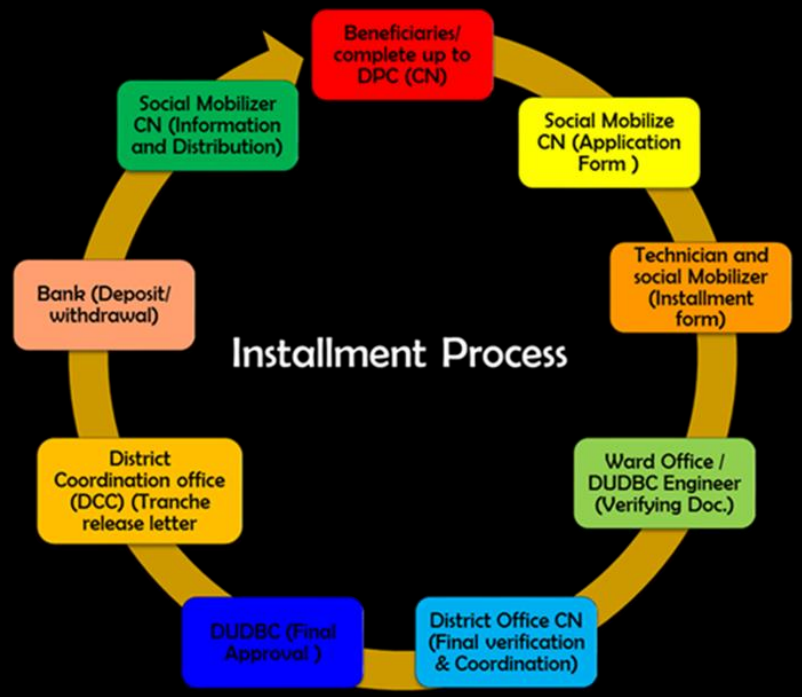
Case study I: Project design and implementation process



Inclusion of livelihood, wash and protection activities, besides shelter construction

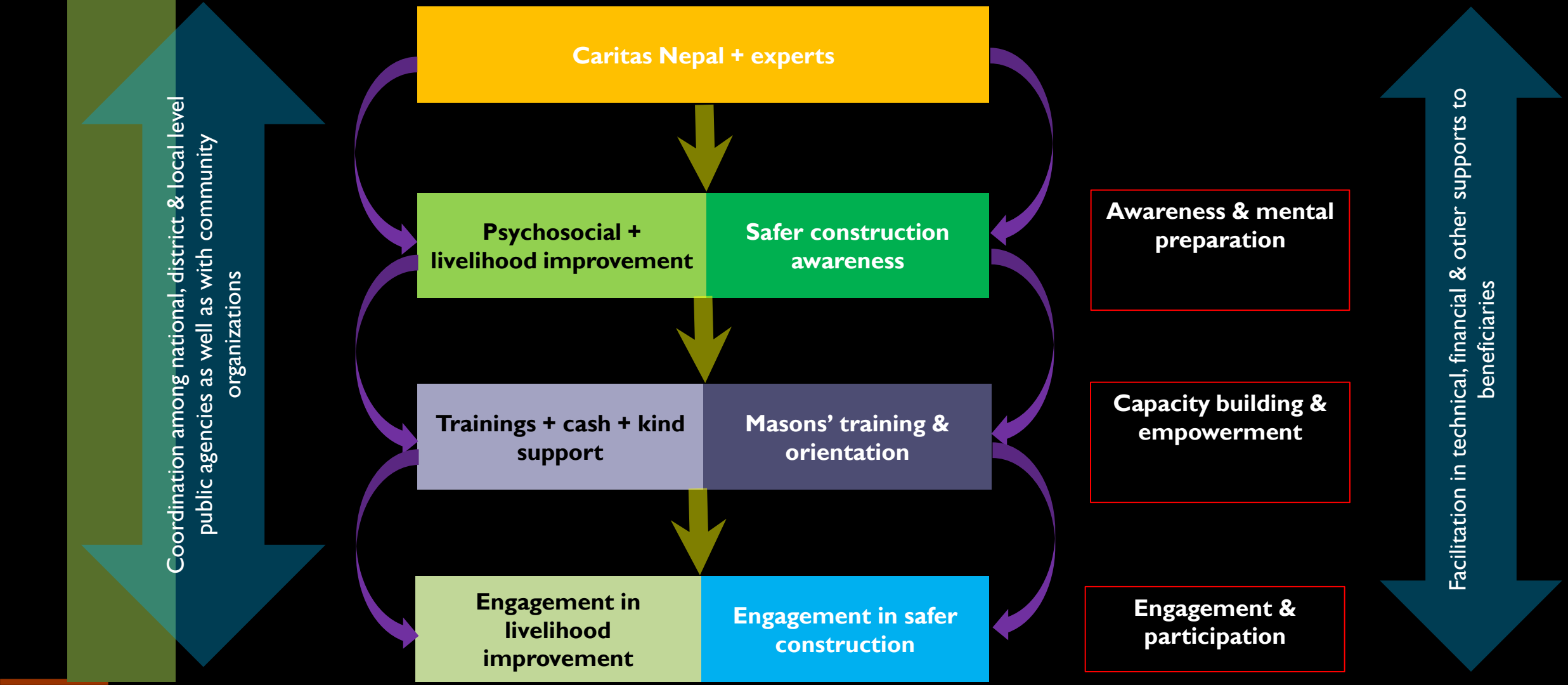


District and site office establishment and mobilization of local people



Facilitation in technical and financial matters by coordinating with DCC, ward office and bank

Case study I: Owner driver approach with facilitation from NGO



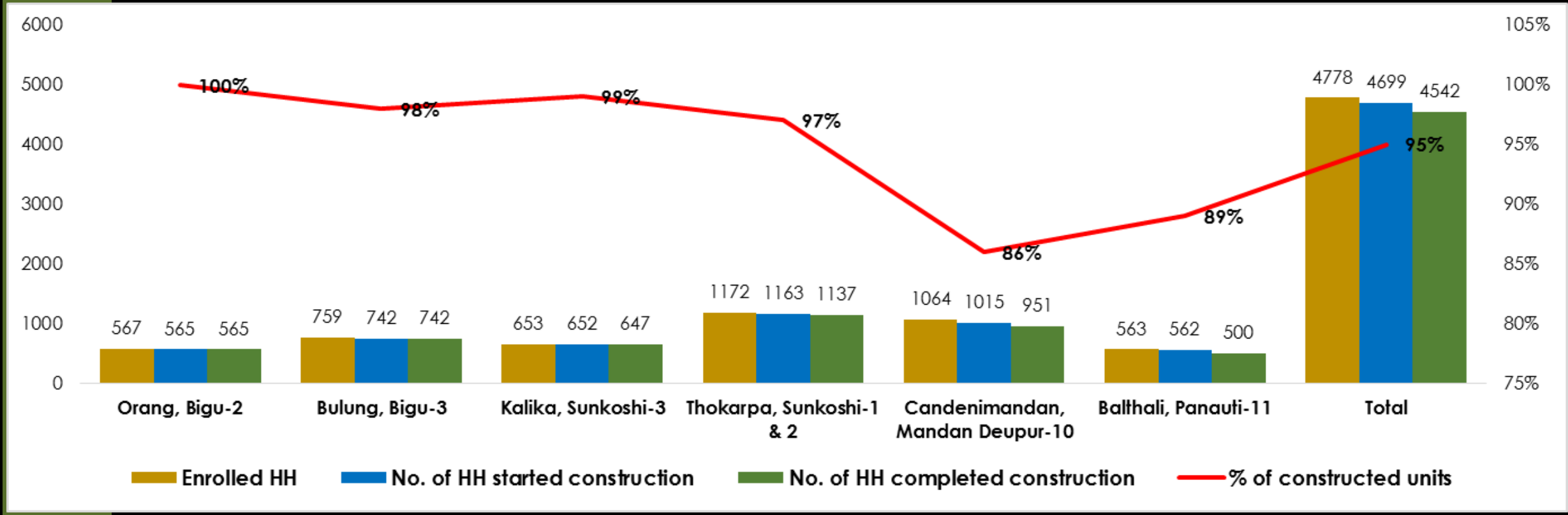
Case study I: Owner driver approach with facilitation from NGO

Sensitization, education & awareness

Training, knowledge & capacity building

Engagement in real house construction & other activities

Case study I: Status of shelter construction

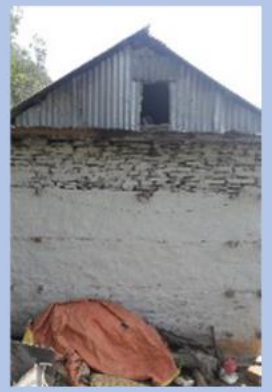


Case study I: Inclusiveness leaving noone behind

Multiple strategies for achieving inclusiveness
Model house given to single woman
Community built on the behalf of economically weak and single member family
Masons gave concessions
Cash for work activity
Extra grant for toilets and transportation

Case study I: Inclusiveness leaving noone behind

"Being a single women, I received extra support from Caritas Nepal and participating in 'parma system' I was able to build my home within NRs. 350,000.00. Caritas Nepal and local community treated me like a family member"



Ms. Kanchi Bika

"Reflecting my single women status and 81 yr. of my father-in-law, the households in coordination with ward office and municipality recommended Caritas Nepal to build a four room model house for us"

Ms. Lila Maya Bika

"With technical, financial and facilitation of Caritas Nepal, a single women like me managed to rebuild safer house without taking any loans"

Ms. Sanu Tamang

Case study I: Cost effectiveness

Multiple strategies for achieving cost-effectiveness
Local production of building materials
Aarma-prama system participation
Construction of group of individual houses : transportation support
Sharing equipment such as drum, generator, pipe, etc. during construction period
Sharing transportation cost while bringing stone from neighboring villages

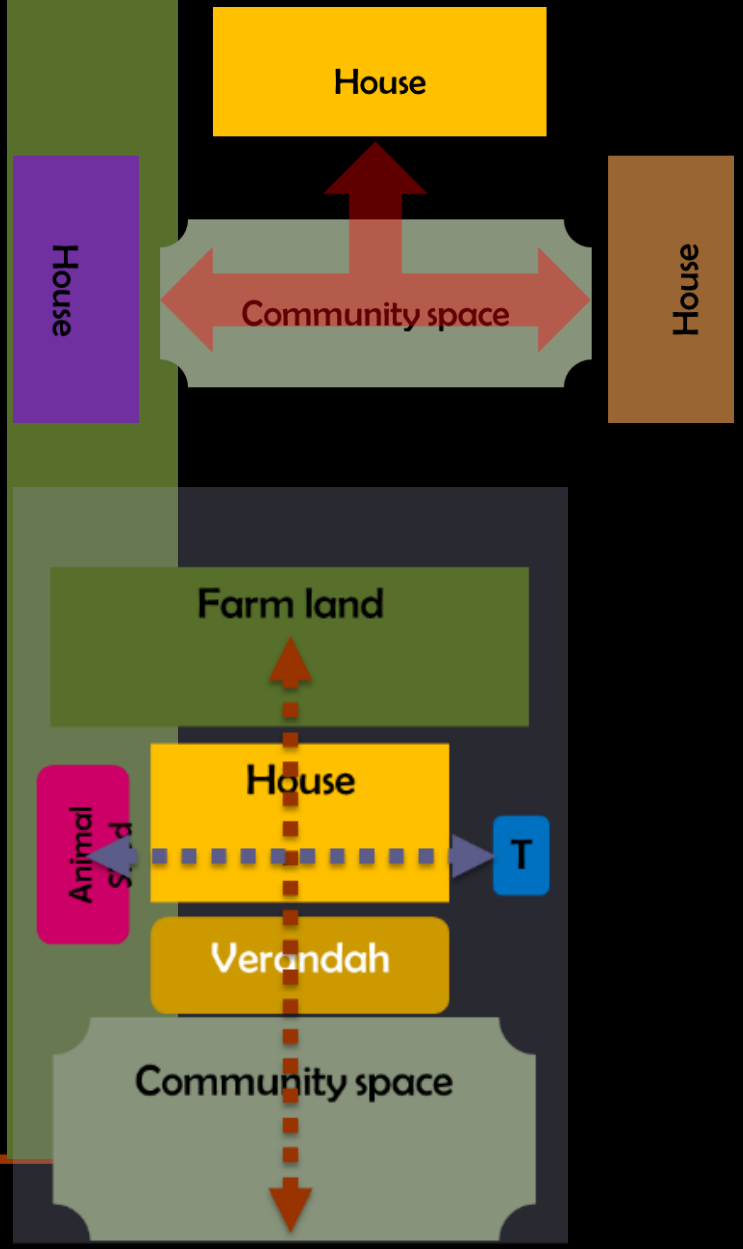
Case study I: Time frame

Multiple strategies for completion of house construction

- Storage of rods and cements in the wire house, which are brought from city centre before monsoon starts
- Facilitation by Caritas Nepal in technical support as well as coordination with banks, NRA district office and municipality
- Filling up of building progress firm by Caritas Nepal staff and coordination with NRA engineers
- Ready made design from DUDBC catalogue, Caritas Nepal staff facilitated in cost calculation and in selection of house type
- Conflict among neighbors managed

