Stormwater Quality Assessment through different sources in a sub-tropical town of India

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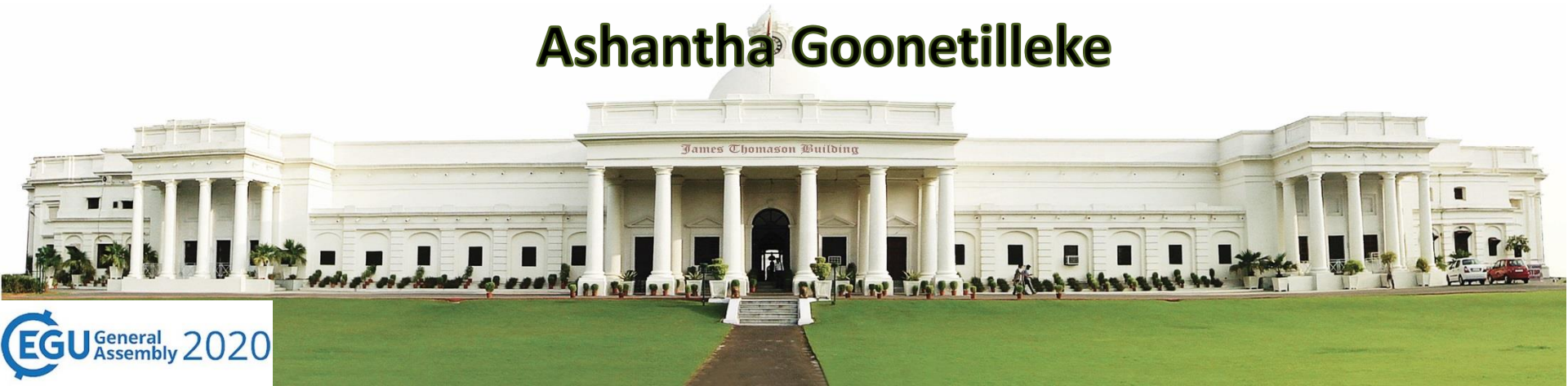
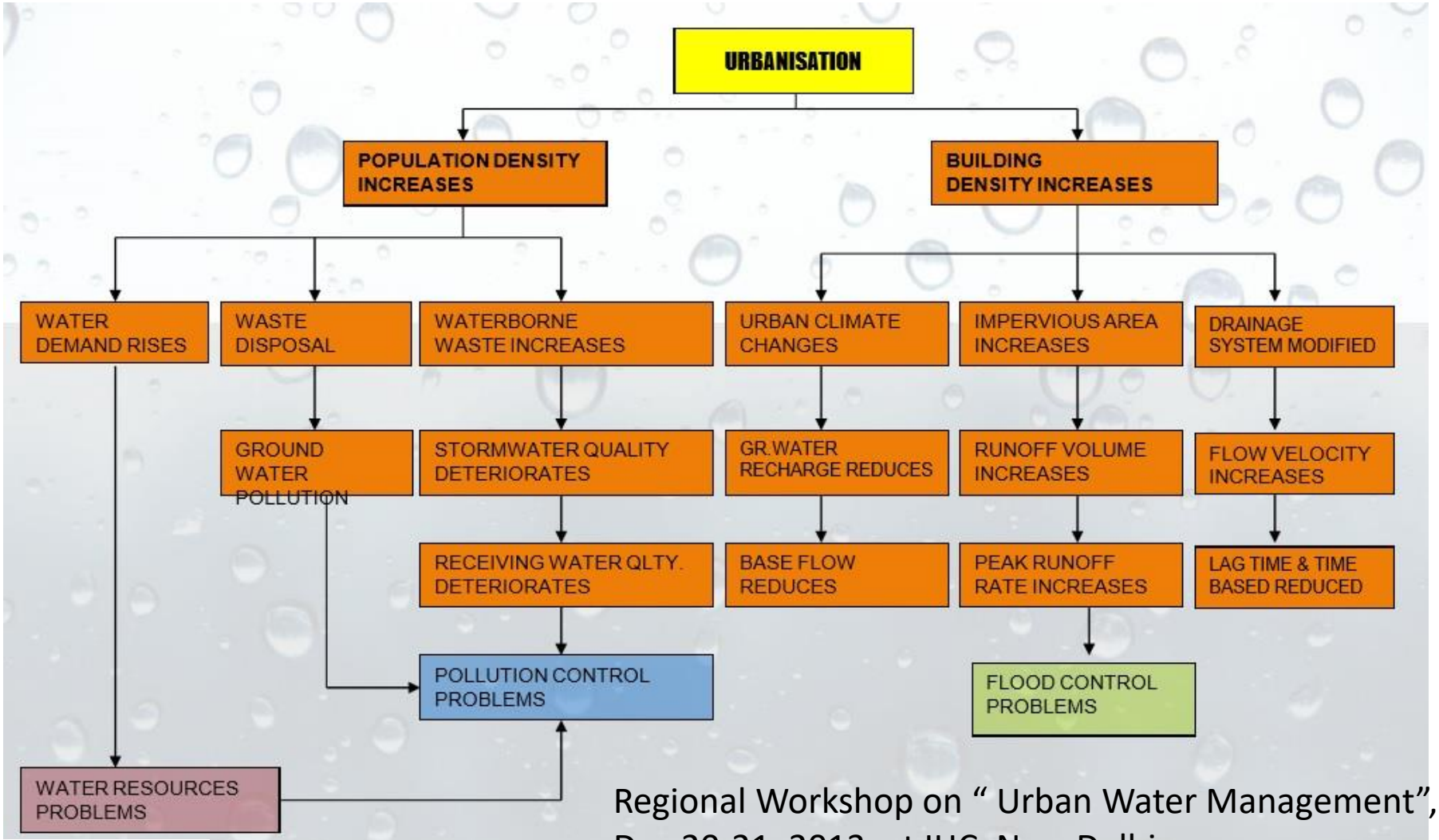


