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Site Level Flood Risk Assesment

UN-GGIM
UNITED NATIONS
COMMITTEE OF EXPERTS ON
GLOBAL GEOSPATIAL
INFORMATION MANAGEMENT

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Hrushikesh Sandhe is a Head-Infrastructures with more than 21 years of experience in water resources engineering. His experience includes flood and water supply planning, feasibility studies and Detail Design. He has extensive experience with complex water resources projects across the globe (India, United States, Saudi Arabia, Oman, and the United Kingdom).

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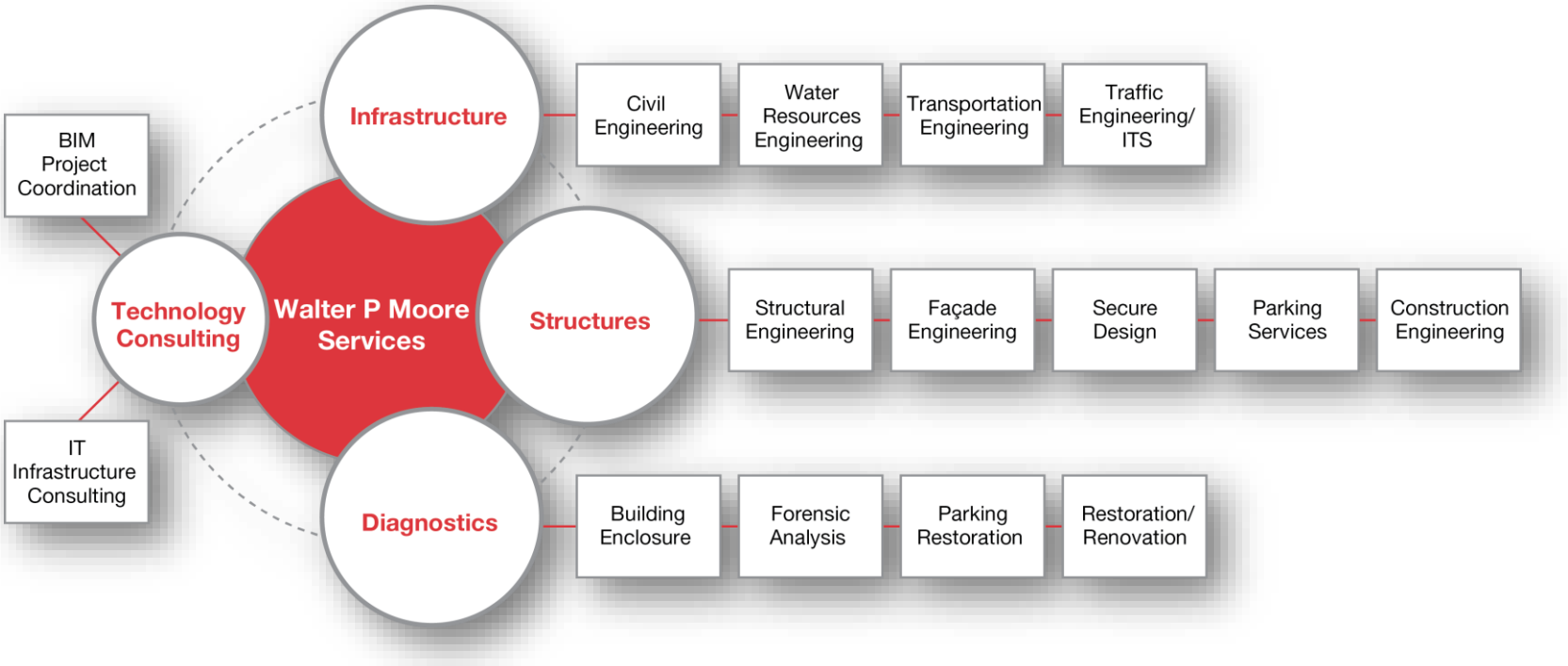
Practice Areas



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Agenda

- Flood Risk concept
- Lifecyle of flood risk process
- Application of Spatial data for risk assesment
- Challenges / summary

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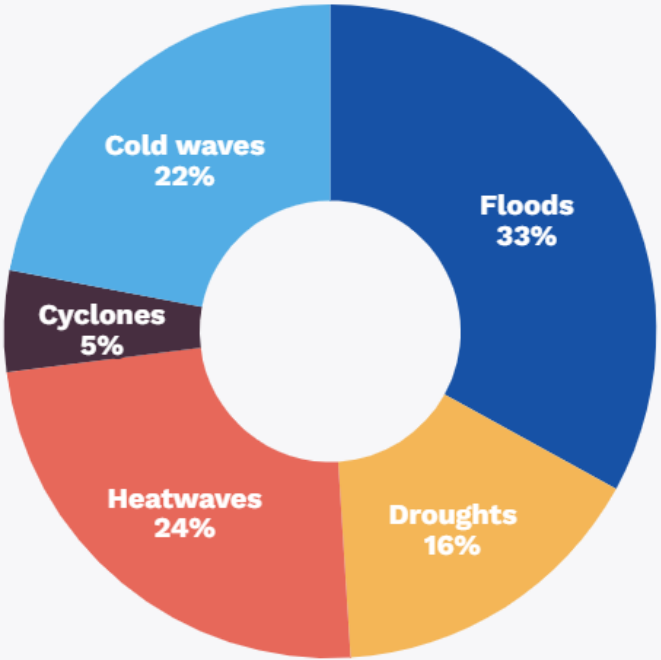
Flood - a large amount of water covering an area that is usually dry