Case study I: Resilient community and safer building

Case study I: Conservation & vernacular architecture, modern infrastructure



Case study I: Conservation & vernacular architecture, modern infrastructure

Case study I: Conservation & vernacular architecture, modern infrastructure

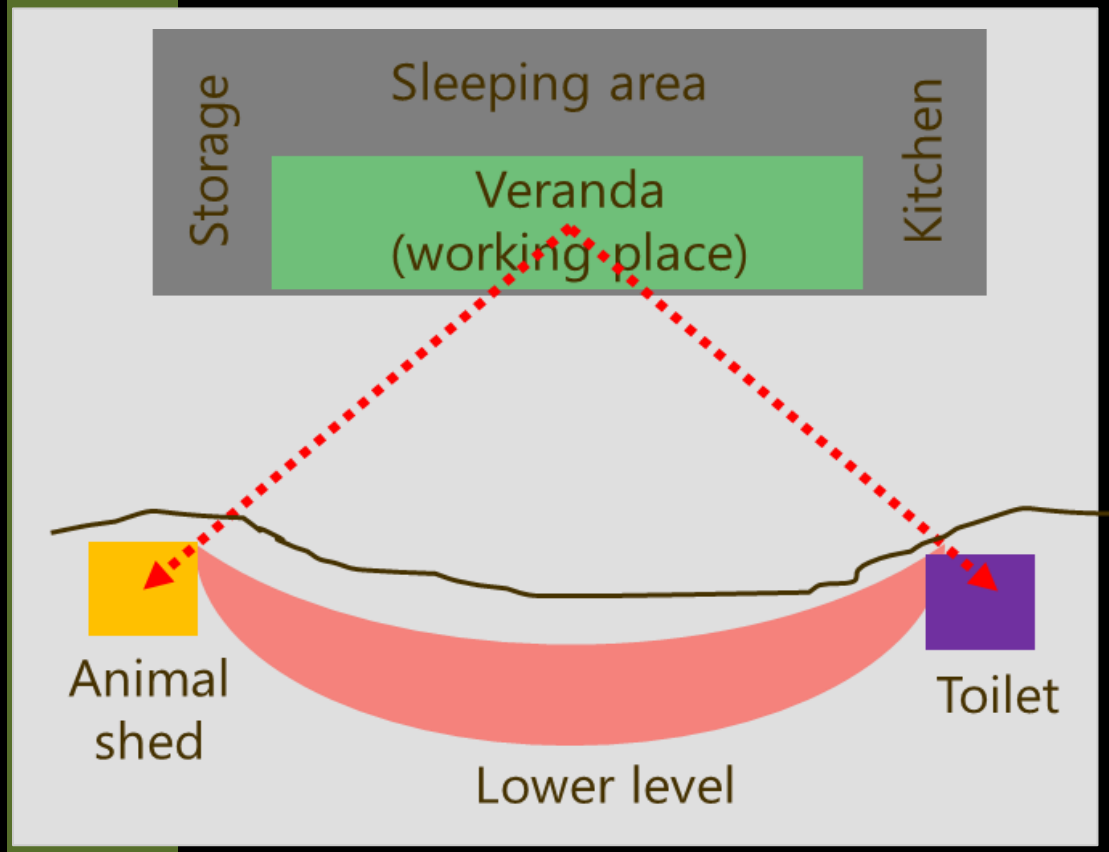
- Vulnerable to landslide?
- Future addition of floors?
- Foundation of new structure?
- Light & ventilation in old house?
- Pounding effect in earthquake?

- No protection for front wooden door & windows
- Fronting RCC slab toilet whereas house of stone in mud?
- Storage of agriculture product & socialization space?

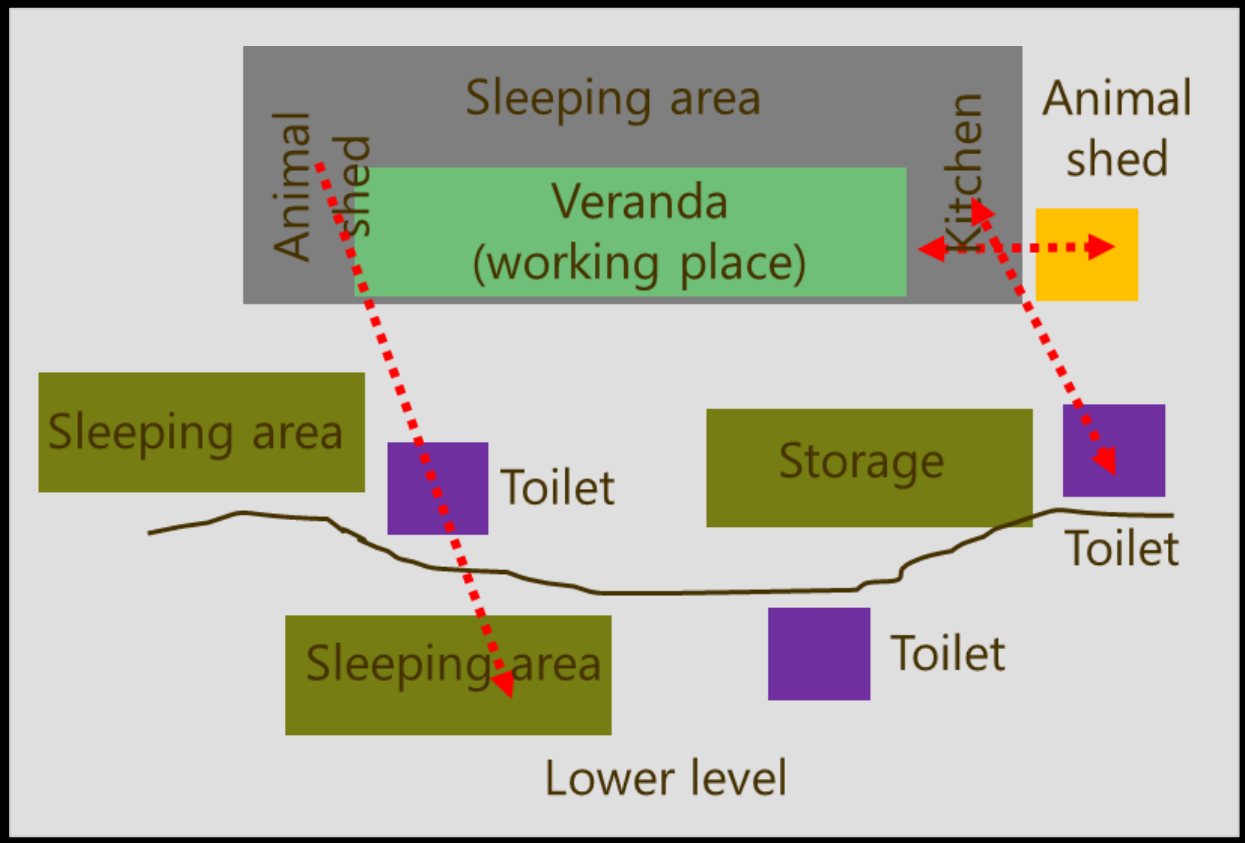
- Rat digging mud mortar?
- Fire vulnerability
- Health & hygiene issue?
- Animal shed & human house same design, space & detailing?

Case study I: Conservation & vernacular architecture, modern infrastructure

Despite integrated approach, inadequate consideration of townscape and living style villagers