EGU General Assembly 2020

Urban Growth and Stormwater:



Regional Workshop on " Urban Water Management", Dec 20-21, 2013, at IHC, New Delhi

Indian Cities Considered: classification

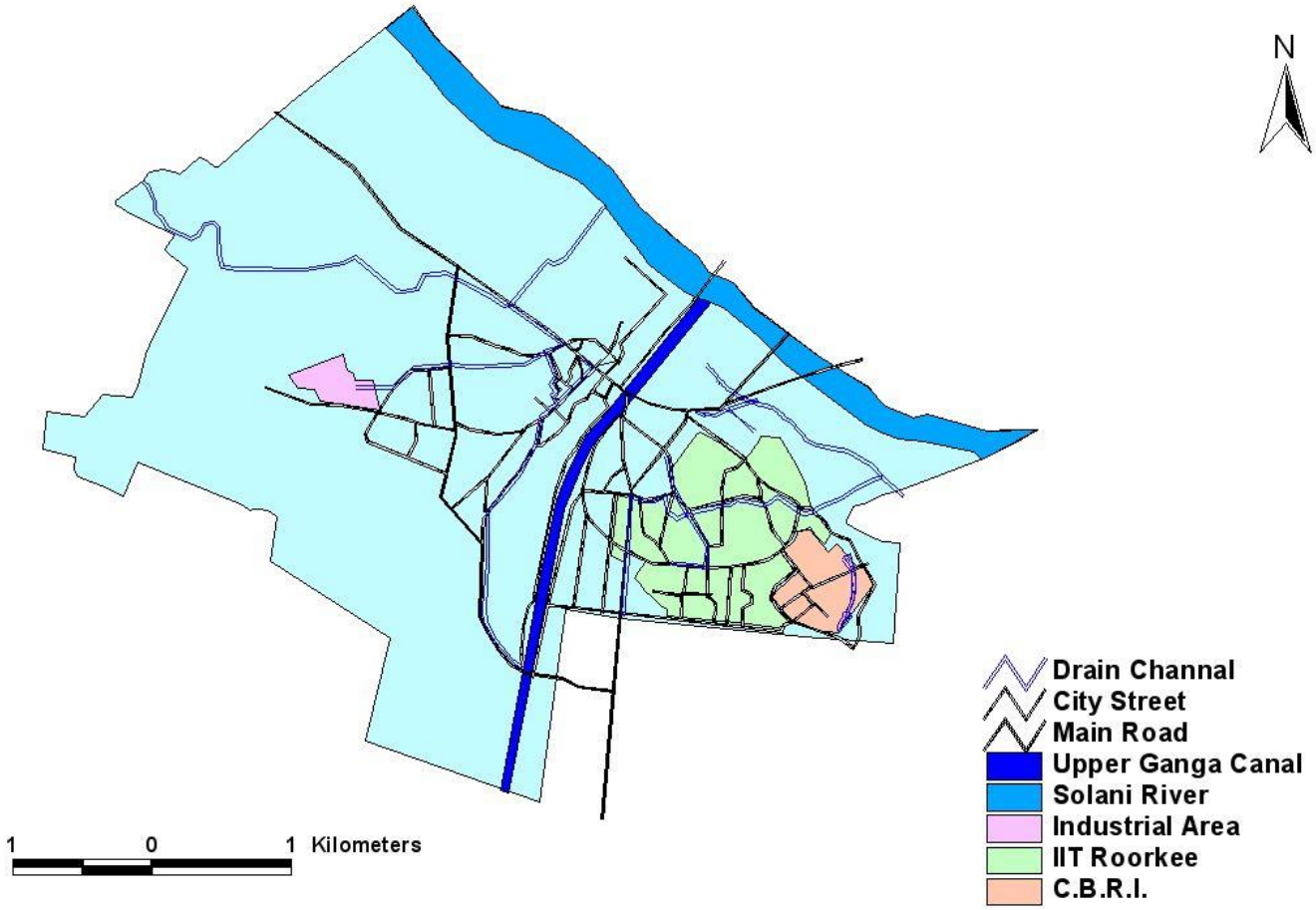
An urban centre with less than one lakh population is called a town while that with more than one lakh is called a city. Cities having population varying from one to five million are called metropolitan cities while those with more than five million are known as mega cities.