A **flood risk assessment** (FRA) is

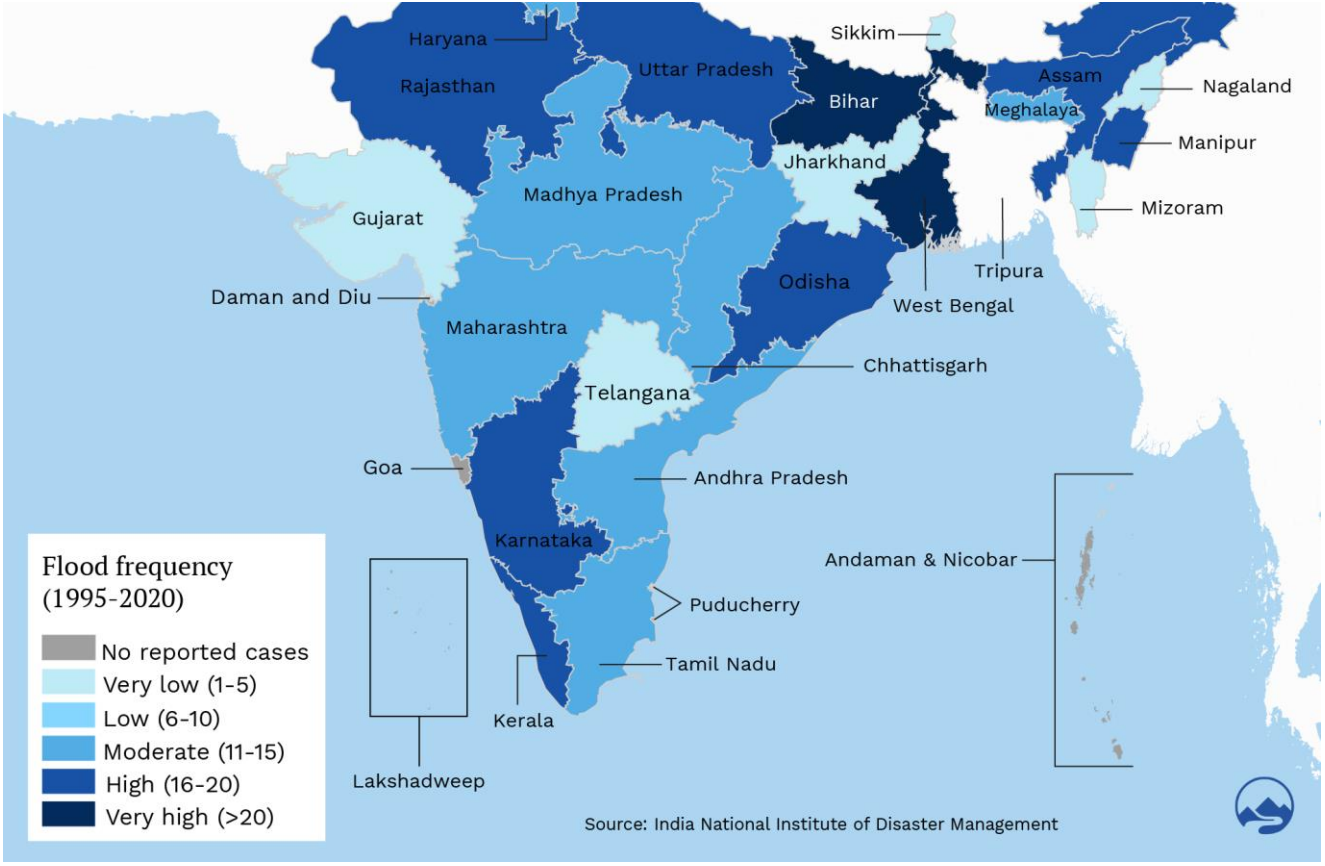
- an assessment of flood risk from all flooding mechanisms,
- the identification of flood mitigation measures and
- should provide recommendations on actions to be taken before and during a flood.

Floods are the most frequent disaster in India

1,058 climate-related events by disaster type (1995-2020)



Source: India National Institute of Disaster Management



2022 Year So Far

- Bangalore Flood
- Rainfall in Indore breaks 39 year record
- Rain submerges Kochi
- Heavy Rain in Pune

