

GIS in Urban & Rural / Regional Planning

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GIS application**



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Determinants of GIS Application

Application of GIS is largely determined by the philosophy and purpose of planning.



Purpose of using GIS in URP

- ✓ **Descriptive and Predictive Models**
Describe existing situation, Forecast future, Identify problems
- ✓ **Assess supply and demand**
Concisely express your thoughts and keep the style of template.
- ✓ **Monitor changes**
Model changes, relationship, impacts and contingencies
- ✓ **Communicate to decision makers**
Concisely express your thoughts and keep the style of template.





Approach, scale and typology

- ✓ **Planning philosophy and approach**
Purpose, local contexts and local initiatives

- ✓ **Scale**
Spatial coverage, Diversity,

- ✓ **Substantive planning**
Global, regional, national and Local issues to be considered in planning

- ✓ **Procedural planning**
Changes in substantive part leads to subsequent change procedural planning





Major Typology of Data

Generally planners need data on
demography and economy, Environment,
land use and transportation, and
infrastructure and services.





Population and Economy



Size

Space requirements for future housing, retail and office, manufacturing, and community facilities and open space



Composition

Employment composition, Age-sex structure, Household type, ethnic/cultural & socioeconomic groups



Spatial Distribution

Necessary to assess the distribution of community facilities; access to jobs, shopping; exposure to different kinds of problems (e.g., flooding); and for differentiating impacts among segments of the population.



Environmental Systems



Topography and Slope

Mountains, valleys, plains, lakes, rivers, canals
→ Fill & cut, water logging, land slide



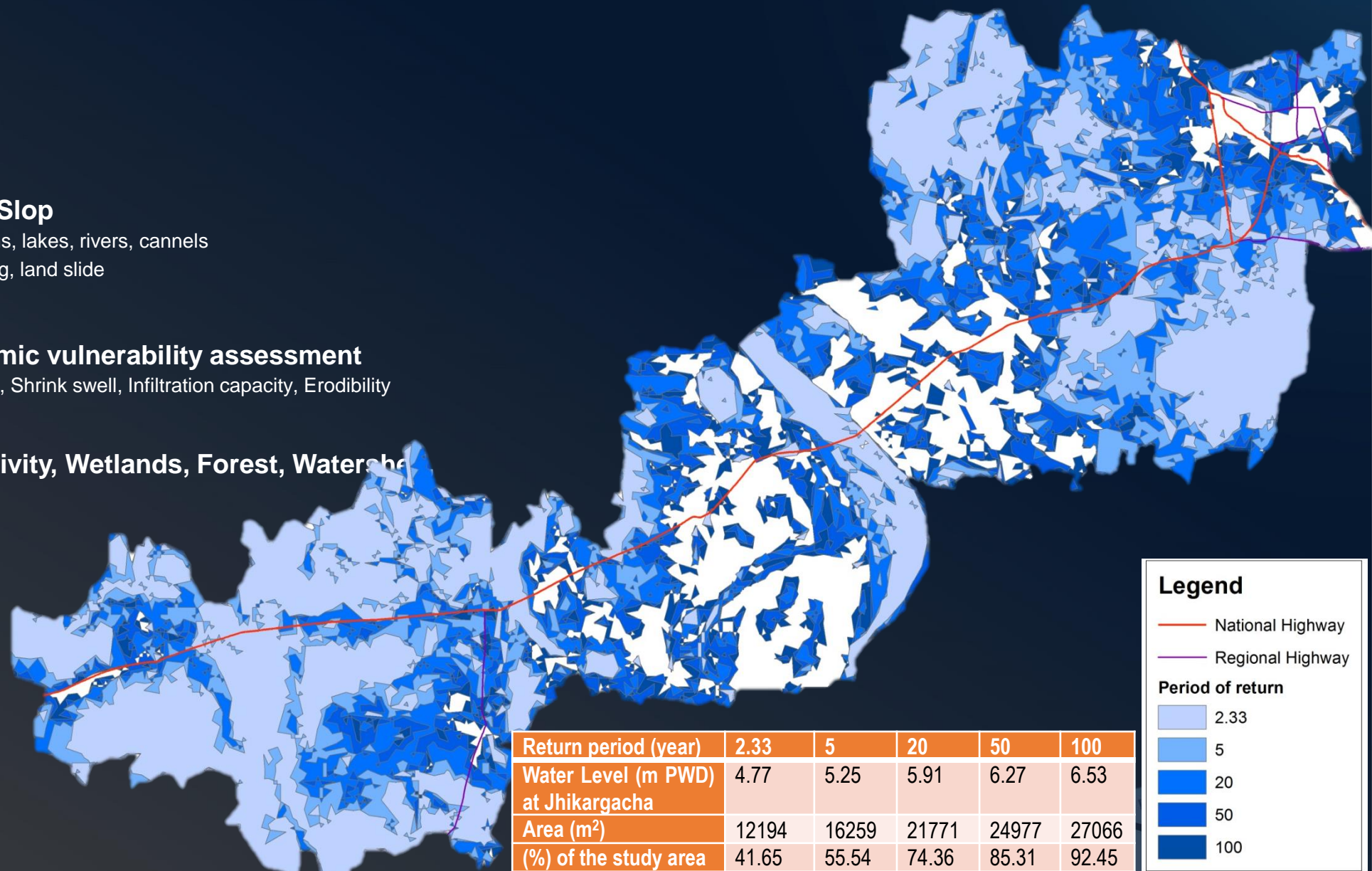
Soil survey, Seismic vulnerability assessment