Sr. No.	City	Population as per 2011 Census	Classifications
1.	Roorkee	2.38 Lakhs	Class-I (City)
2.	Delhi	1.9 Crores	Class-I (Mega Cities)
3.	Chennai	70.9 Lakhs	Class-I (Mega Cities)
4.	Mumbai	1.84 Crores	Class-I (Mega Cities)
5.	Chandigarh	10.6 Lakhs	Class-I (Mega Cities)
6.	Varanasi	12 Lakhs	Class-I (Mega Cities)

Study/pilot area: Roorkee Town (India)

- Medium size town comprising of Roorkee municipal board and Roorkee cantonment board.
- 29° 51" N latitude, 77° 63" E longitude located on right bank of Solani River.
- Elevation 274 meters above the msl.
- Population of 24535 (Census 1951), 2.38 Lakh (Census 2011).
- Coldest months December- January, Warmest months May-June
- Major precipitation during 15th Jun to 15th September.
- Annual average rainfall is near 110 cm.

Base map of Study Area:



Objective:

ENVIRONMENTAL ASSESMENT OF STORMWATER IN A PILOT URBAN AREA AND MANAGEMENT OF STORMWATER QUALITY

Methodology:

Stormwater runoff collection procedure

Description of study drains

S No.	Name of drain(s)	Total drainage area (Km^2)	Description of land use type
1	C.B.R.I.	0.323	Purely residential type
2	Adarsh Nagar	0.345	Residential type along with highway
3	IIT Roorkee	2.325	Mixed with high percentage of residential type
4	Industrial area	0.134	Purely industrial type
5	B.T.Ganj	4.362	Mixed residential and Commercial type with high percentage of paved surface
6	Ramnagar	2.516	Mixed residential and commercial type

Characteristics of Urban stormwater runoff

- For monitoring and analysis study area divided after survey.