Source: News agencies

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River Flooding

Coastal Flooding

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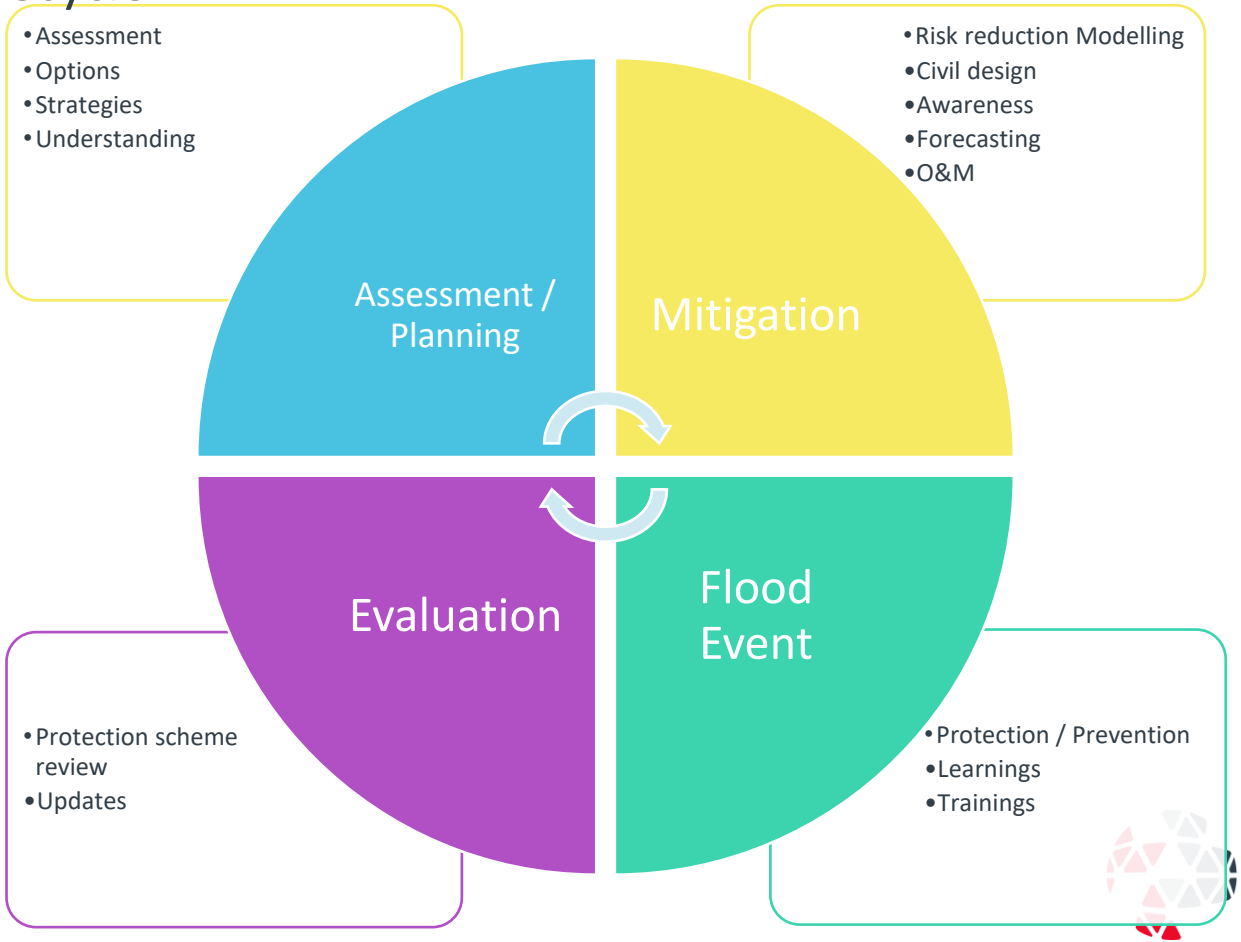
Internal Drainage Flooding

Flood Risk Lifecycle



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Data Checklist

Economics of Green Infrastructure

This matrix provides a list of data used to conduct two pilot projects in the Great Lakes assessing the costs and benefits of using green infrastructure to reduce flooding impacts. These data are the best available from national, state, and municipal data sources and models. They are suitable for watershed-scale studies. Work with your local GIS analyst to discuss the data available for your assessment.

Learn more about each assessment step in the "Guide for Assessing Green Infrastructure Costs and Benefits for Flood Reduction." *www.coast.noaa.gov/psds/gi-cost-benefit.pdf*

	ASSESSMENT STEPS					
	STEP 1: Define the Flooding Problem	**STEP 2:** Assess Flooding Scenarios without Green Infrastructure	**STEP 3:** Identify How a Flood Reduction Target Can Be Met with Green Infrastructure	**STEP 4:** Assess Flooding Scenarios with Green Infrastructure	**STEP 5:** Estimate Benefits and Costs	**STEP 6:** Identify and Communicate the Desired Green Infrastructure Strategy
Land Data						
Land Use, Current	✓	✓	✓	✓	●	●
Land Use, Future		✓	✓	✓	●	●
Land Cover, Current	●	✓	✓	✓	●	●
Land Cover, Historical	●		●			●
Digital Elevation Models (DEMs)	●	✓	●	✓		
Weather and Climate Data						
Precipitation, Current	●	✓		✓		●
Climate, Current	●	✓	●	✓		●
Precipitation, Future		✓		✓		●
Climate, Future		✓	●	✓		●
Hydrology Data						
Historic Flood Locations	✓		●		●	●
Watershed Delineations	✓	✓	●	✓		
Streams	✓	✓	●	✓		●
Stream Points		✓	●	✓		
FEMA Regulatory Maps	●	✓	●	✓	●	
FEMA Digital Flood Insurance Maps (DFIRM)	●	✓	●	✓	●	
FEMA Flood Insurance Studies (FIS)	●	✓	●	✓	●	
USGS Regression Equations		✓	●	✓		
Basin Storage %		✓	●	✓		
Basin Development Factor		✓		✓		
Main Channel Slope		✓	●	✓		
Rural Peak Discharge		✓		✓		
Inundation Grids		✓	●	✓		●
Flow Direction Grids	●	✓	●	✓		●
Flow Accumulation Grids	●	✓	●	✓		●
Social and Economic Data						
Social Vulnerability Index	●	●	●		●	●
Bureau of Labor Statistics Employment	●	●			●	●
Infrastructure Data						
Land Parcel / Assessor Database		✓	●	✓	●	
Stormwater Utilities	●	●	●	●	●	●
Building Structure	●	●	●	●	●	●
Green Infrastructure Sites, Current	●	●	✓	●	●	✓
Green Infrastructure Sites, Future		●		●	●	●
Impervious Surface %	●	✓	●	✓		●