Weight-bearing capacity, Shrink swell, Infiltration capacity, Erodibility



Ecological sensitivity, Wetlands, Forest, Watershed Flood-flow zone

Hydrologic modeling



Return period (year)	2.33	5	20	50	100
Water Level (m PWD) at Jhikargacha	4.77	5.25	5.91	6.27	6.53
Area (m ²)	12194	16259	21771	24977	27066
(%) of the study area	41.65	55.54	74.36	85.31	92.45

Legend

— National Highway
— Regional Highway

Period of return

2.33
5
20
50
100



Environmental Systems (Hydrological modeling)

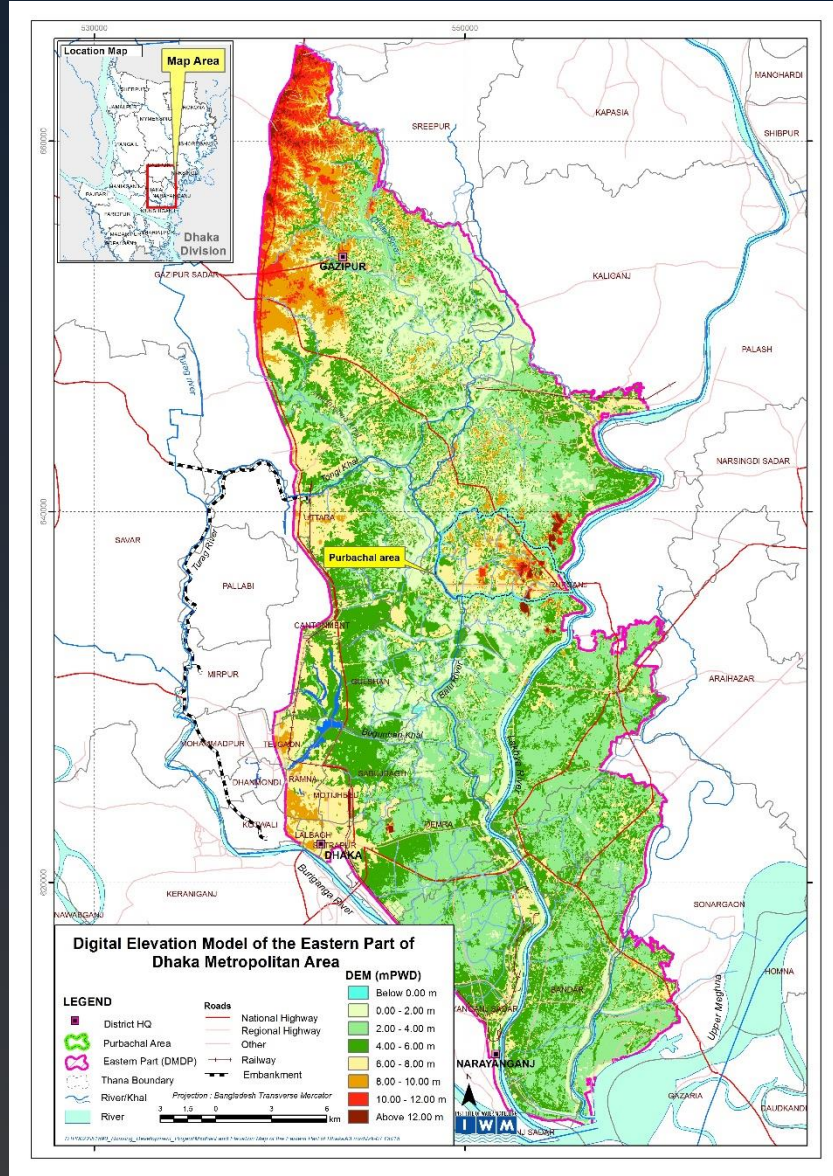
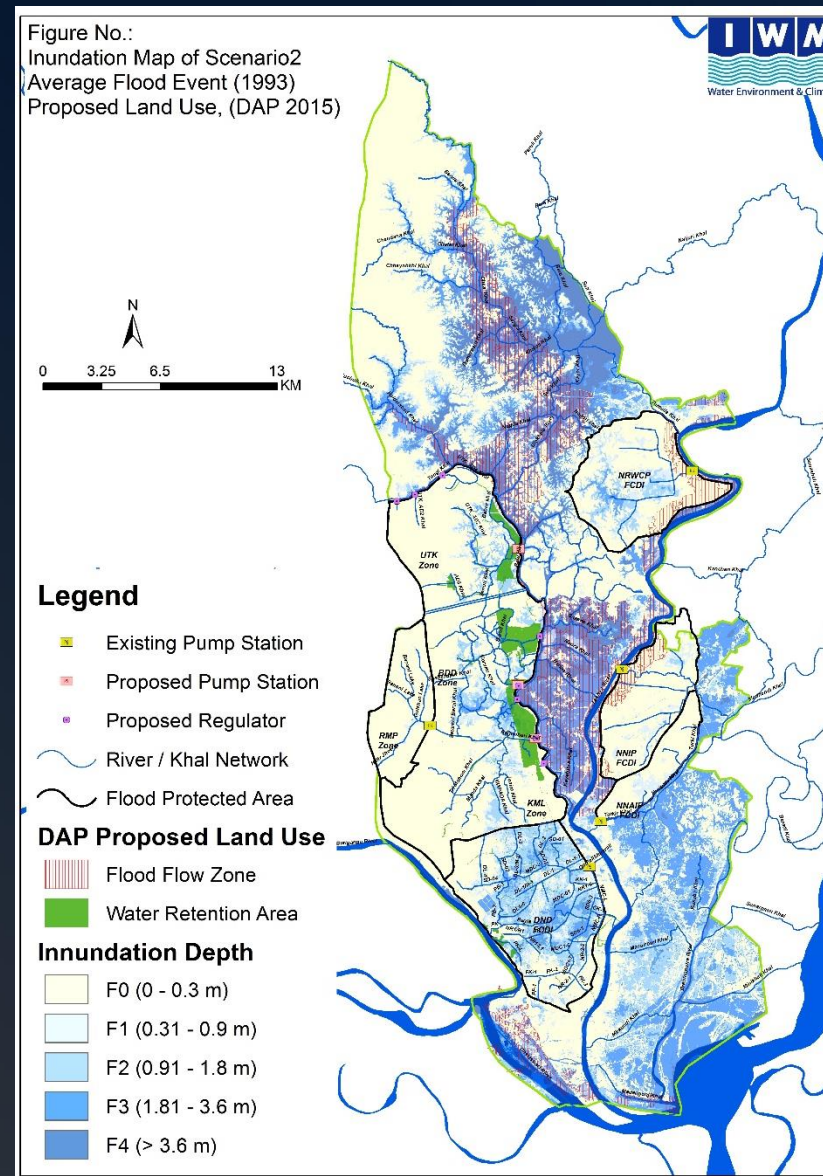