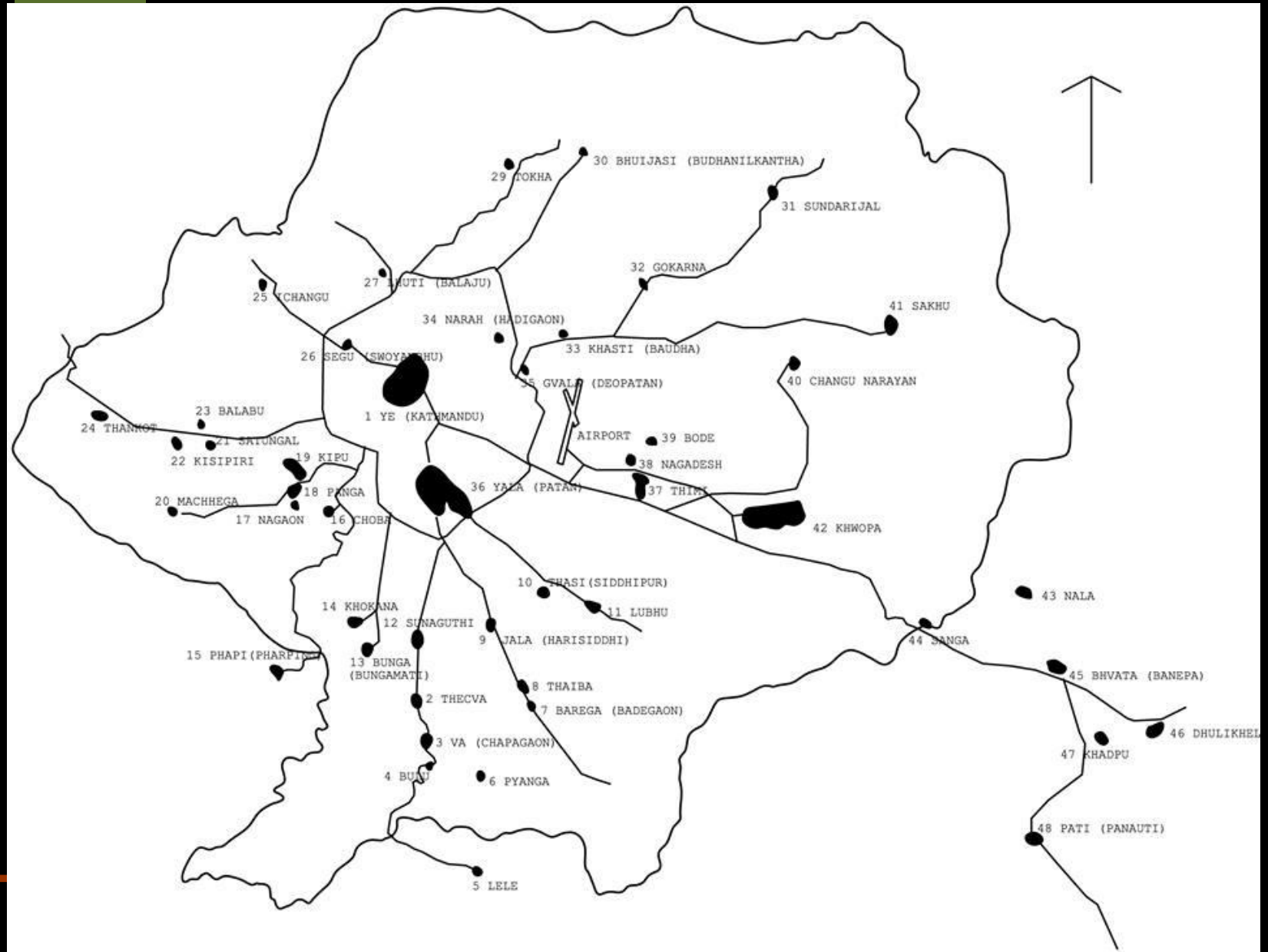


Pre-earthquake period



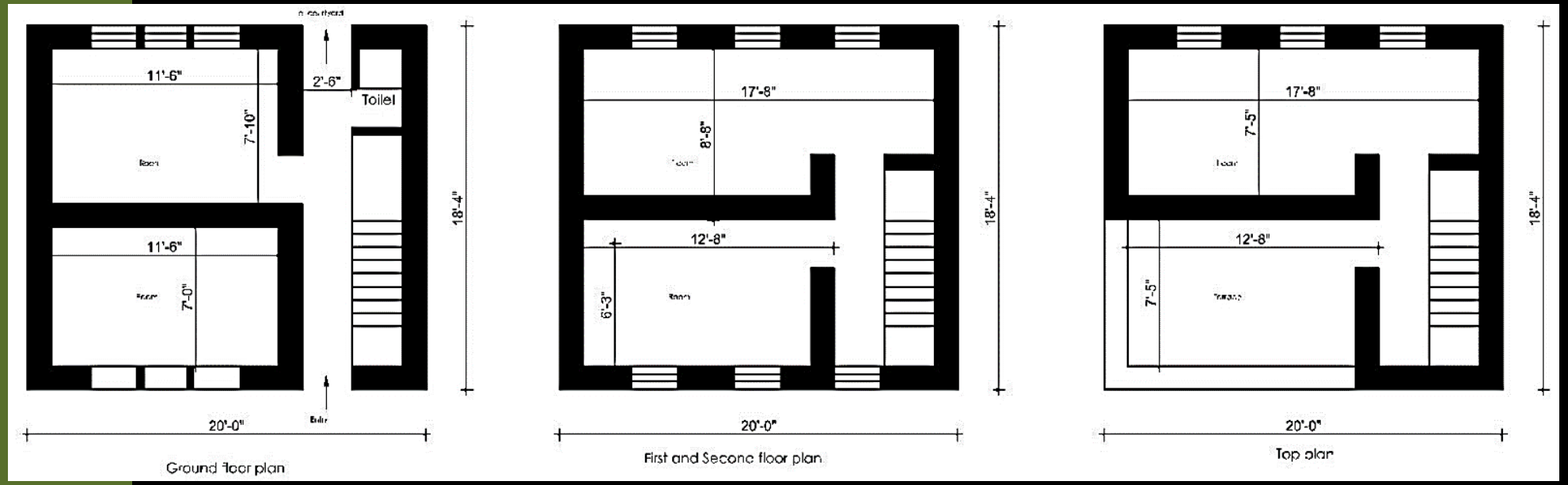
Post-earthquake period

Case study II: Historic core of Kathmandu valley

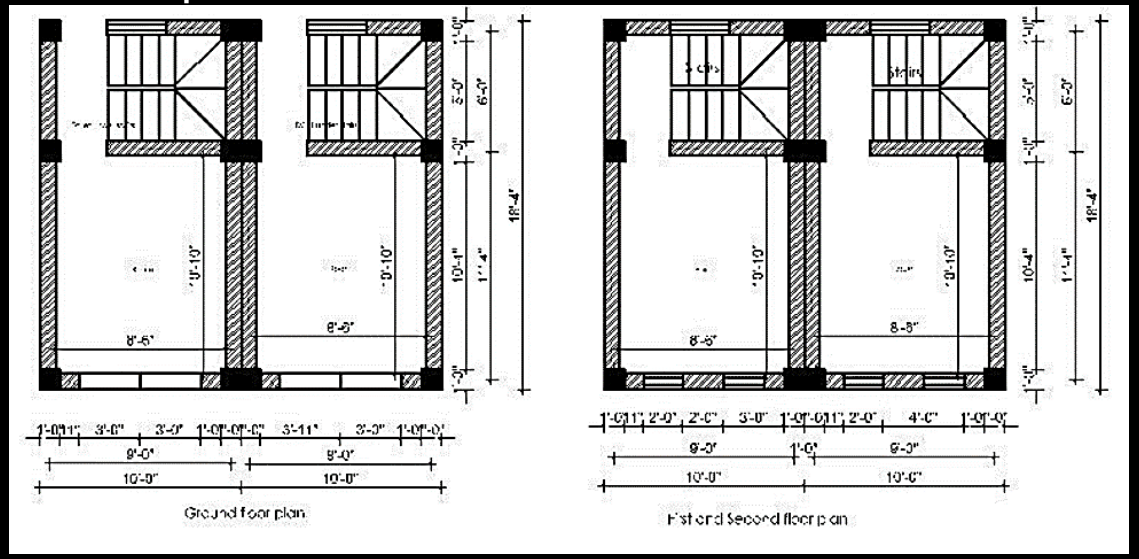


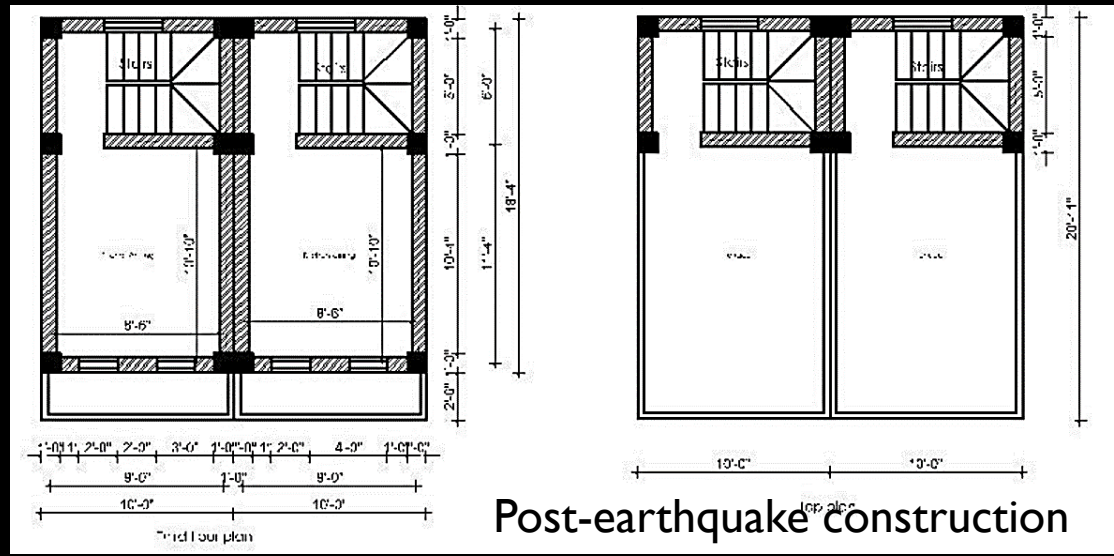
WHS	- Monument zone of Kathmandu -Monument zone of Lalitpur - Monument zone of Bhaktapur
WHTL	Khokana; Kirtipur; Panauti; Shankhu
Newari towns	Bungamati, Panga, Kisipidi, Satungal, Macchhey gau, dhulikhel
Neighbourhood	Clusters of newari houses

Case study II: Historic core area of Kathmandu valley



Before the earthquake 2015

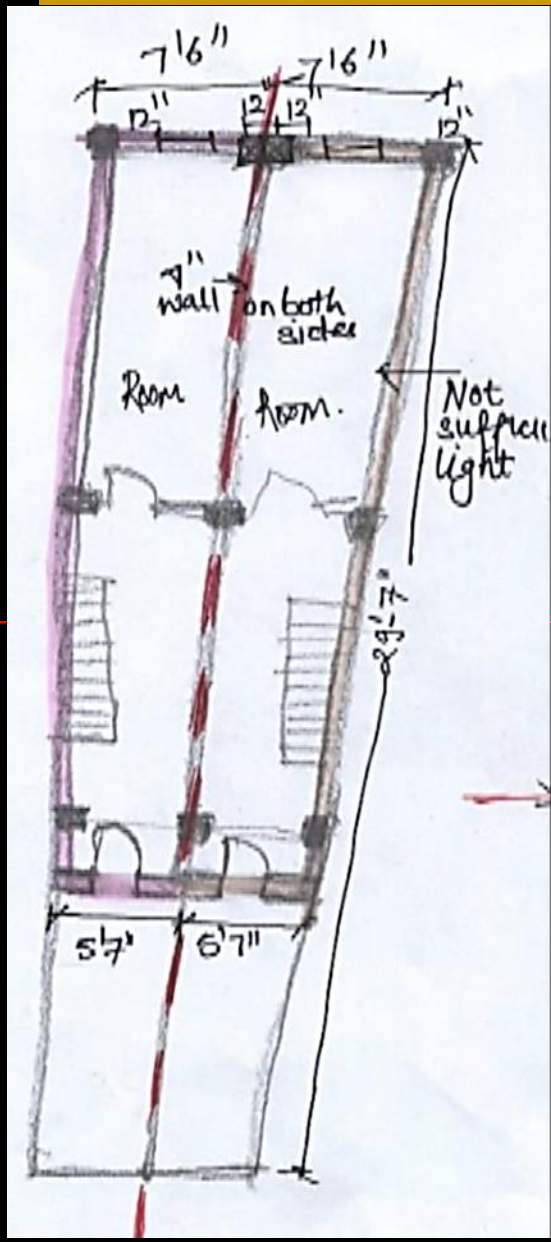




Post-earthquake construction

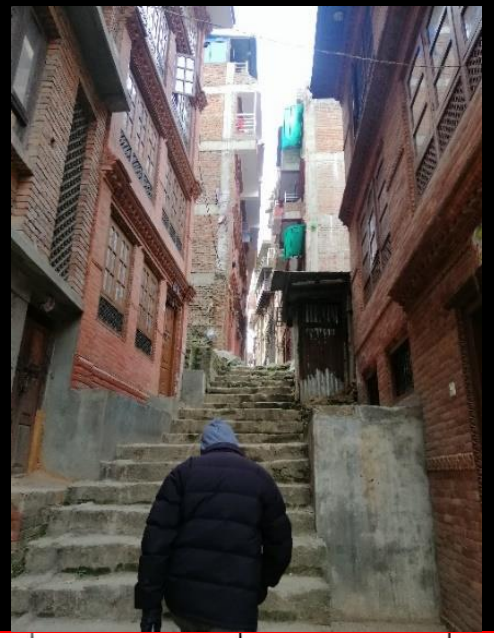
Case study II: Historic core area of Kathmandu valley

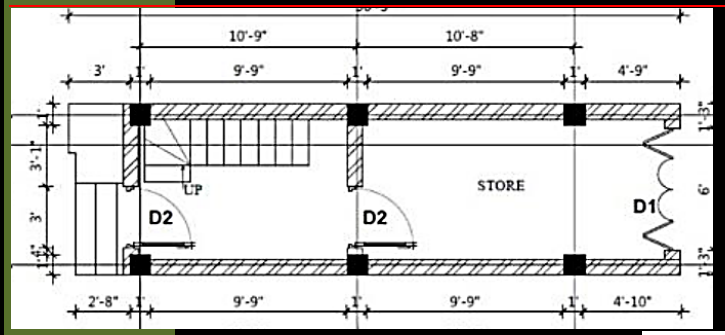
Inclusiveness	Gentrification of some family members;
	Wastage of habitable spaces;
	No extra support from outside except government's grant of NRs 300,000