✓ **Required: Data that get you through the process**

● **Optional: Data that help to improve the process**

www.coast.noaa.gov/digitalcoast/publications/gi-cost-benefit

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Citywide Flood Vulnerability

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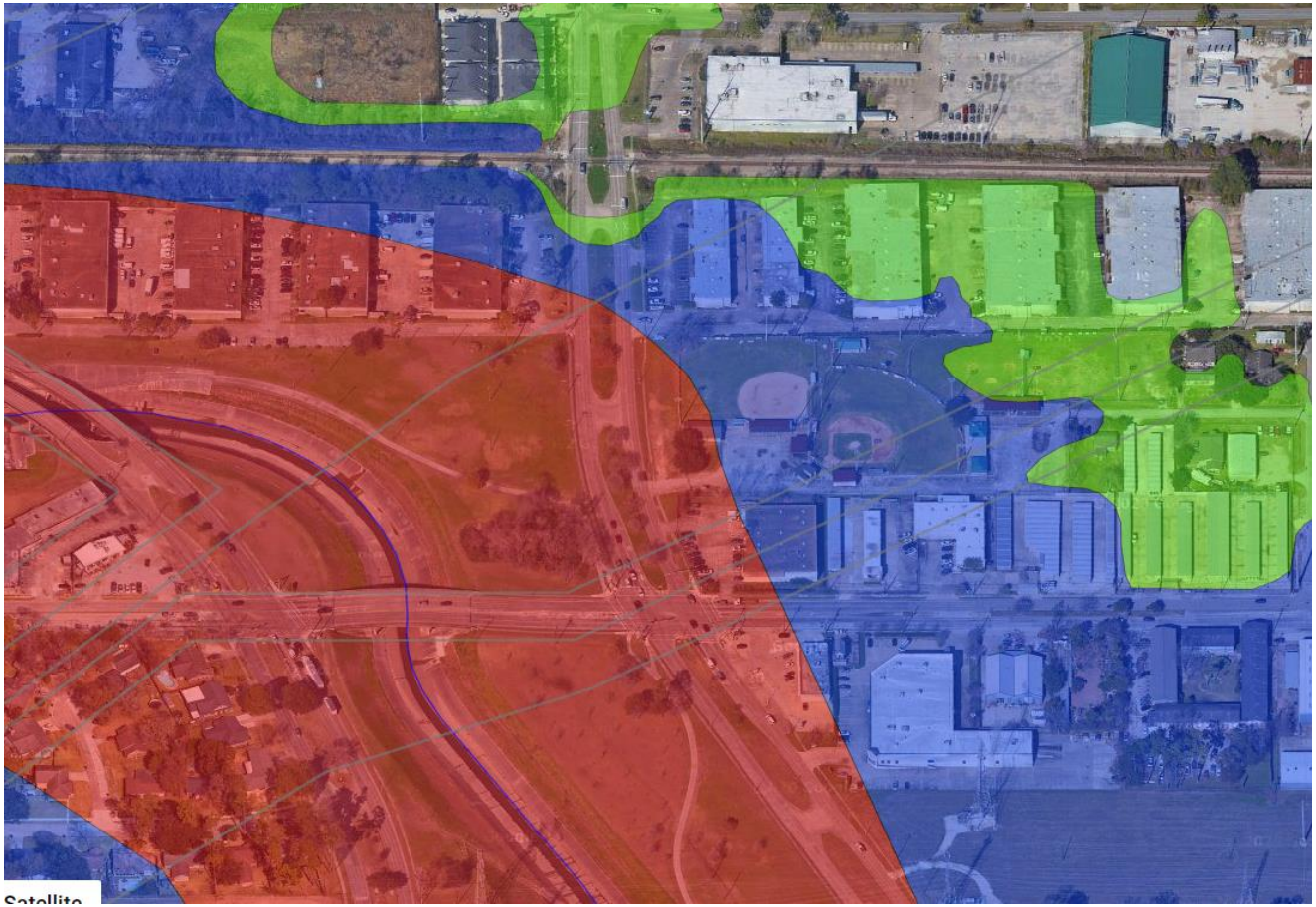
Site Specific Flood Vulnerability