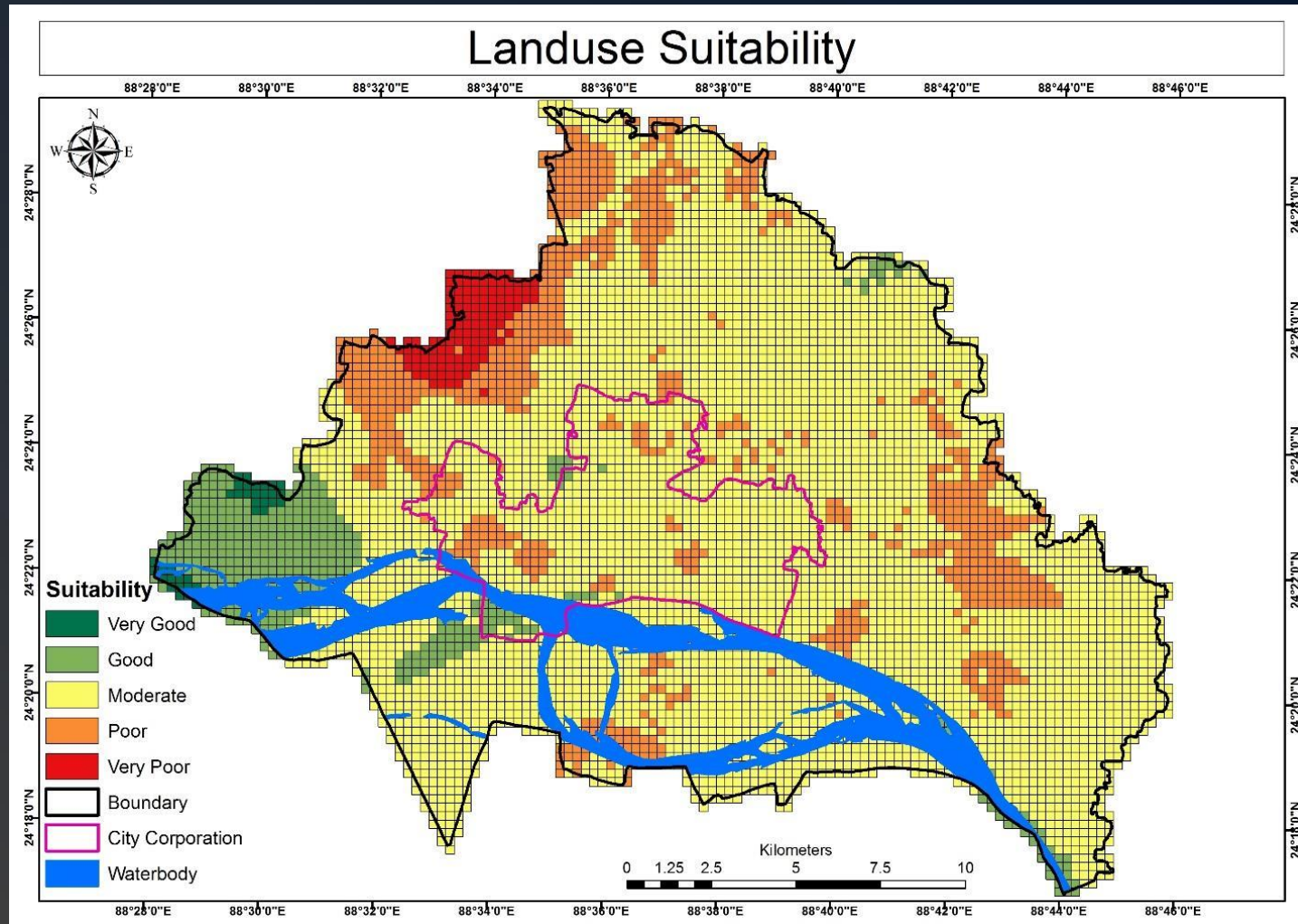
Figure No.:
Inundation Map of Scenario2
Average Flood Event (1993)
Proposed Land Use, (DAP 2015)