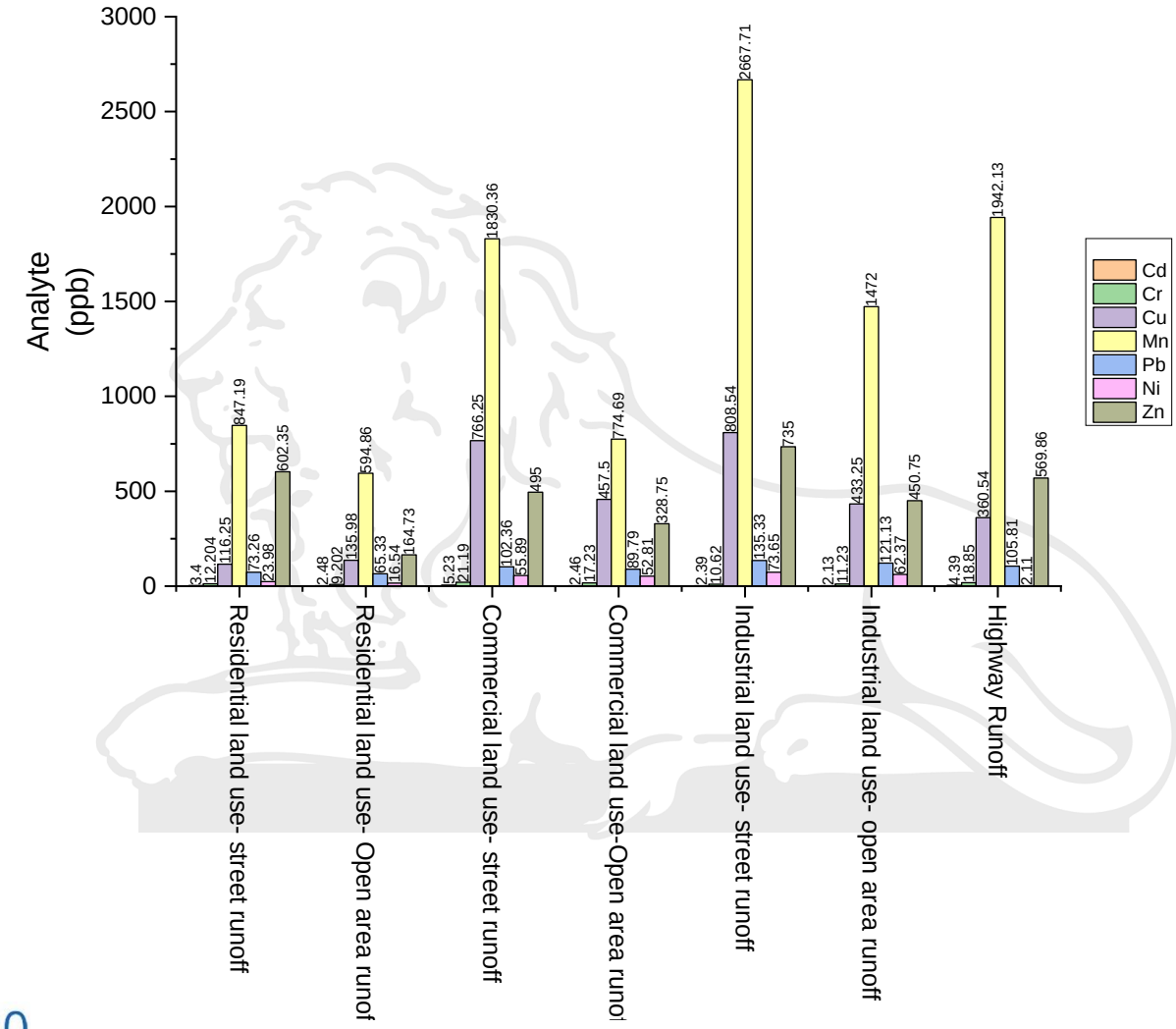
LAND USE TYPES	SOURCE AREAS
Residential area	Road
	Open area
Commercial area	Road
	Open area
Industrial area	Road
	Open area
Highway & Transportation Activities	Highway
	Bus stand
	Petrol pump station

- 18 stormwater runoff samples were collected on a 15 min. interval during storm event. (2016-2019)