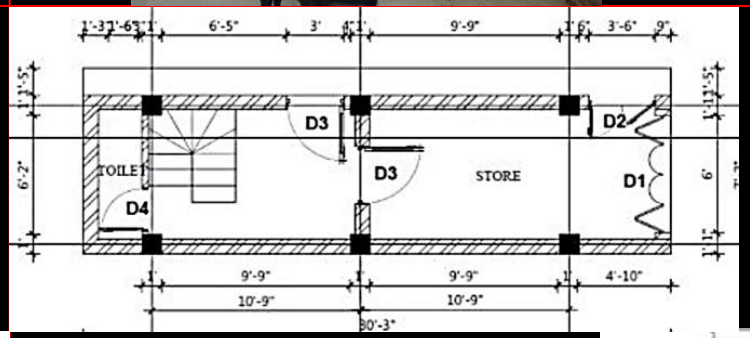


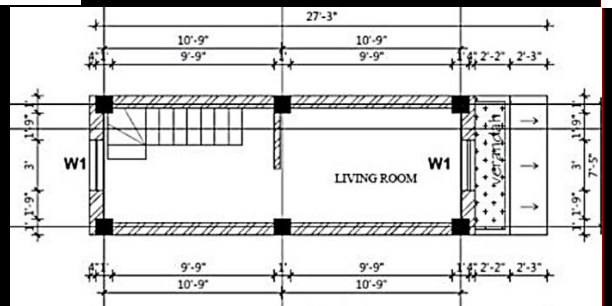
Case study II: Historic core area of Kathmandu valley

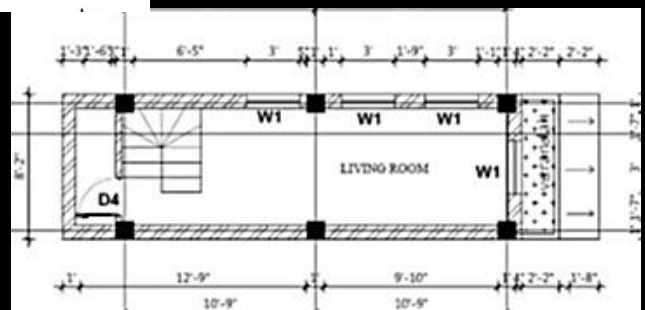
Cost effectiveness	Mat foundation in almost all cases
	Minimum size of column 12” X 12” even for span less than 10’
	Lack of vehicular access to the construction site
	Material transportation for individual/single building











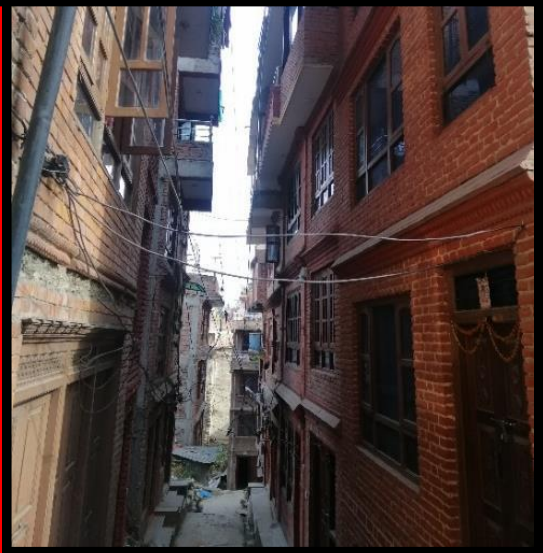
Case study II: Historic core area of Kathmandu valley

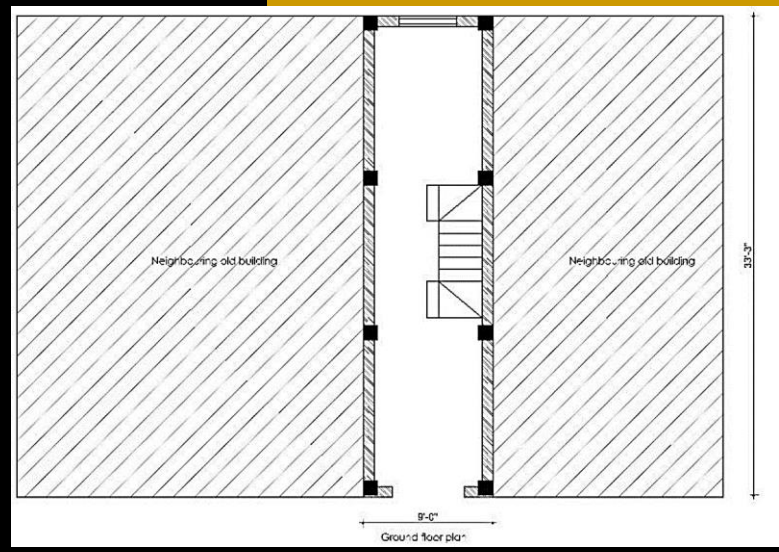
Time frame	Social issues of joint ownership, absentee of one owner
	No landownership certificate in some cases
	Dismantling of damaged house difficult do to connectivity with adjacent houses
	Manage building material, contractor by earthquake victims
	Building permit to be taken from municipality and grant from NRA office : extra burden

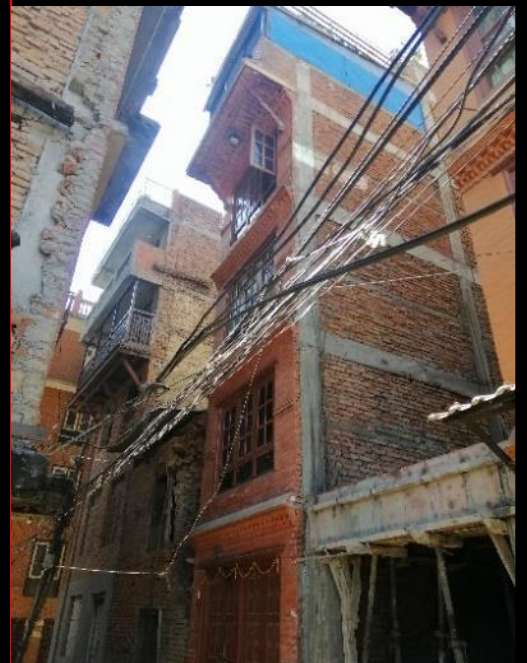
Case study II: Historic core area of Kathmandu valley

Resilient community and safer building

- Fragmentation of buildings : single buildings into multiple houses
- Joint family to nucleus family with displacement of some family members
- Pounding effects of newly built houses
- Cylindrical with small base
- Cantilever of structure from second floor onwards
- Privacy reduced, as sun light and ventilation on streets







Case study II: Historic core area of Kathmandu valley

Conservation, vernacular architecture and modern infrastructure	Not defined the elements of vernacular architecture and features to be saved, continued, etc.
	Scale, proportion and detailing all different from pre-earthquake period, except brick exposed element
	Absence of integrated provision of infrastructure as the reconstruction mainly focuses on individual building structure

Case study II: Historic core area of Kathmandu valley

Case study II: Historic core area of Kathmandu valley

Kisipidi - 1970

Kisipidi - 2009

Kisipidi - 2018

Case study II: Historic core area of Kathmandu valley

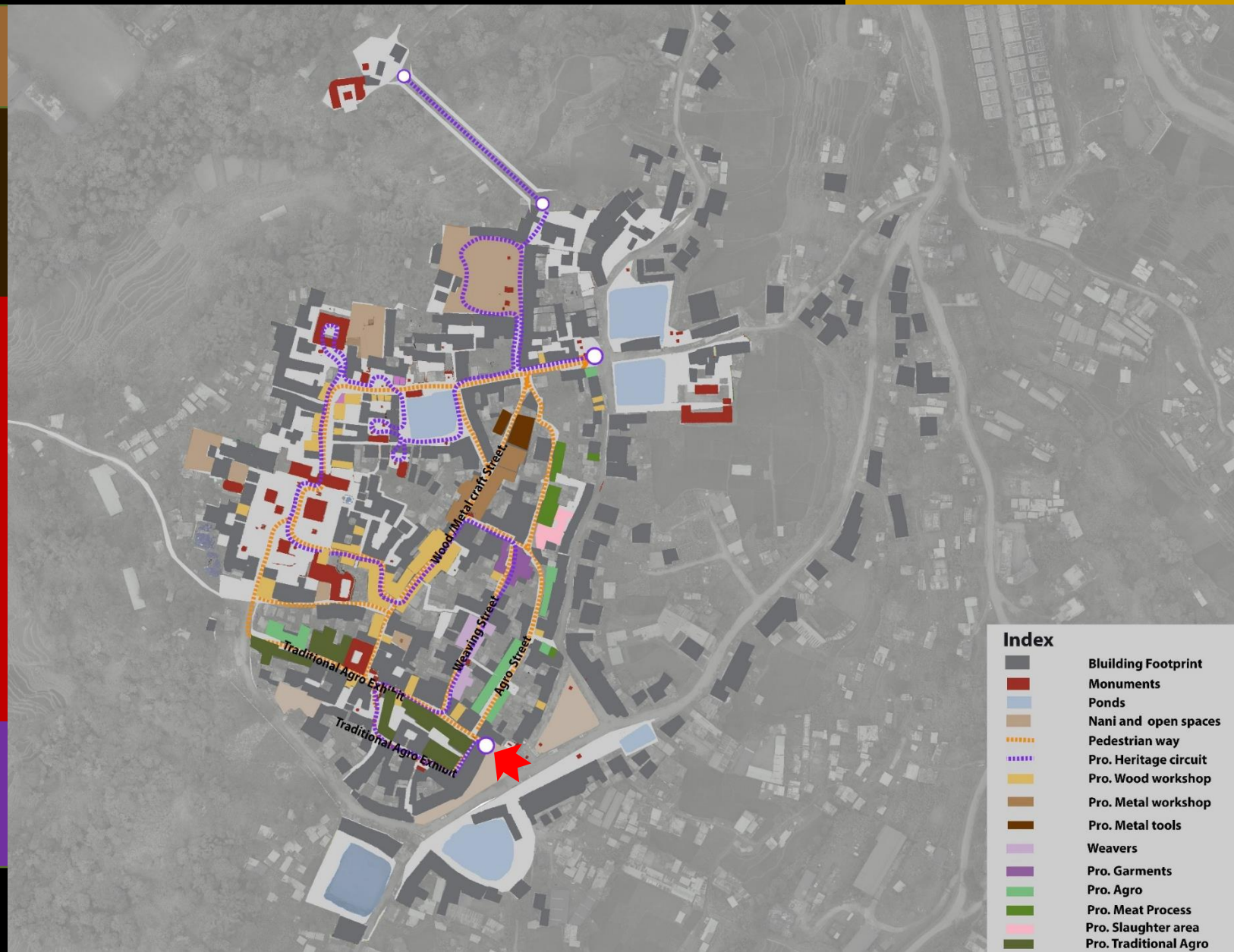
Lessons to be learned and way forwarded

- Post earthquake housing construction program should include livelihood and other activities;
- Earthquake victims required support from external sources in facilitating technical and financial aspects;
- Planning at community/settlement level is required instead of focusing on individual structure or adopting ready-made design irrespective of site context and individual requirements.