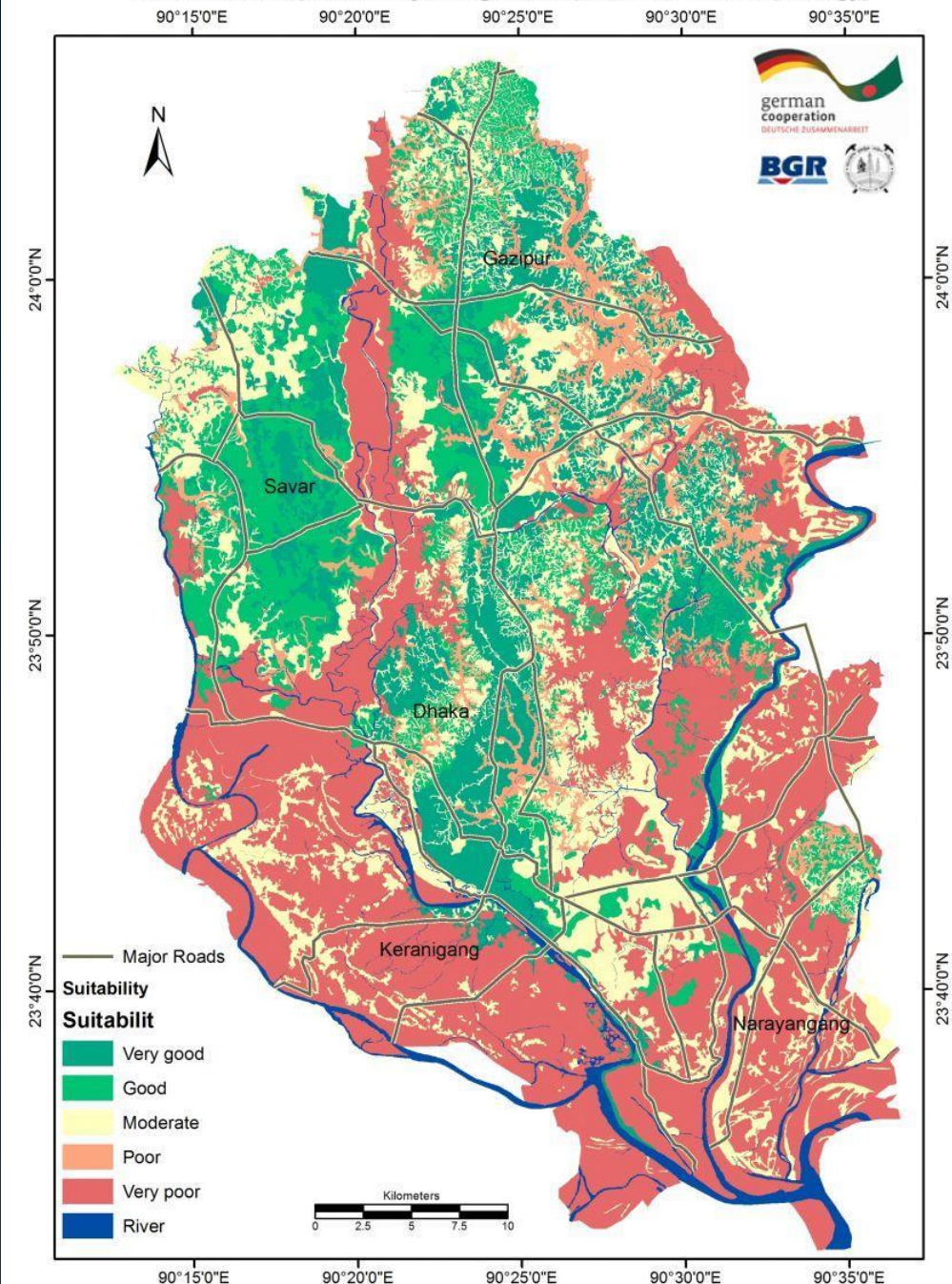


Environmental Systems (Earthquake Sensitive LU)

Peak ground acceleration, Foundation layer depth, Soil Type, Liquefaction Potential Index, Building Height Recommendation



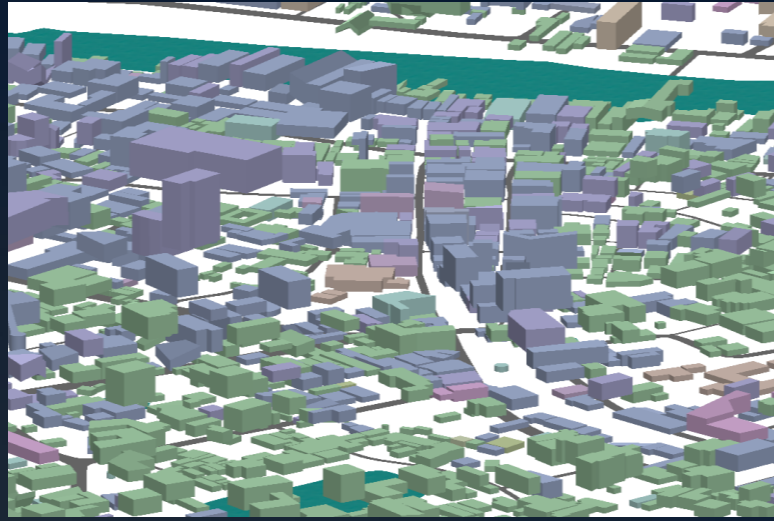
Infrastructure Suitability for shallow foundation of Dhaka Metropolitan City, Bangladesh (based on Geomorphology)



Land Use (Mapping)