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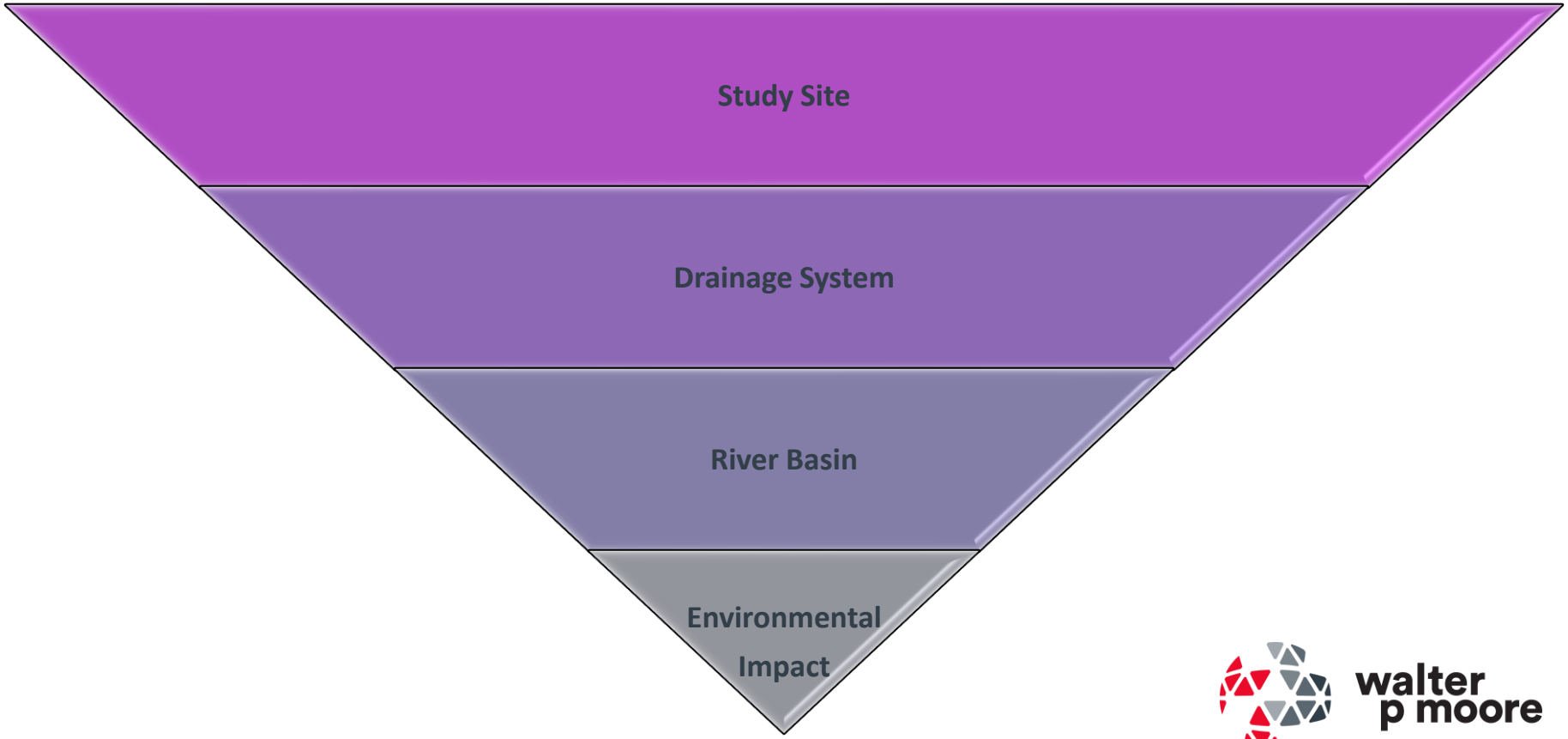
Site Level - Flood Risk Assessment Process (Geo-Spatial)



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Site Vicinity

Public Data Used

Data	Source	Analysis
Rainfall	IMD and NOAA	Intensity-Duration-Frequency
Topographic	BHUVAN - ISRO	Catchment delineation
Survey	Client	Site topographic
Satellite Imagery	Google Earth Pro	Site vicinity

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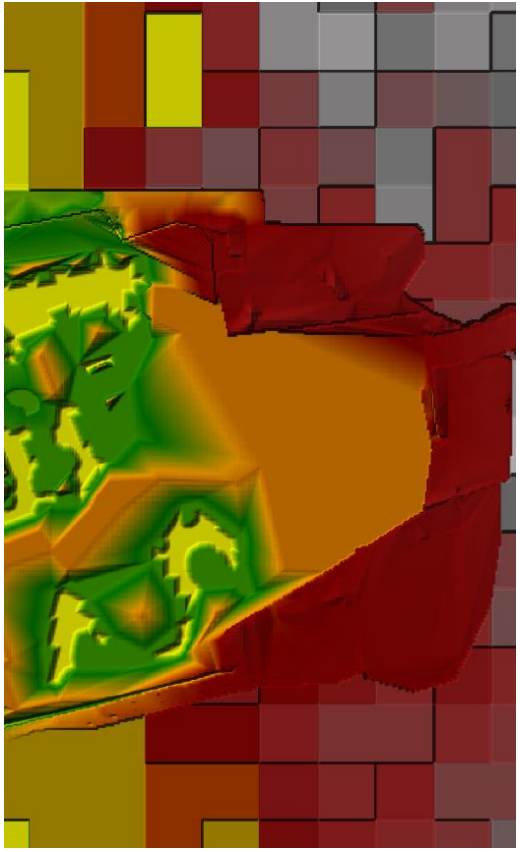
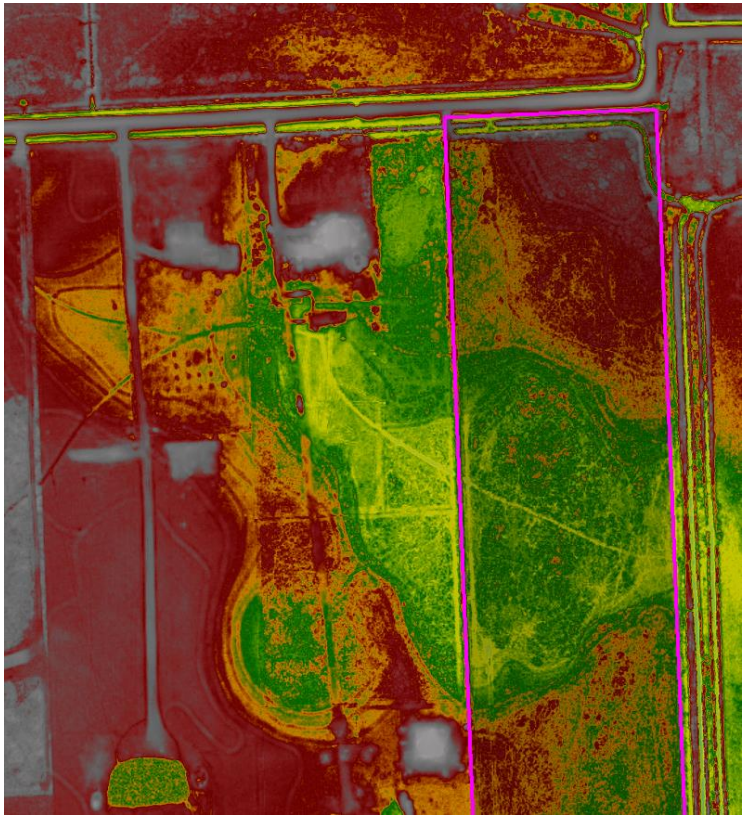
Topographic Data