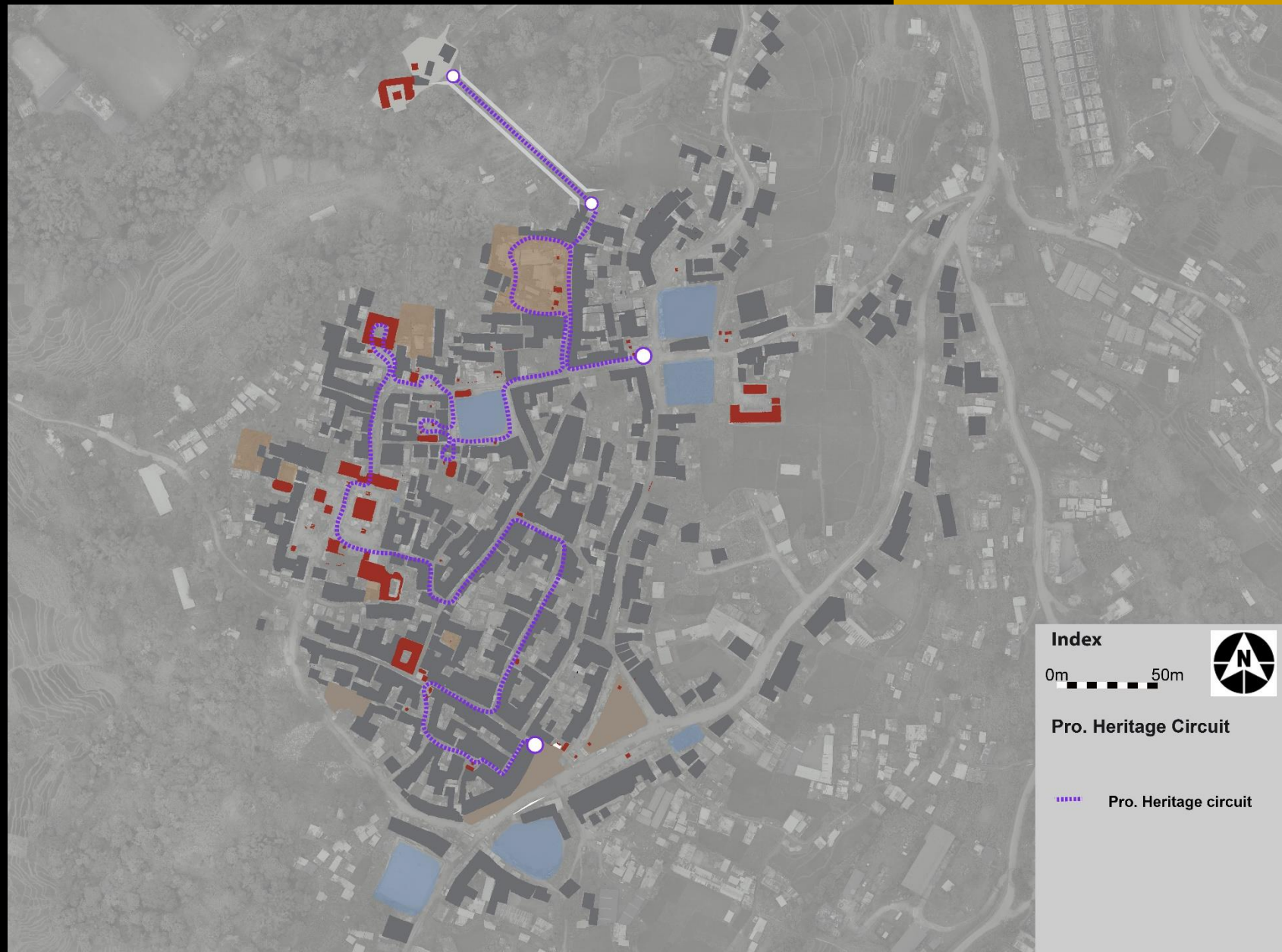
Way forwarded: Settlement level planning - Bungamati

Activities in the GF of encircled buildings

Accommodation	Homestay & lodges
Eating & entertainment	Restaurants, coffee shops, traditional food shops
Local business targeting tourist	Hand wool Metal craft Wood craft Agriculture products Souvenir shops
Local business targeting neighbours	Retails & others facilities



Way forwarded: Heritage walk in the core of Bungamati

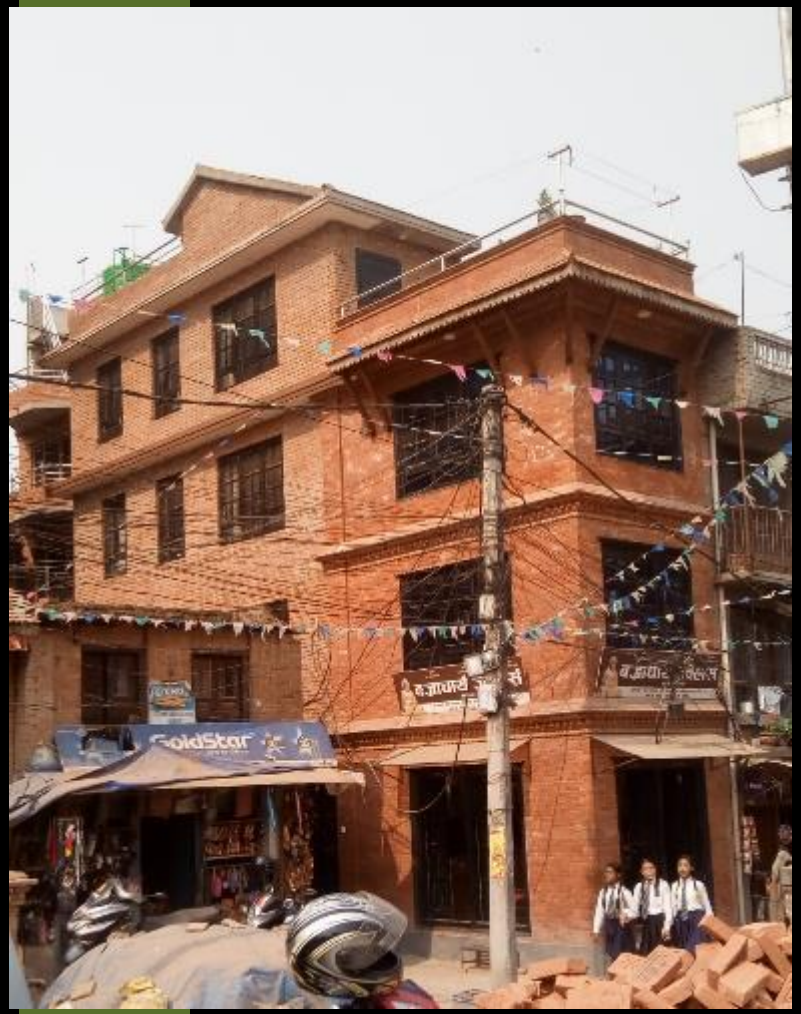


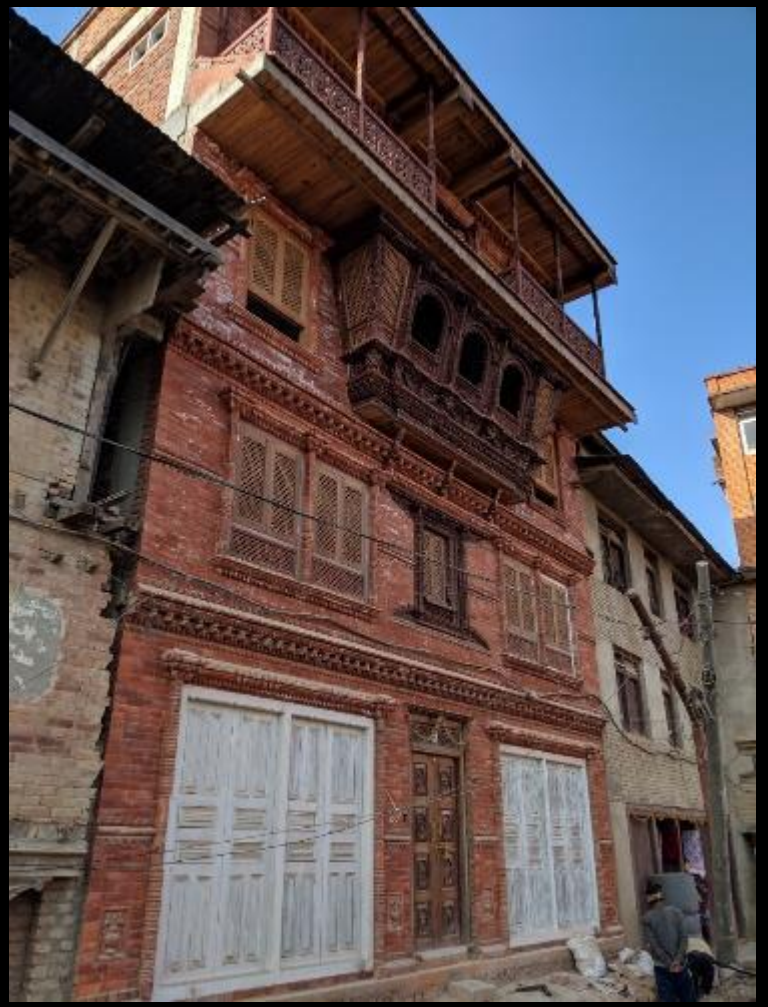
Way forwarded: Proposed bus park at Jawalakhel

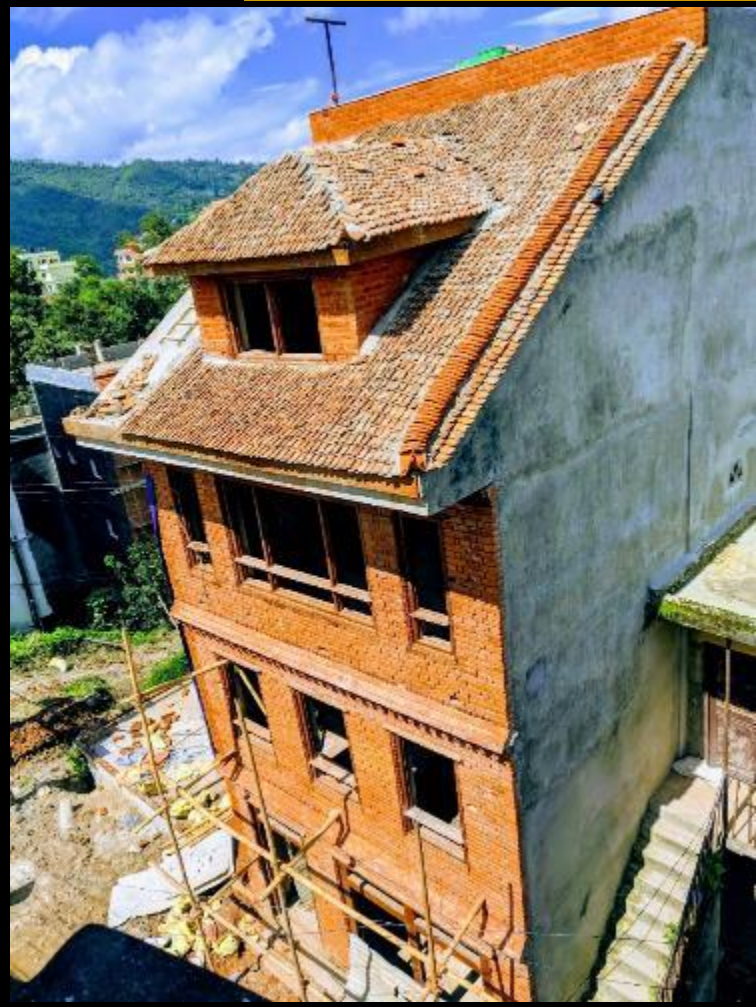
Way forwarded: Proposed revitalization of metal craft route