Land use map



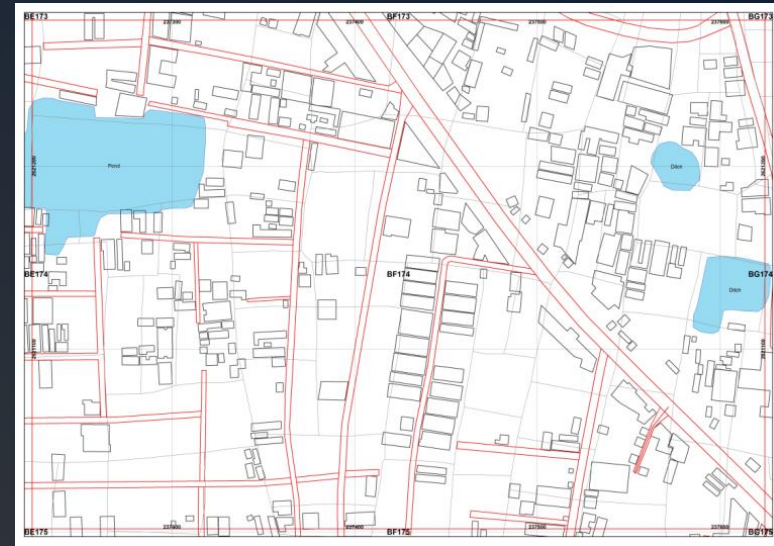
Updated physical feature map

Sl. No.	Floor	Impt. Street Name	Appln. No.	Address (Hd, Rd, Block/Section/Plot)	Plot Area	Structure Use_Floor_1	Structure Use_Floor_2	Structure Use_Floor_3	Structure Use_Floor_4	Structure Use_Floor_5
99	SP			17/2 Chhachhi		2	R			
100	SP	Cardinal	9	11/2 Chhachhi		18	R	R	R	R +
101	2	Adi 2	30	17/2 Chhachhi		2	R +	R		
102	6	Karim	12	17/2 Chhachhi		13	R	R	R	R +
103	6	Villa	23	22/3/4/1		12	R +	R	R	R
104	SP			Chhachhi			R			
105	5		15	22/3/4/1		5	R	R	R	R
106	SP		4			1	R			
107	6	CHHACHHI	22	22-3-4		10	R +	R	R	R
108	5		21	22/3/4		10	R	R	R	R
109	SP			22/4-3		3	R			
110	4		10	22/A		4	R	R	R	R
111	SP			22/A		1	R			
112	5		25	22/4/2		10	R	R	R	R

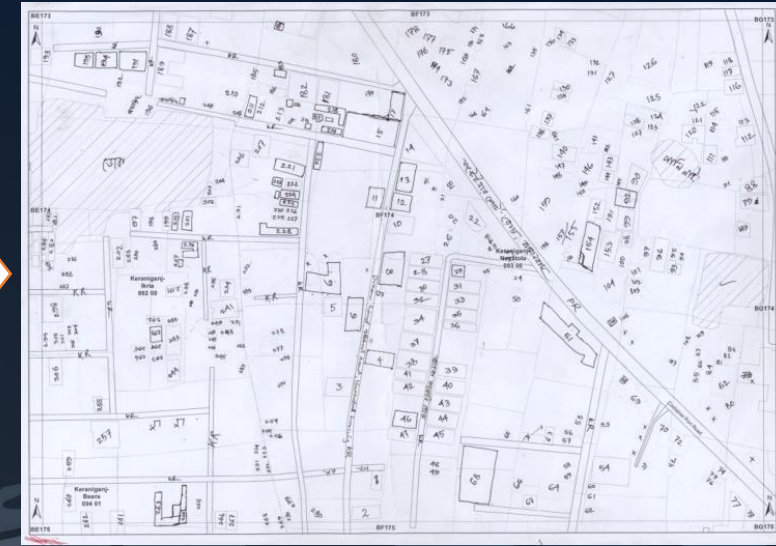
Log Book Page



Georeferenced MS Mouza Map



Base Map comprising Mouza Map and Photogrammetric Data



Sample surveyed Base Map of Physical Feature Survey

Transportation



Four-step Travel Forecasting Process

- Trip generation
- Trip distribution
- Modal split or mode choice
- Traffic assignment



Assess supply and demand

- Transport Demand Data ← Population and Socio-Economic Conditions (Zone wise)
- Traffic Volume Surveys ← Screen Line Survey, Cordon Survey, Intersection Turning Movement Survey, Queue Length Survey, Travel Speed and Time Survey



Geographic Information Systems for Transportation (GIS-T)



Service Infrastructure

- ✓ **Water and Sewerage System**
- ✓ **Community services**
Religious stablishments, Health and Educational institutes, parks and playgrounds,
- ✓ **Waste Management System**





Data sources and Technology

Analog and digital sources of data for
planning information system, current barriers
and future potentials

Spatial data

- ✓ **Cadastral map**
Till 1990, most of the plans used cadastral maps prepared at 1920-1930.
- ✓ **Total station and RTK-GPS**
Between 1990-2005, many plans (e.g. Rajshahi) used these technology.
- ✓ **Low-resolution satellite image**
Since early 1990s, we started using Landsat images (e.g. DMDP)
- ✓ **High-resolution and stereo satellite image**
Since 2000, most of the plans used relatively satellite imageries with relatively high spatial resolution. We started using stereo-images around 2010~
- ✓ **UAS**
Current method of data collection.