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Field Data Collection

- Collector for ArcGIS
  - iOS or Android
- WebMaps from ArcGIS Online
- Explorer for ArcGIS
  - iOS or Android

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Field Data Collection

Field Photos: WFT001 Main Channel

Picture	Comments
Photo83.jpg	WFT001 - MAIN CHANNEL - Location 022. Looking upstream. Not much of a channel. Timber wall on left bank.

Picture	Comments
Photo84.jpg	WFT001 - MAIN CHANNEL - Location 022. Looking downstream.

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Existing Condition of Project Site

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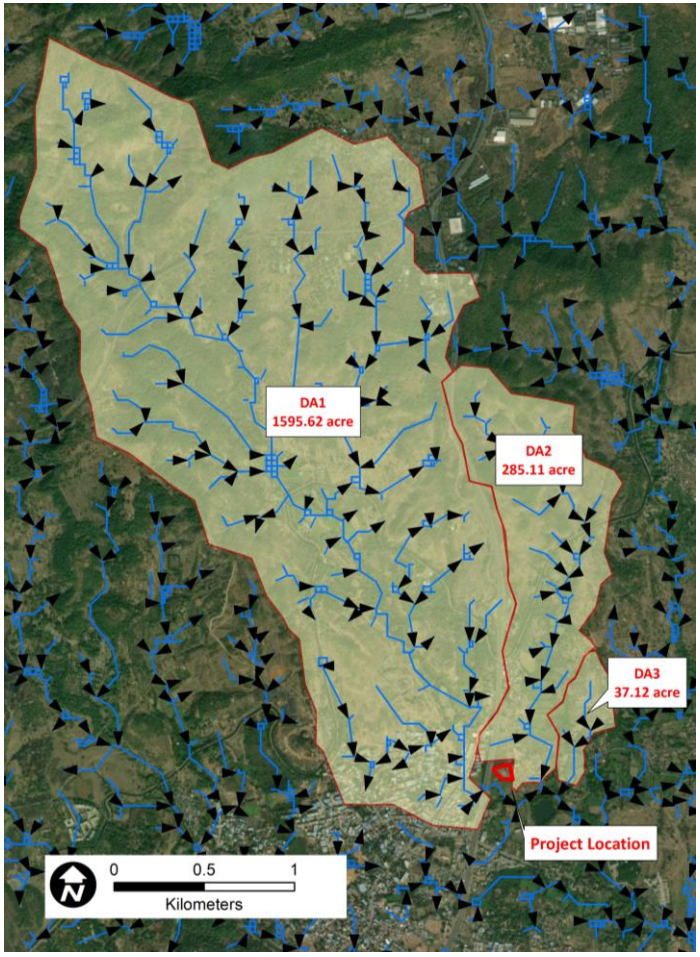
Drainage Area