Way forwarded: Proposed public space improvement

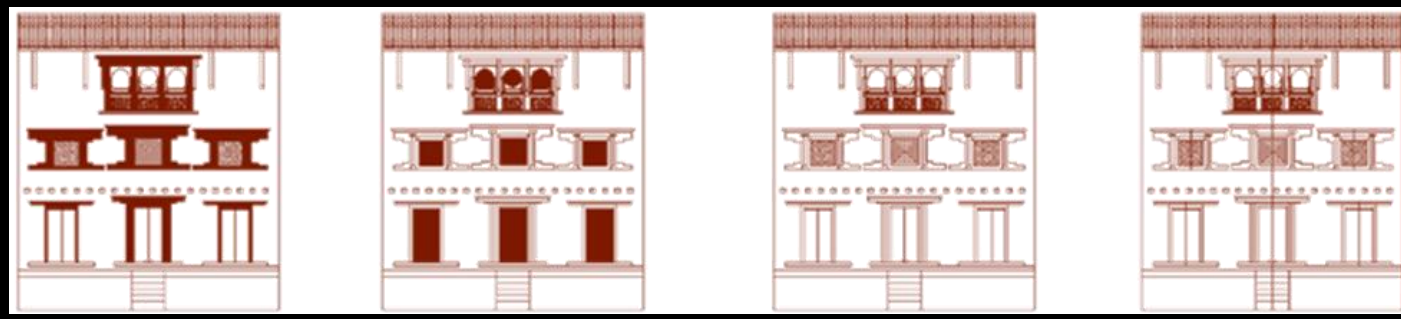
Way forwarded: Existing inncenties for individual house owners







Way forwarded: Urban design guidelines



S. N.	Qualitative aspects	S. N.	Quantitative aspects
1	Vertical façade with projection of balcony on second floor only	1	Ratio of opening area to façade area [individual houses vs façade]
2	Dominating tiled roof supported by struts	2	Percentage of roof seen in elevation against total building height
3	Vertical oriented windows and doors	3	Figure ground picture [opening vs decoration]
4	Cornices separating each floor in most cases	4	Changes in ratios between 1968 and pre-earthquake houses
5	Plinth as a transitional space between public and private		

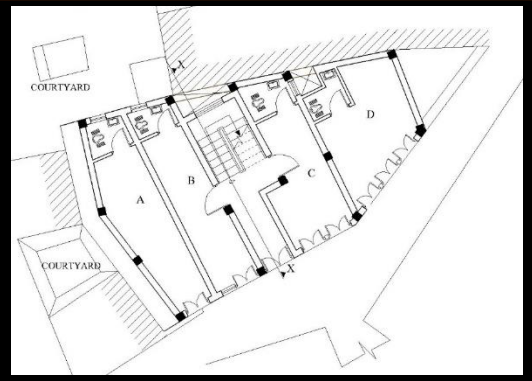
Way forwarded: Small plots combined to build a single house

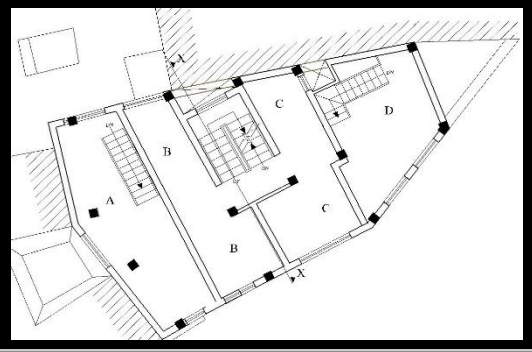
Jela, ward no. 2

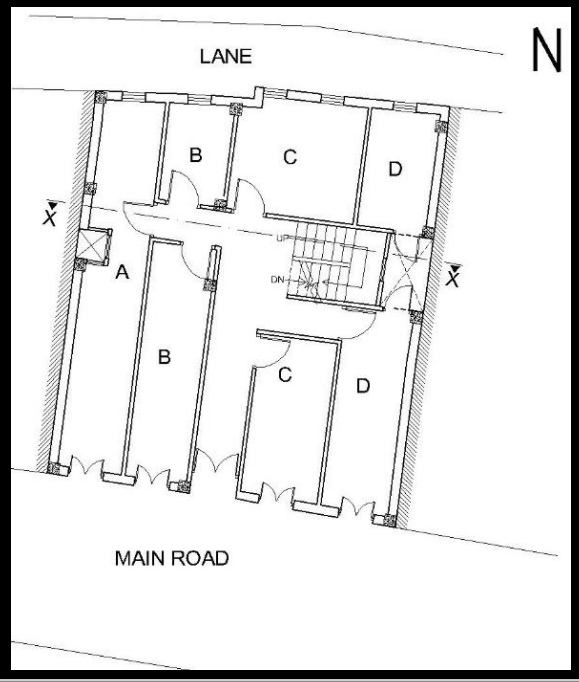
Byasi, ward no. 10

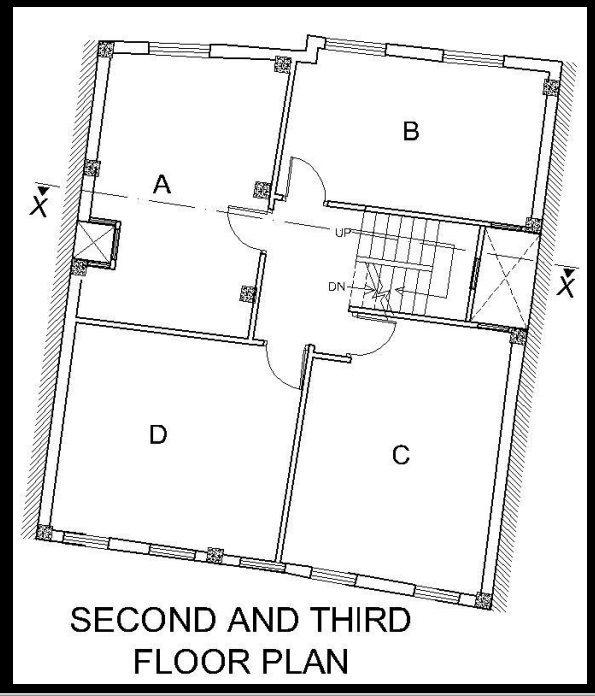
- Combination of small plots into a single one with common staircases – stable form & bulk
- Common foundation and columns but can have separate blocks within larger plot area. If needed small wooden staircase is possible for vertical circulation
- Adequate light, ventilation and convenient circulation inside the houses
- Easy to regulate and economical in combined construction

Way forwarded: Small plots combined to build a single house









Particular	Jela	Byasi
Plot area (individual 4 plots) (sqf)	A (302.79) + B (218.72) + C (221.84) + D (233.90) = 977.25	A (259.27) + B (234.38) + C)286.55) + D (266.18) = 1046.38
Area sharing after deduction for common staircase & lobby	A-30.98%, B -22.38%, C – 22.70% & D – 23.94%	A-24.78%, B-22.40%, C-27.38% & D-25.44%
Habitable area increase (compared to ind. const.)	Ground floor – 3.87 times First floor – 2.11 times	Ground floor – 10.37 times First floor – 42.18%

Way forwarded: Tekhacho housing reconstruction, Bhaktapur

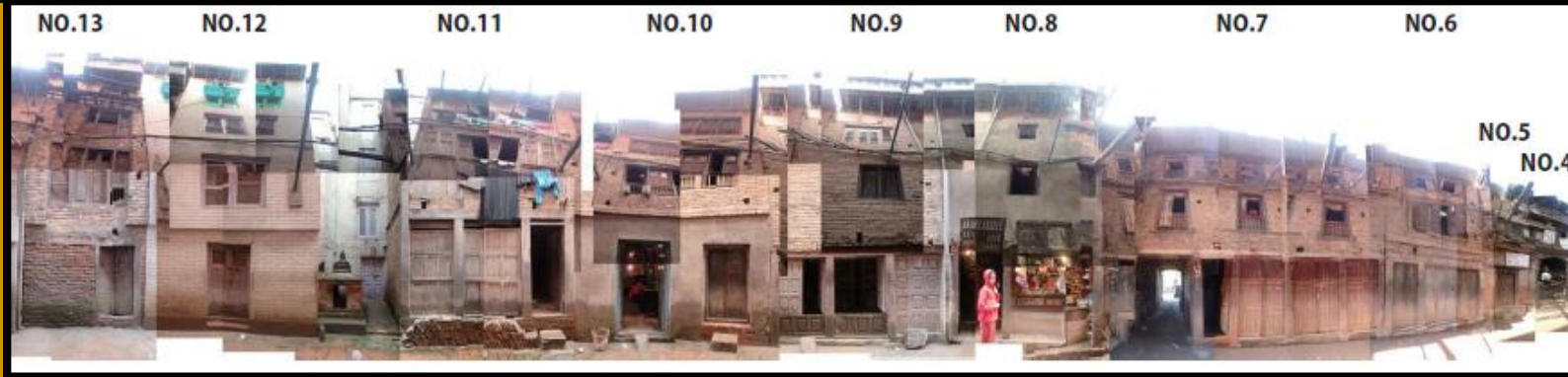
- 35 plots
- Main Street & Sub Street
- Courtyards