Non-spatial data

- ✓ **Government Organizations**
Bureau of Statistics (BBS), Local governments (e.g. City corporations), Other govt. organizations
- ✓ **Web-based data collection**
Very limited application (proprietary softwares do not let us customize, lacks integration, expensive and surveyors are not trained enough).
- ✓ **Manual data collection**
Physical feature survey, socio-economic survey



Potentials

- ✓ **LiDAR**
Lightweight Airborne LiDAR to be used by UAV
- ✓ **Multi-spectral and Hyper-spectral images**
Most of the surveyworks are carried out by non-survey grade UAS.
- ✓ **High-resolution RADAR Images**
Practically we do not see any application as such
- ✓ **National Spatial Data Infrastructure (NSDI) and WebGIS**
2 initiatives (<http://nsdi.gov.bd/> ; <https://geodash.gov.bd/>)





Way forward

Generally planners need data on
demography and economy, Environment,
land use and transportation, and
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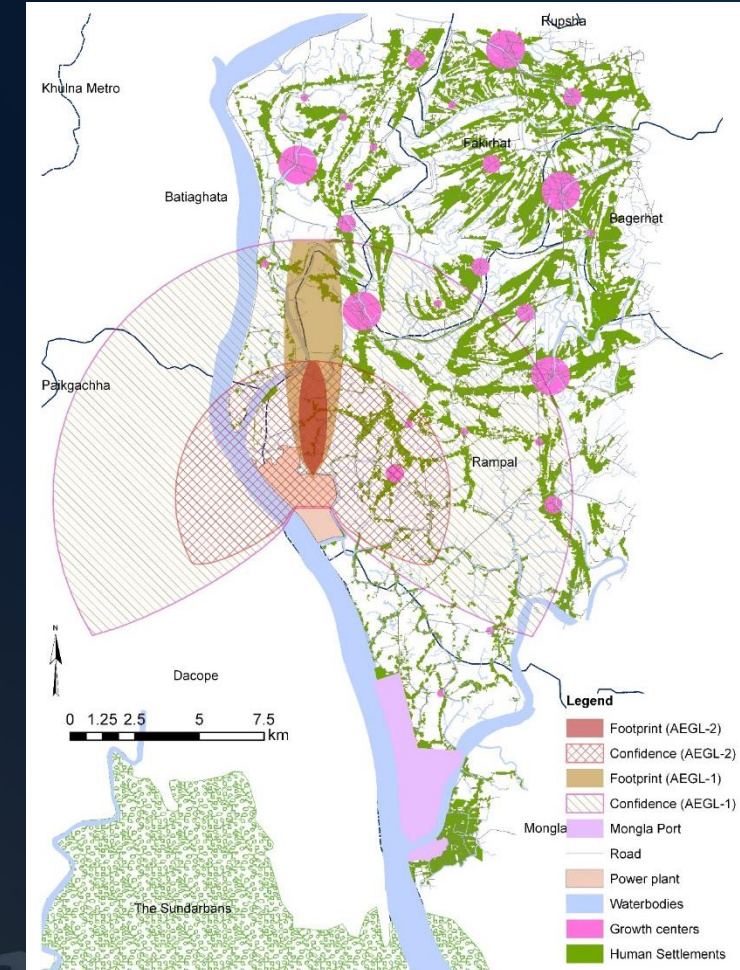
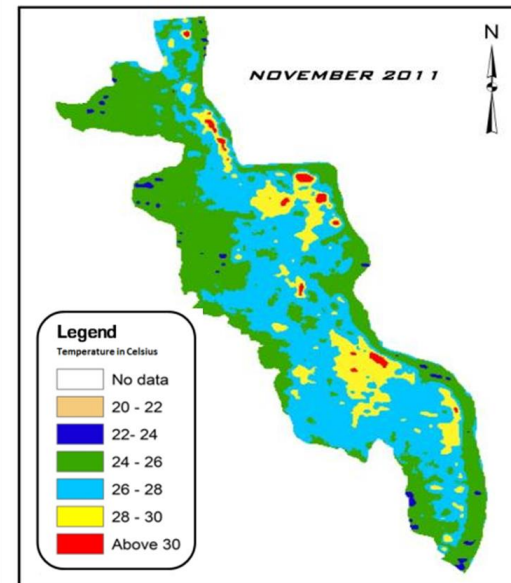
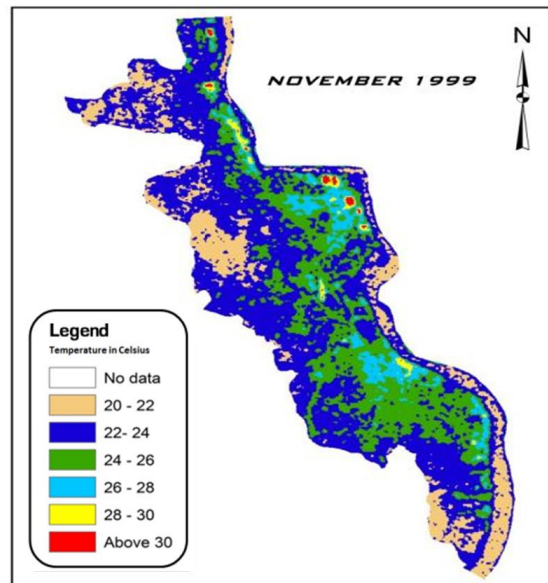
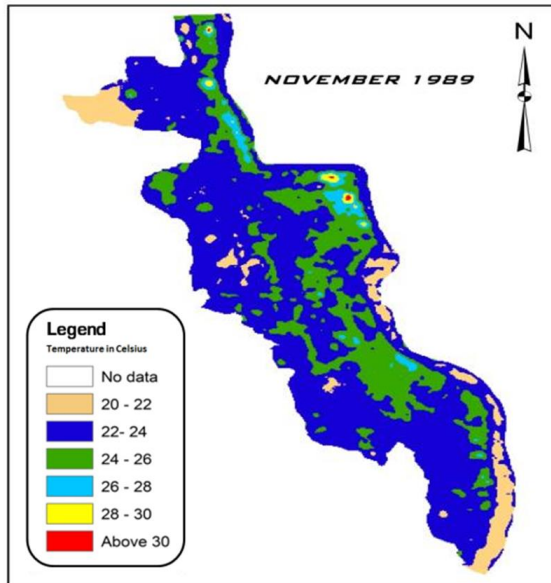