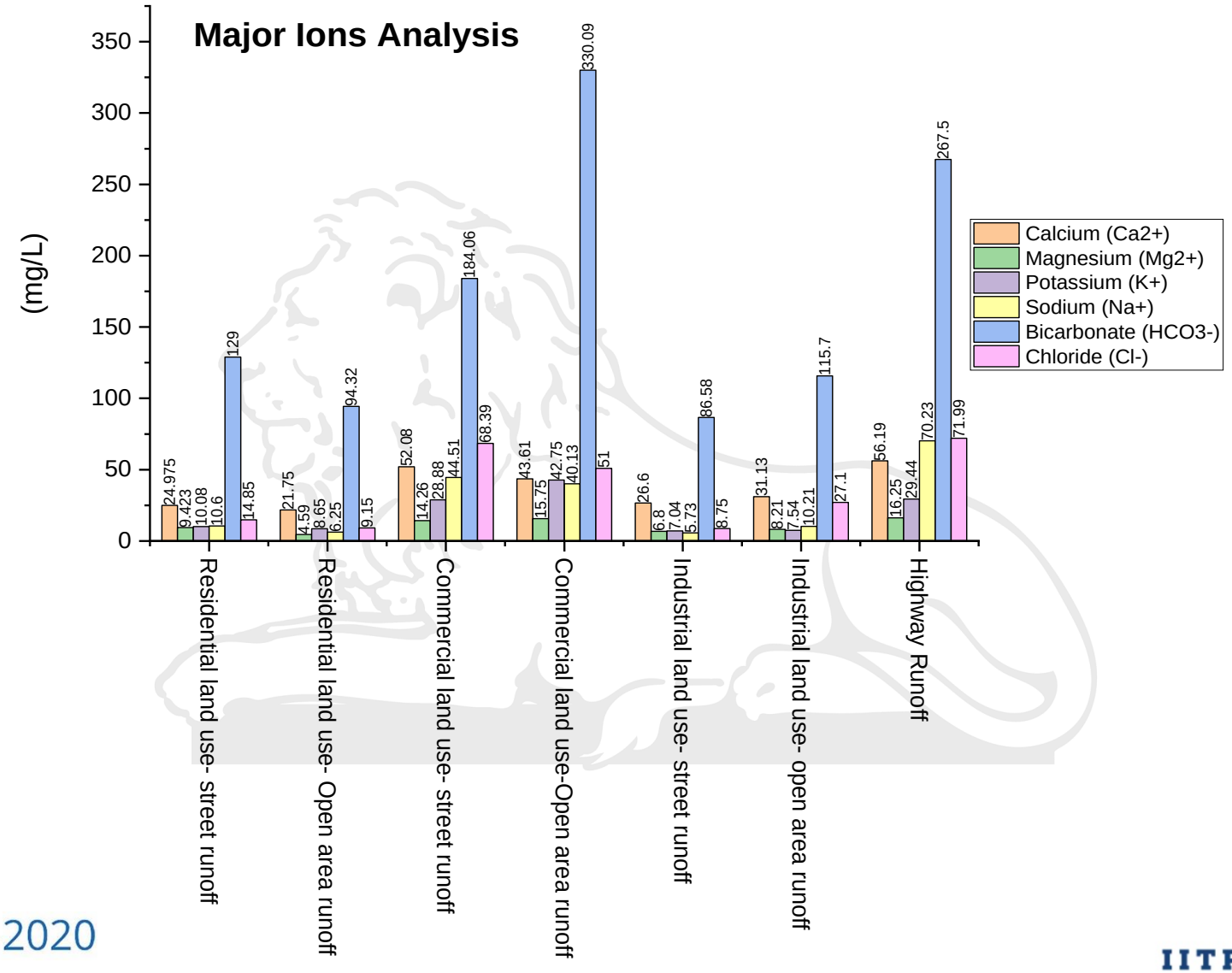
- Physicochemical analysis of rain water and runoff samples for EC, pH, major ions, Nutrients, Organics, TOC, and

Sr. no.	Date	Event timing
1	26/07/2016	3.20 PM-4.10 PM
2	13/08/2016	4 PM- 5.30 PM
3	29/08/2017	5.15 PM- 6.30 PM
4	31/08/2017	9.00 AM-10.30 AM
5	3/09/2018	8.00 AM-11.30 Am
6	7/09/2018	4.15 PM – 5 PM
7	12/09/2019	9.30 AM- 10 AM