  -Front courtyard 3

  -Back courtyard 5
- Pati 2

  -Guthi house with Pati I

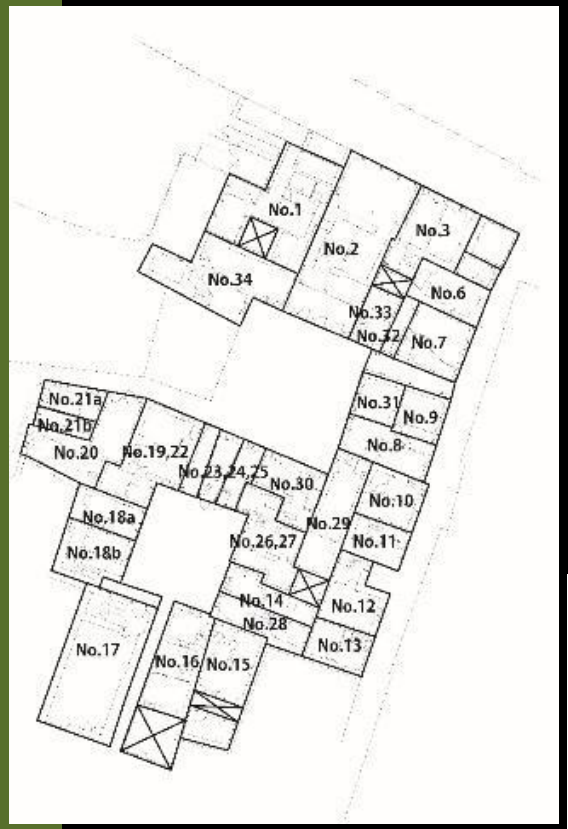
  -Pati in private house I



East elevation

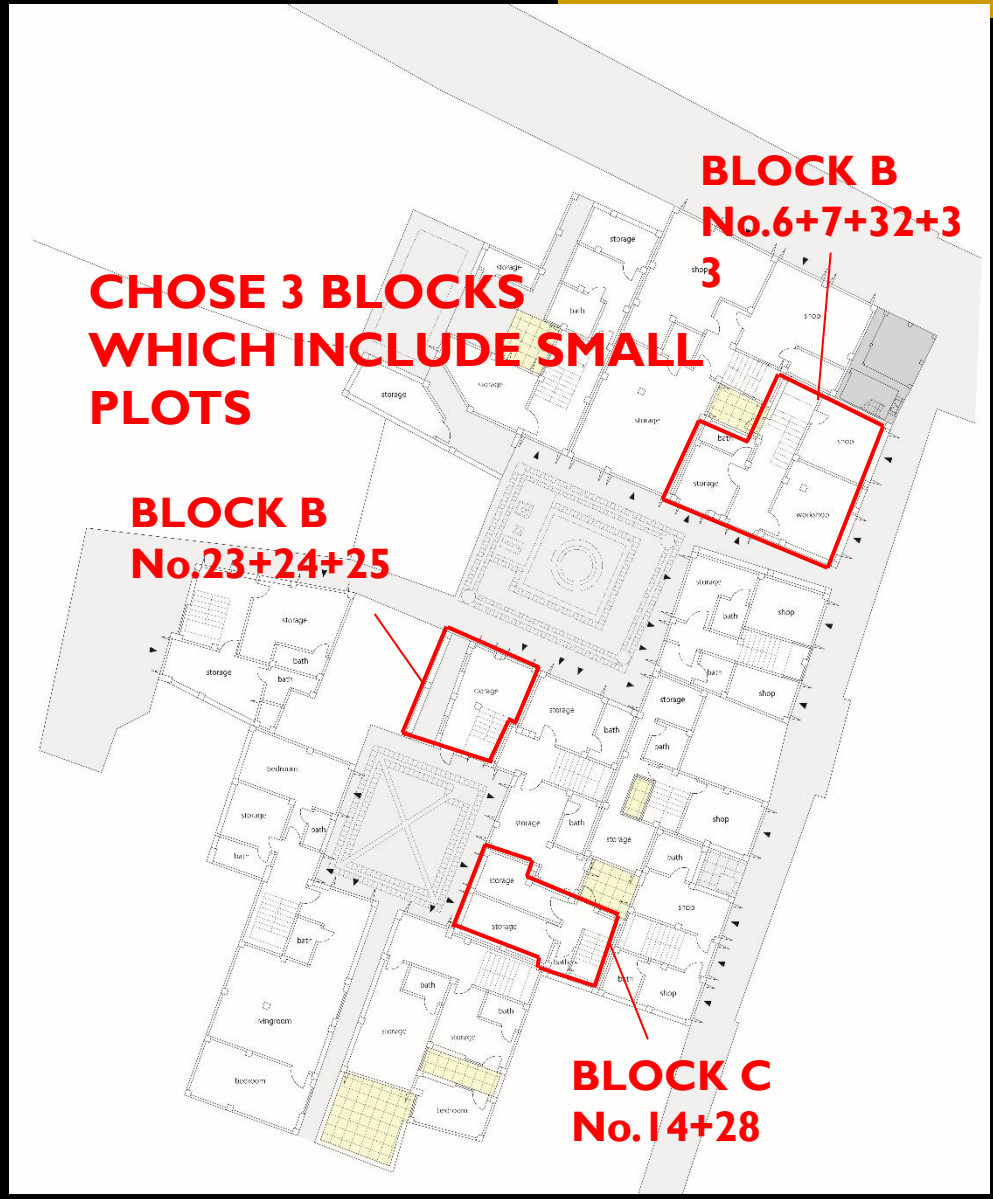
North elevation

Way forwarded: Small plots combined with sharing of staircase



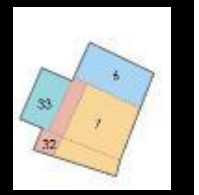
CURRENT

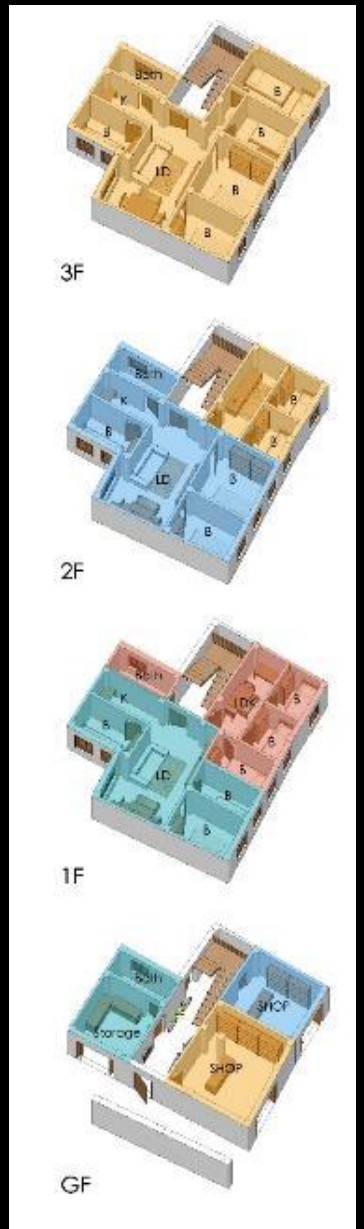
PROPOSAL

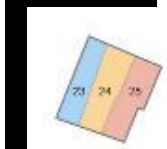


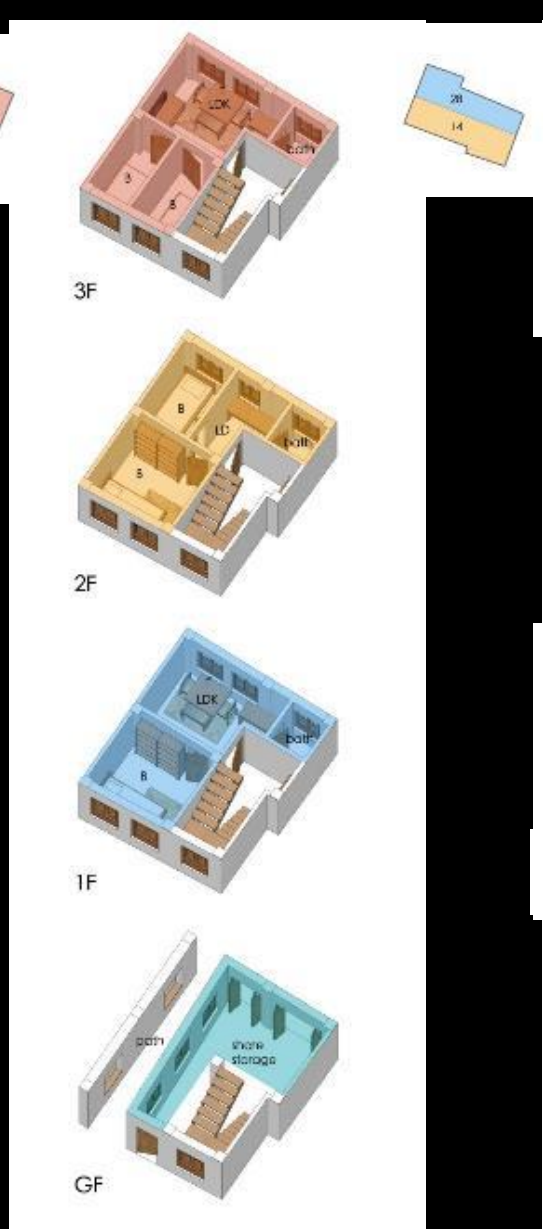
12 GROUPS WHICH COMBINE 2-4 HOUSES

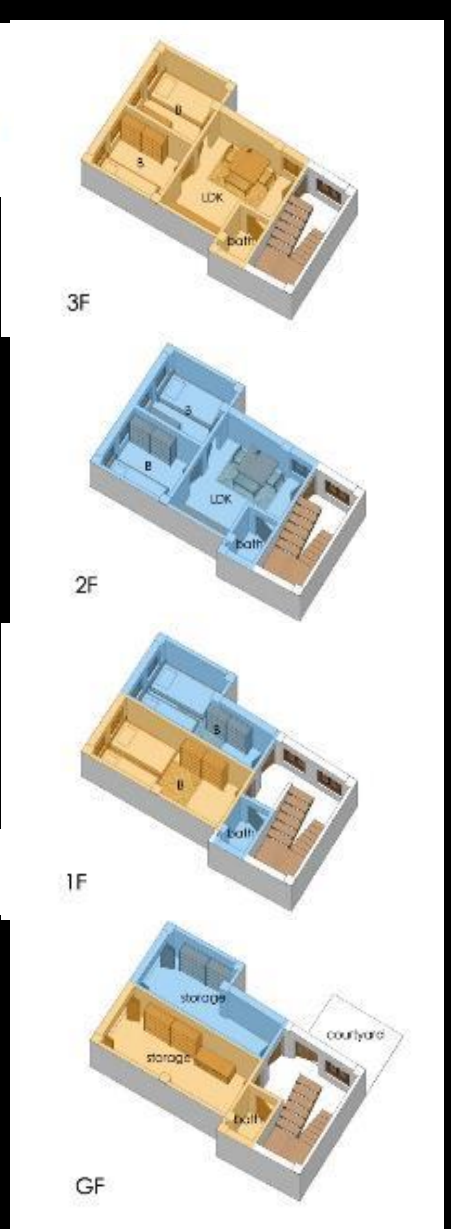
Way forwarded: Small plots combined with sharing of staircase