The Gap

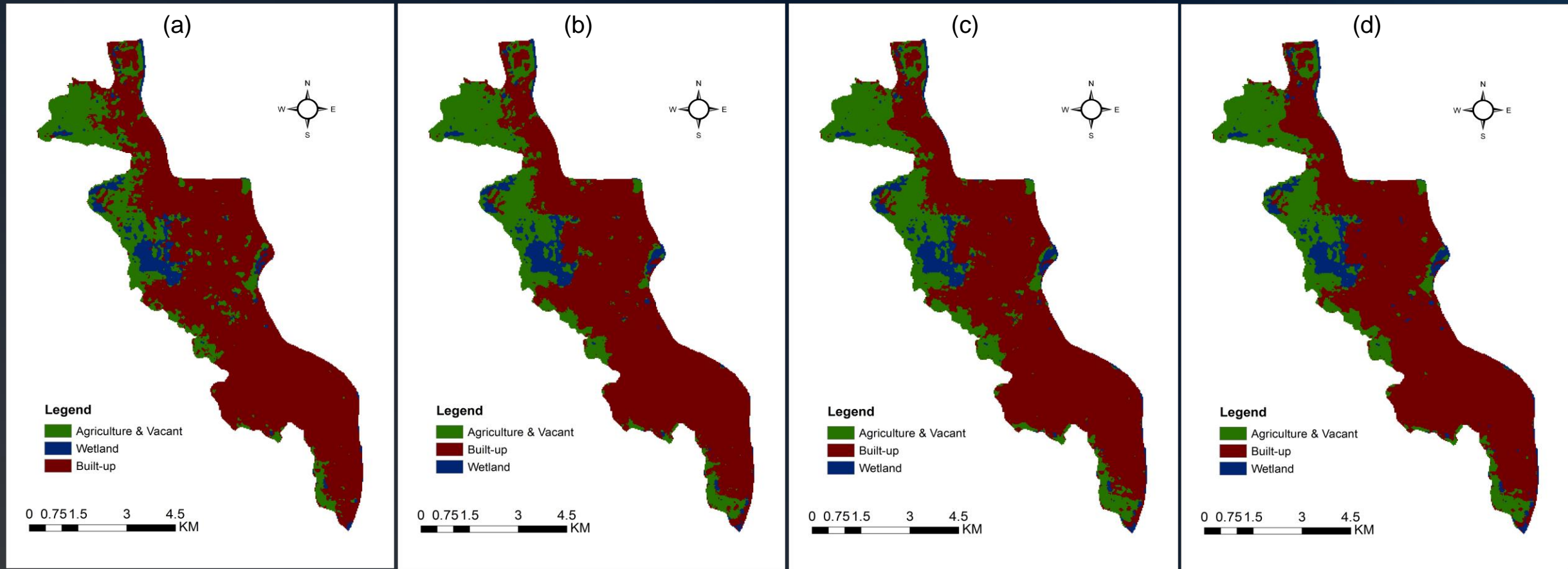


Evidence-based decision making

Some projects used hydrological modeling (e.g. Dhaka, Jessore-beanpole corridor) or geological data (e.g. Rajshahi) for land use planning-



The Gap



a) Actual LULC map of year-2018 b) Projected LULC map of year-2018 by XGBoost model (PCs=30) c) Projected LULC map of year-2018 by LR-CA model d) Projected LULC map of year-2018 by ANN-CA model