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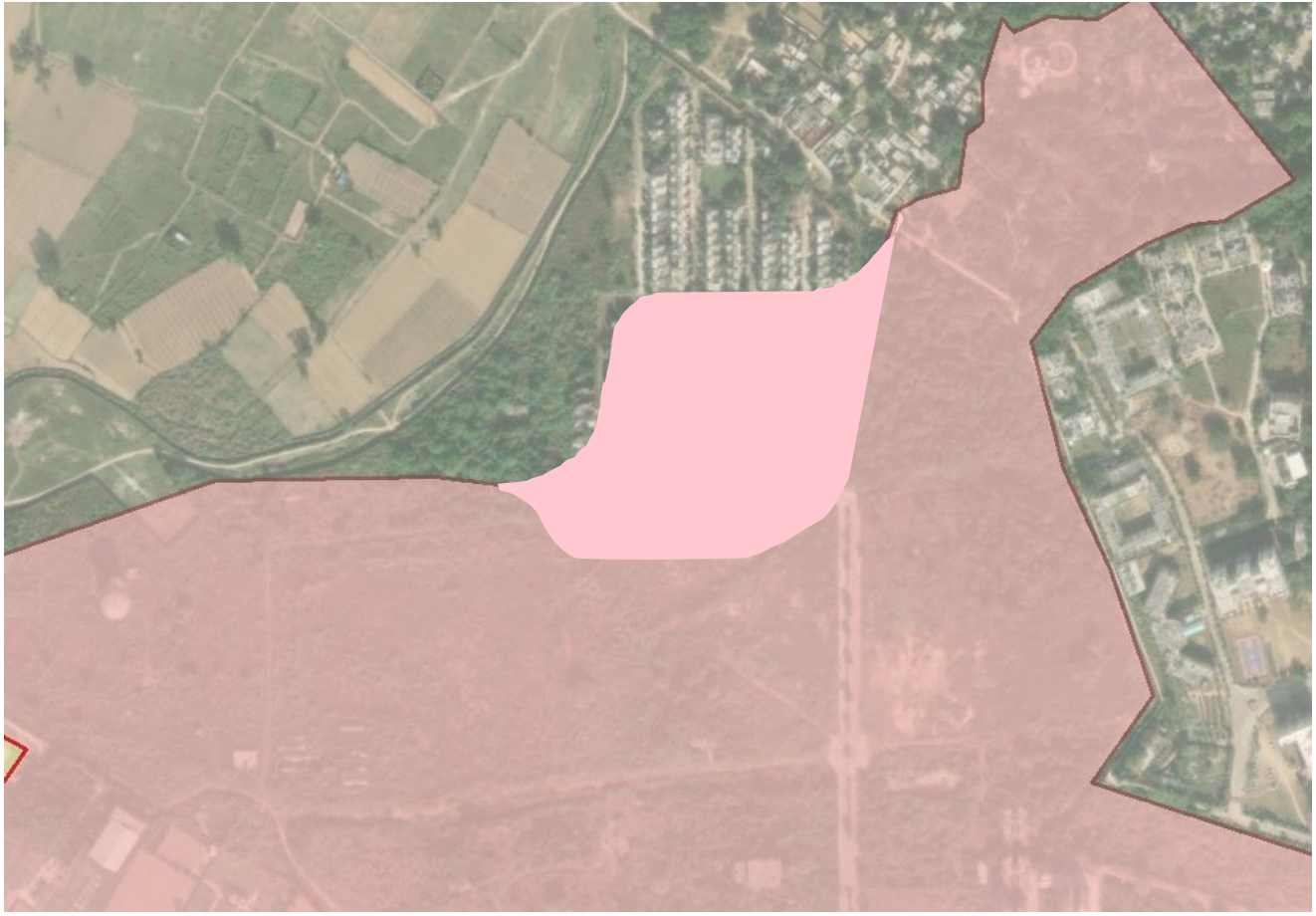