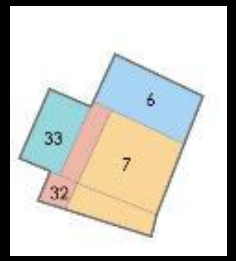






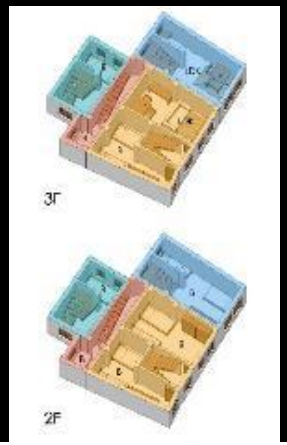


Way forwarded: Small plots combined with sharing of staircase

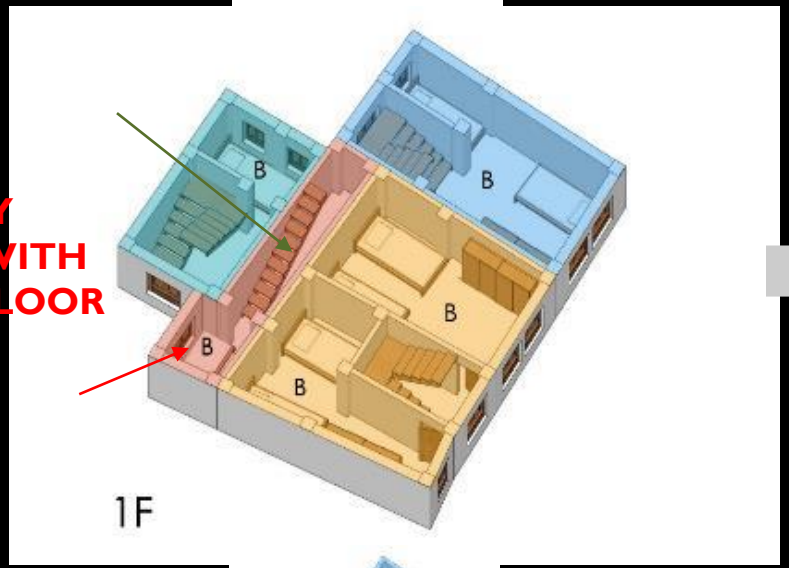


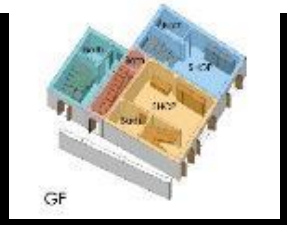
BLOCK A
NO.6.7.32.33

OWN STAIRCASE



4 STOREY HOUSE WITH SMALL FLOOR AREA

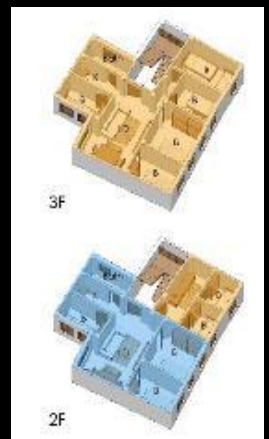


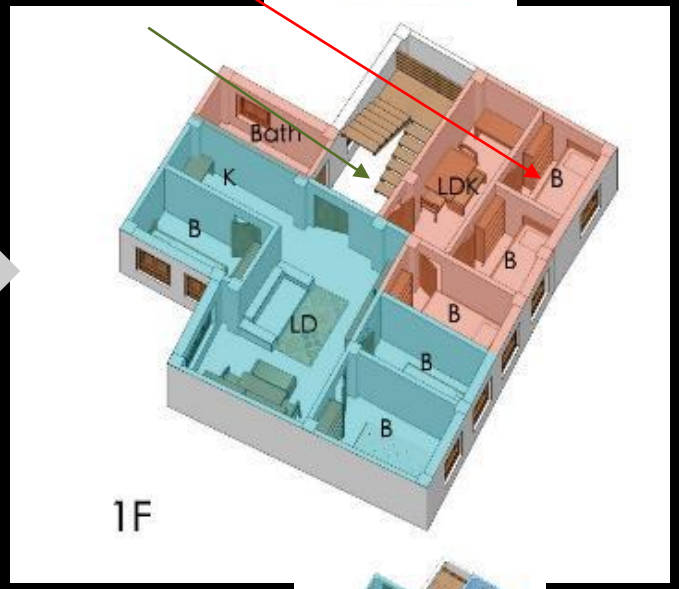


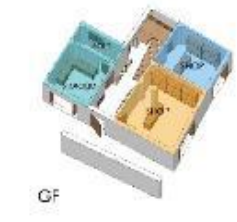
INDIVIDUAL RECONSTRUCTION

FLAT SYSTEM HOUSE WITH ENOUGH ROOM

SHARE STAIRCASE

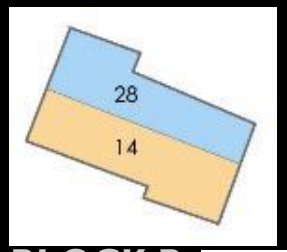






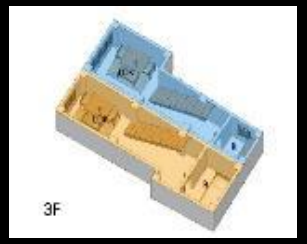
COMBINED RECONSTRUCTION

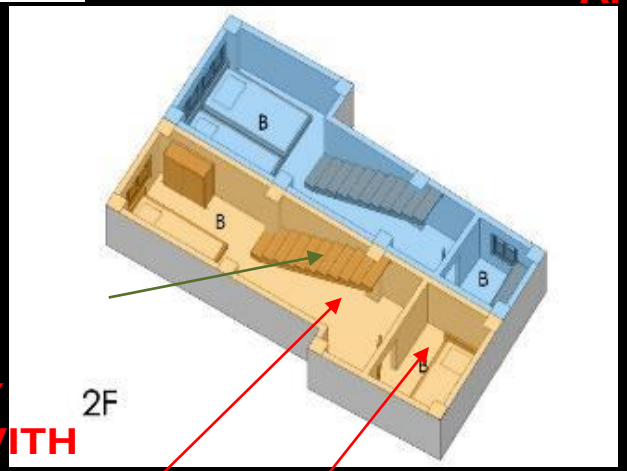
Way forwarded: Small plots combined with sharing of staircase



BLOCK B
NO.14.28

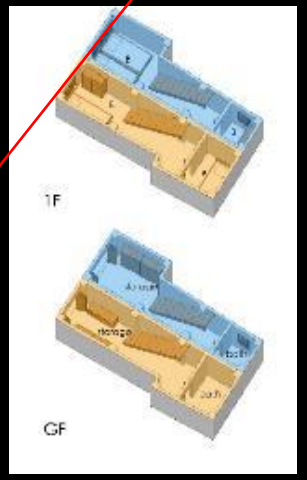
OWN
STAIRCAS
E





4 STOREY
HOUSE WITH
SMALL FLOOR
AREA

NO LIGHT AND
VENTILATION

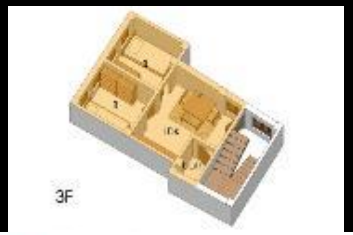


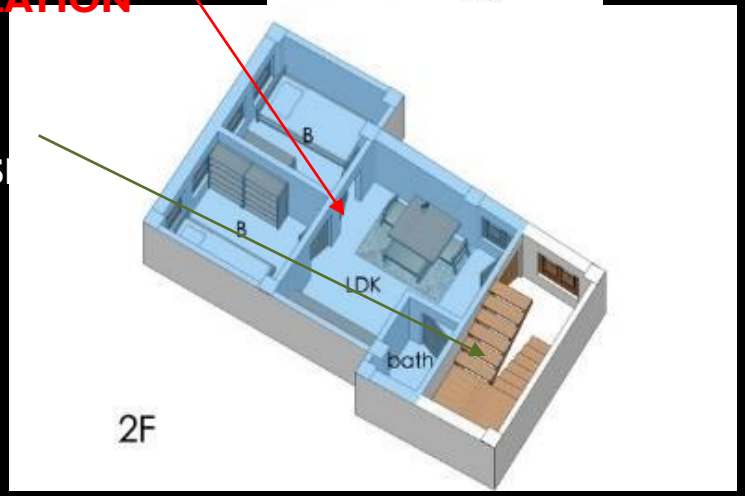
INDIVIDUAL
RECONSTRUCTION

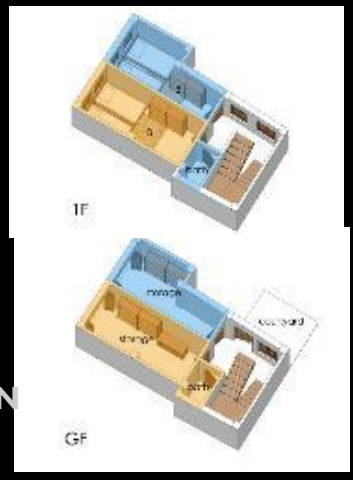
FLAT SYSTEM HOUSE
WITH ENOUGH ROOM

ENOUGH LIGHT
AND VENTILATION

SHARE
STAIRCASE







COMBINED
RECONSTRUCTION

Way forwarded: Small plots combined with sharing of staircase

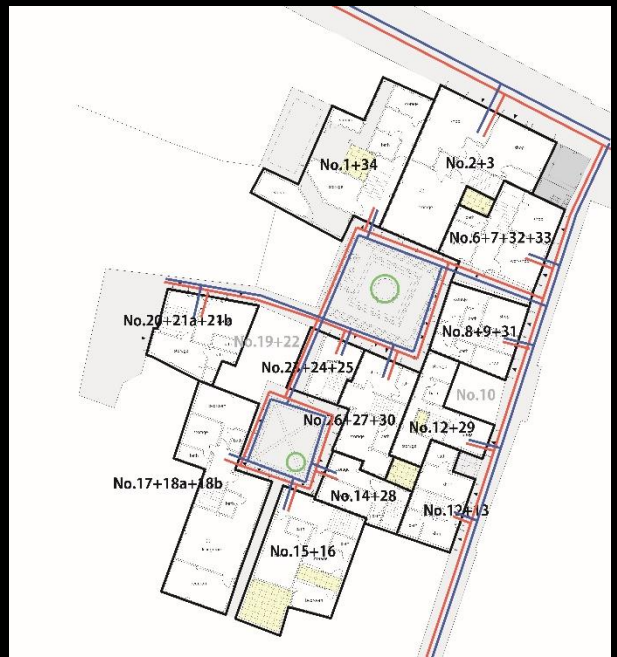
1) Floor area increase

Room area :
Increase 103%～130%

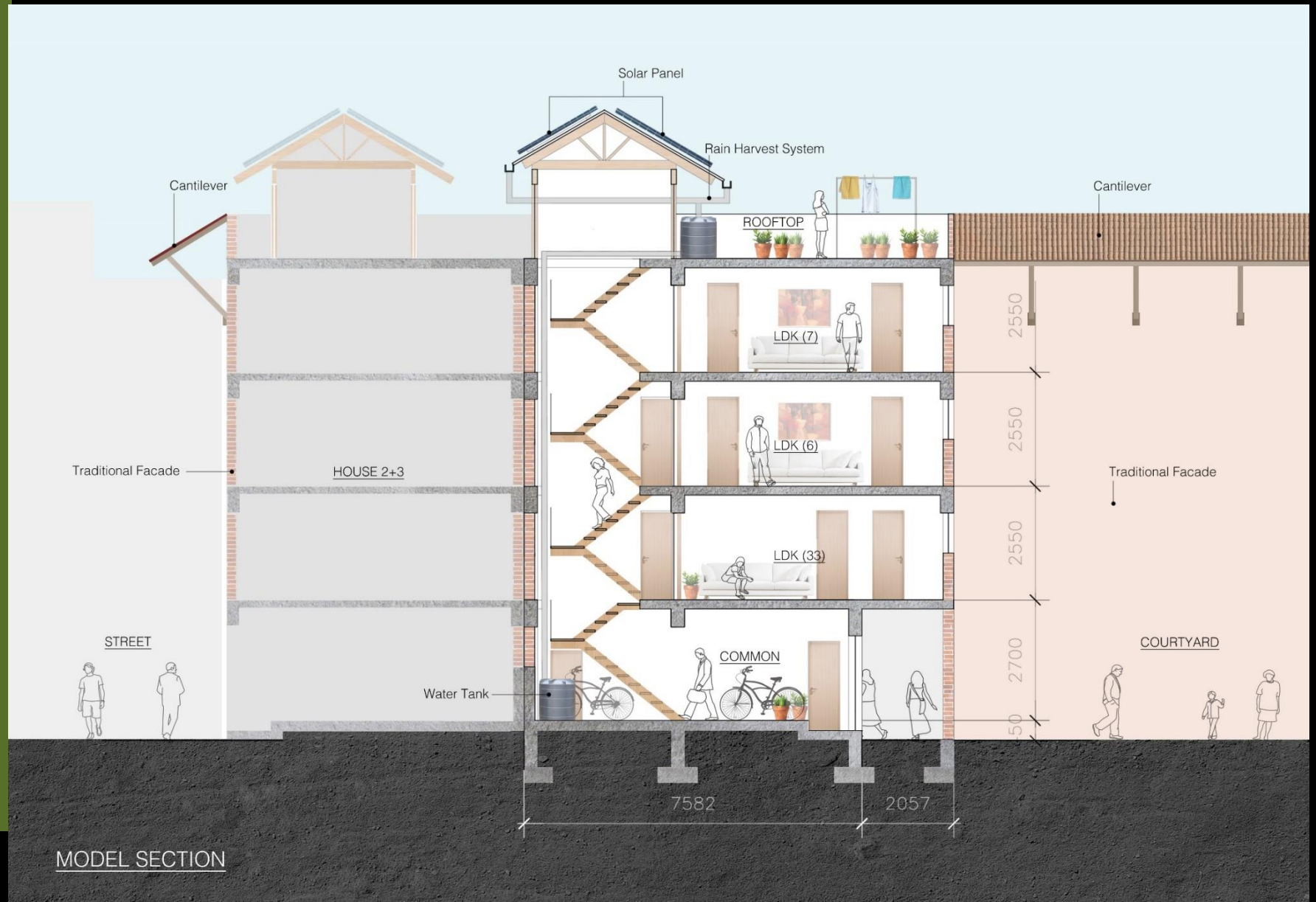
	COMBINE					
HOUSE NO.	6	7	32	33	SHARE	TOTAL
	ROOM	ROOM	ROOM	ROOM	STAIRCASE	
3F	0	54.5	0	0	8	62.5
2F	38.5	16	0	0	8	62.5
1F	0	0	22.7	31.8	8	62.5
GF	12.5	15.5	0	11.7	14.4	54.1
TOTAL	51	86	22.7	43.5	38.4	241.6

2) building construction cost
Reduction
Because of reduction of columns and walls

3) infrastructure cost
Decrease
Because of reduction of water pipes



Way forwarded: Integrated infrastructure – water, sewer, ligh



Way forwarded: streetscape

Dziękuję Ďakujem dhanya-waad Дякую

bedankt ありがとう Thank you go raibh *maith agat*

tesekkürle Danke köszi Thank yu

谢谢 *hvala* tack så mycket

Спасибо *faleminderit*

Shukriyâ Merci شكرًا *kiitos*

takk *Obrigada*

Ευχαριστώ Grazie díky Mulţumesc תודה

Muchas gracias *anugurihiitosumi* köszönöm

너를 감사하십시요 *ačiû* nandri tack *Terima Kasih*

aitäh *děkuji vam* mange tak *salamat*