The Gap

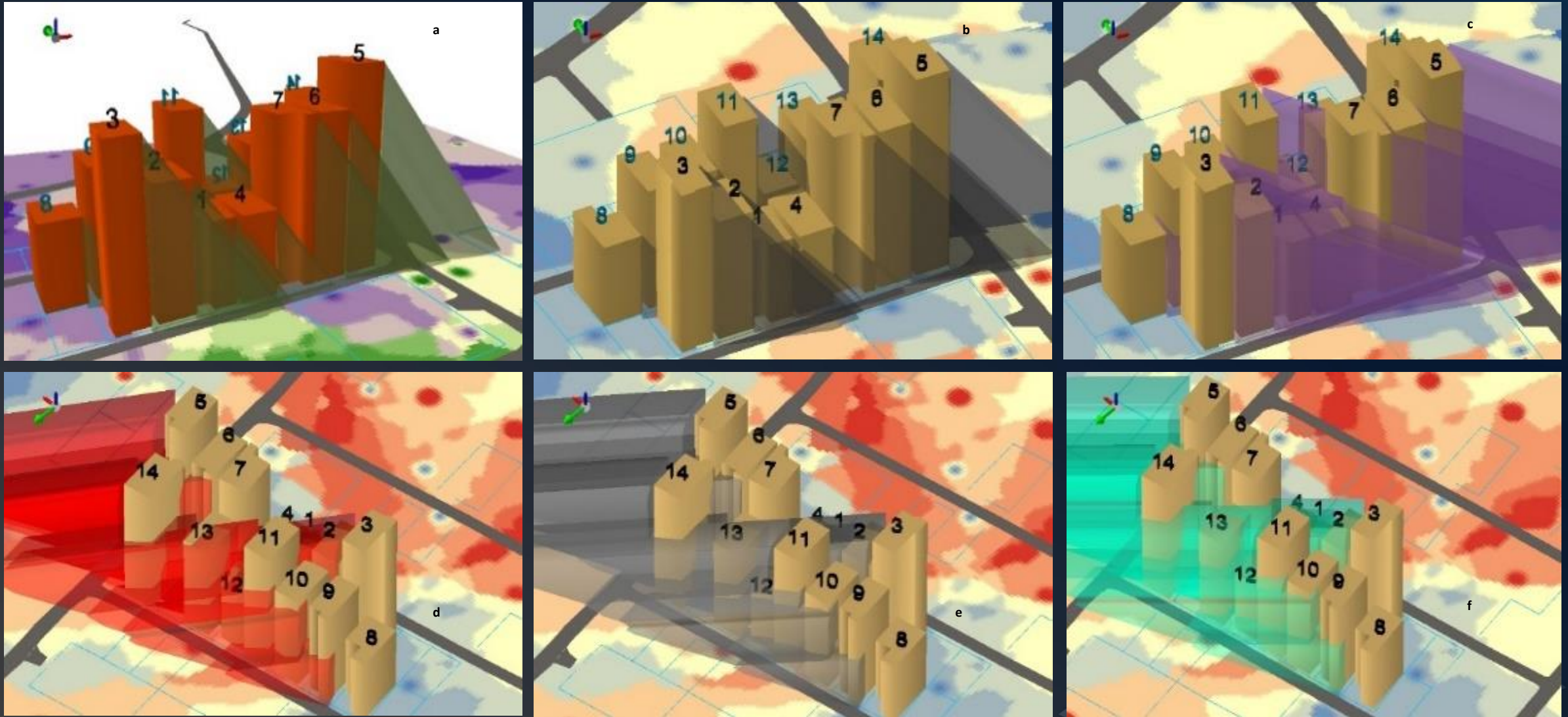


Figure 5: Increase in setback (15%) and shadow volume; summer (a-3.00pm, b-3.15pm, c-3.30pm) & winter (d-2.00pm, e-2.15pm, f-2.30pm)

The Gap

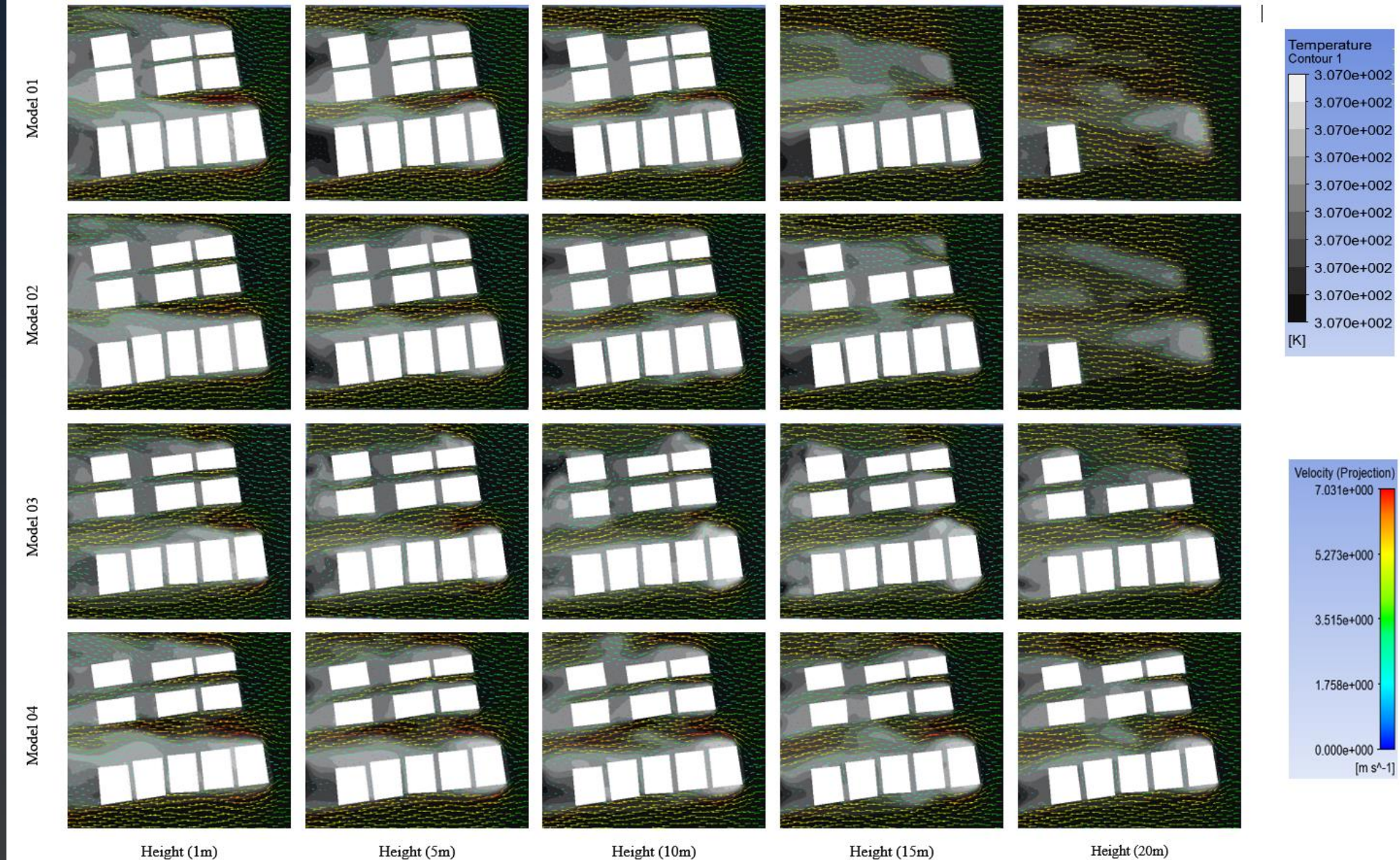


Figure 16: Velocity Vector & Temperature Contour Profile

THANK YOU