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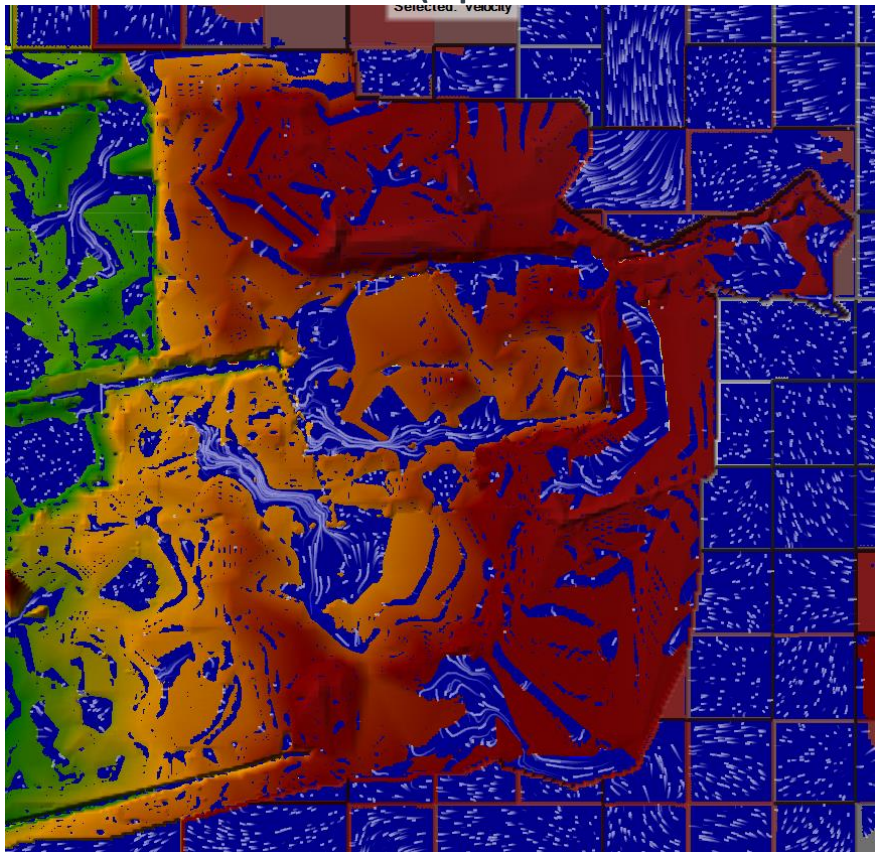
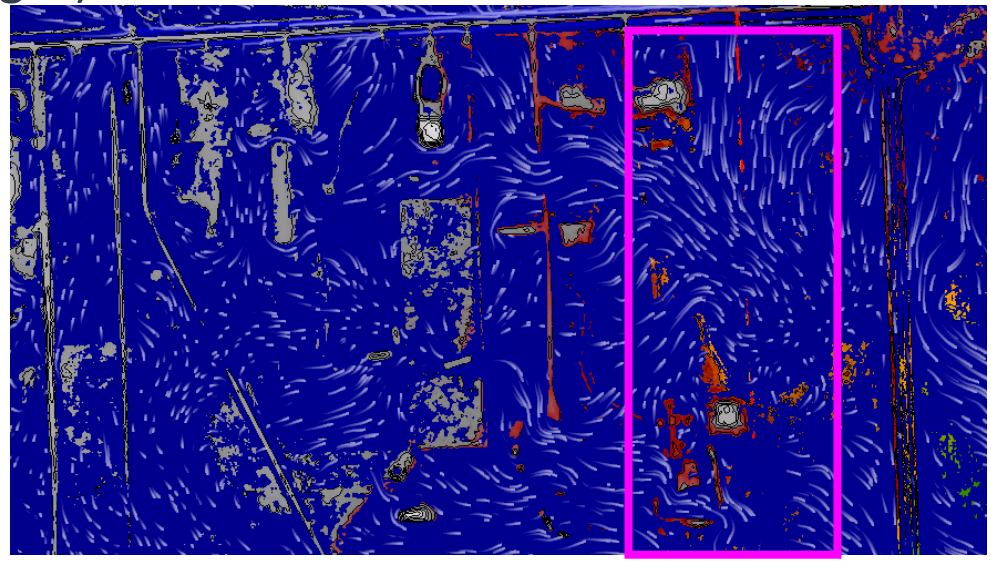
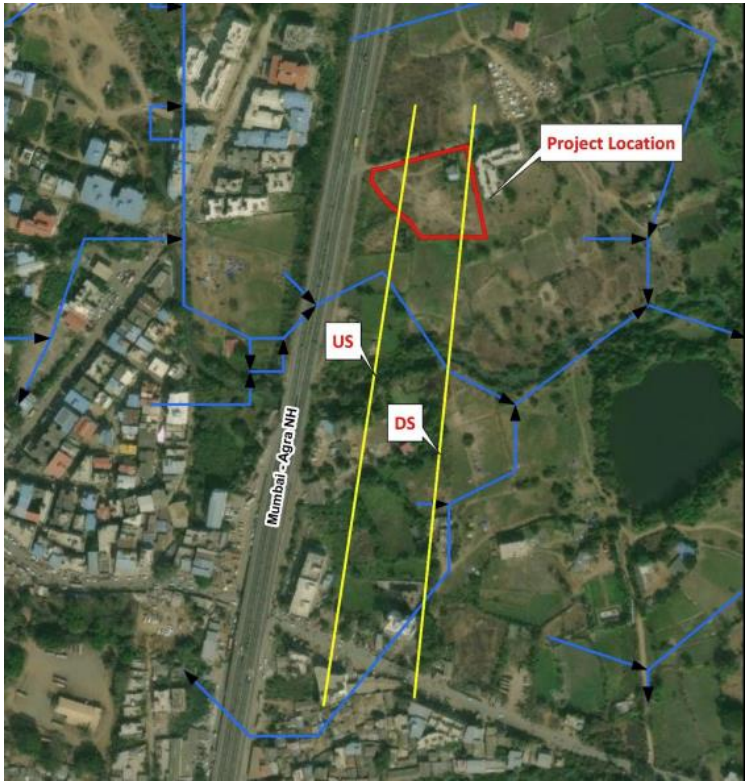
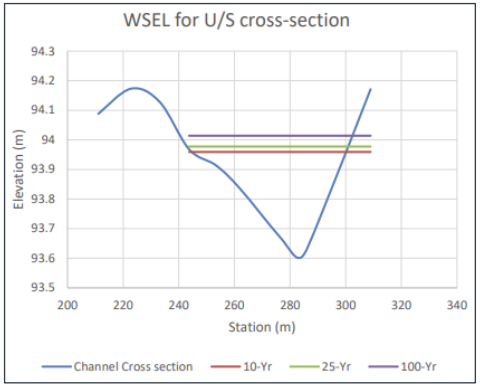
Site Flow Path (Spatial Data Challenges)

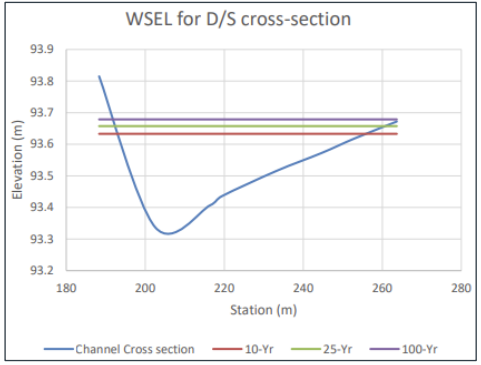




Offsite Drain Analysis in GIS







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Goal

Velocities

Culvert/ nalla crossing back water

Site Entrance

Road Elevation

Compound wall / flood defence height

Critical Infrastructure

Any inundation zones

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Challenges/ Summary

- Participation of Flood risk process from beginning
- Local Spatial data Availability (topography, rainfall, flooding, inundation issues etc)
- Local drainage information in Spatial format
- Offsite topographic data and Survey are different

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Opportunities

- Better late than never
- Data Gaps and accessibility to data
- Opportunity for Spatial Data Integration
- Understanding and awareness of flood risk to the site
- Environmental impact due to mitigation
- Offsite impact due to mitigation (Holistic Approach)

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Technology Platforms

esri ArcGIS

QGIS

AUTODESK® BIM 360® DESIGN

US Army Corps of Engineers®

XPSWMM

XPStorm

Bentley® Advancing Infrastructure

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Thank You

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