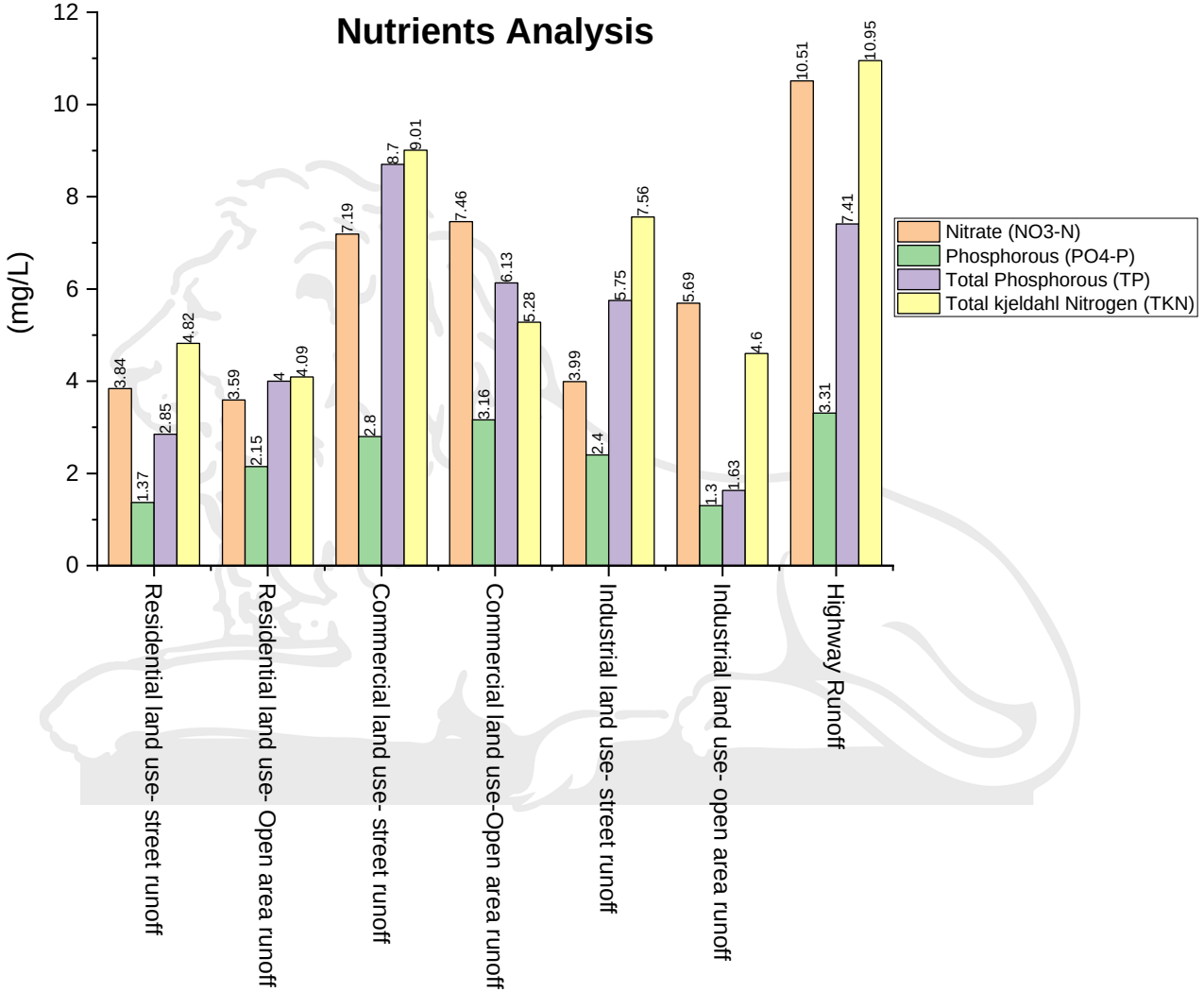
Heavy Metal analysis:



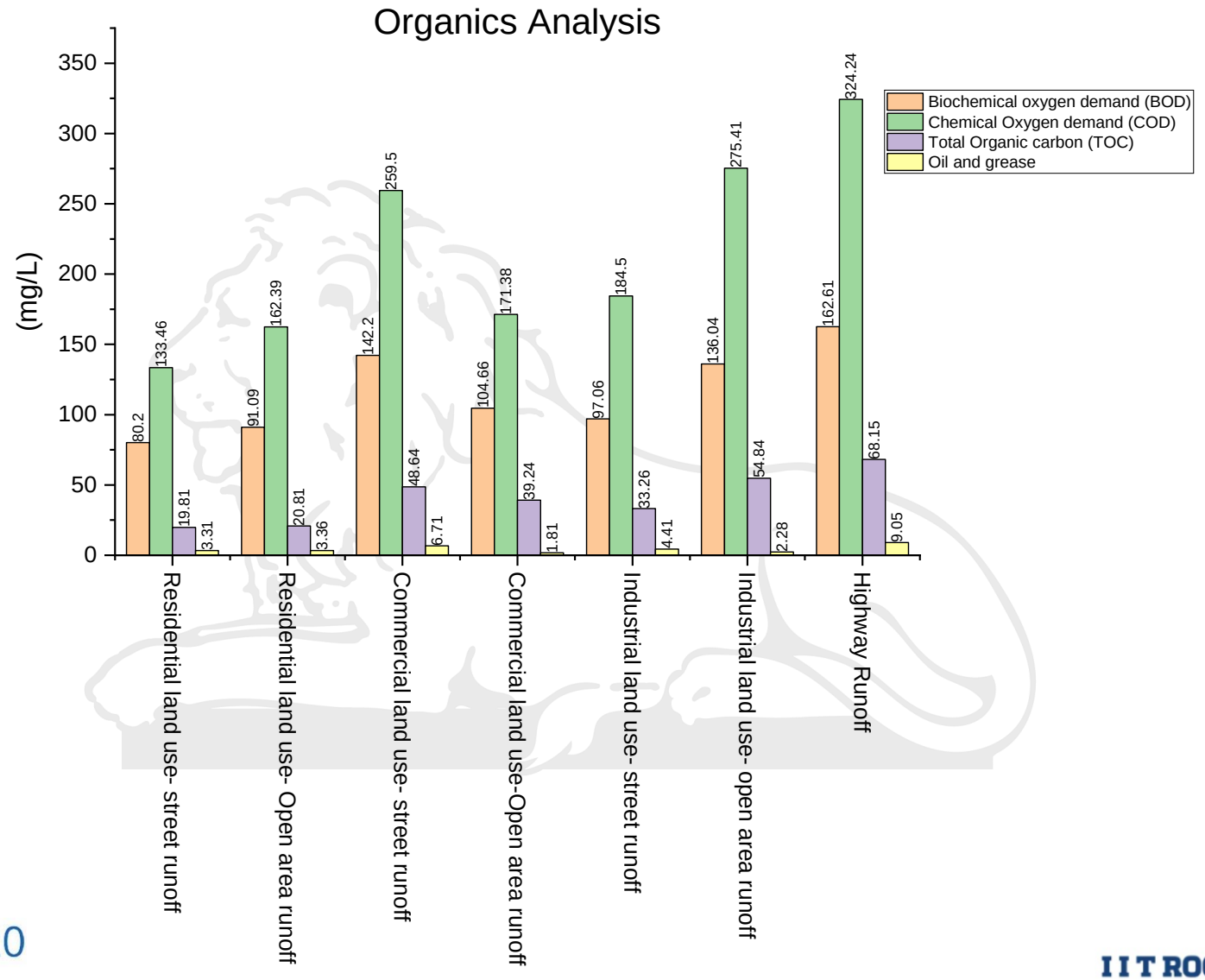
Major Ions analysis:



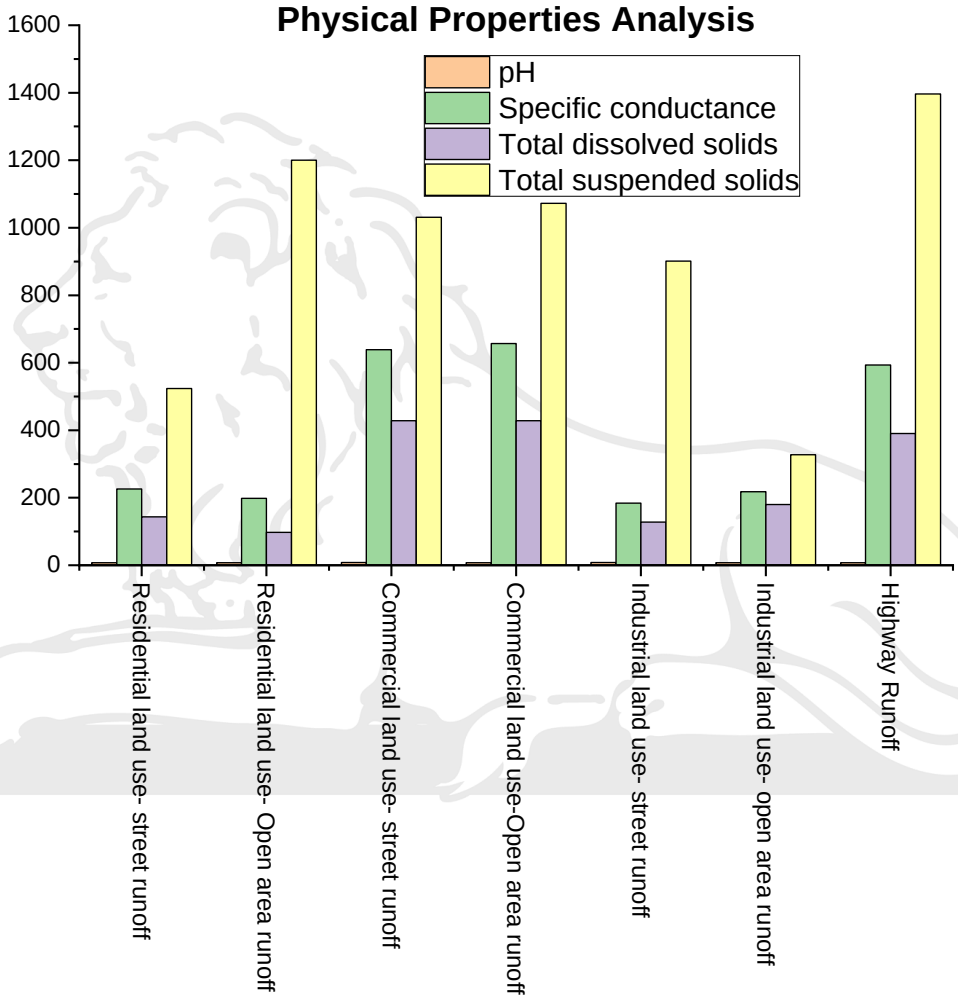
Nutrient analysis:



Organics Analysis:

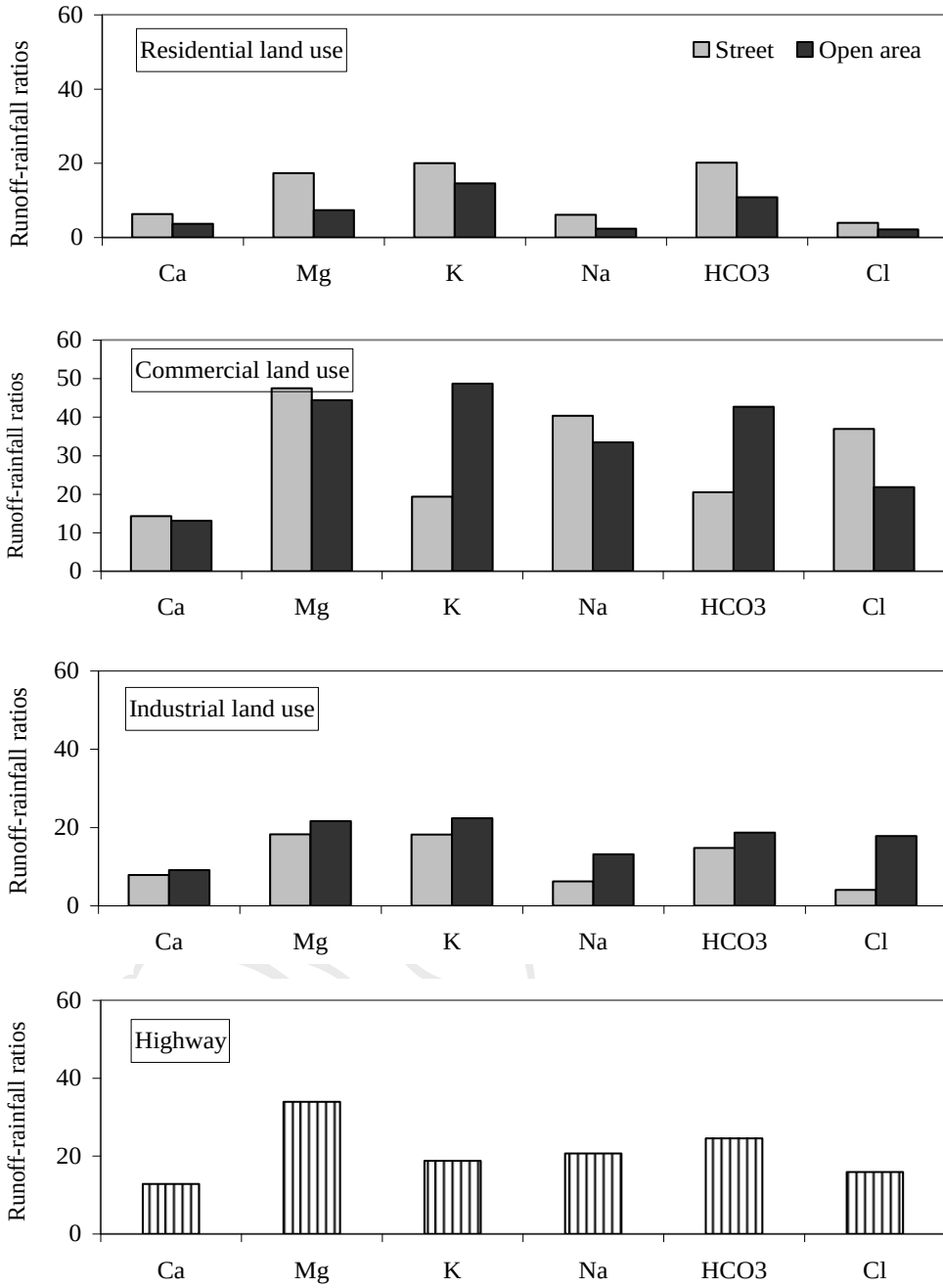


Physical Properties analysis:



Runoff-rainfall ratios

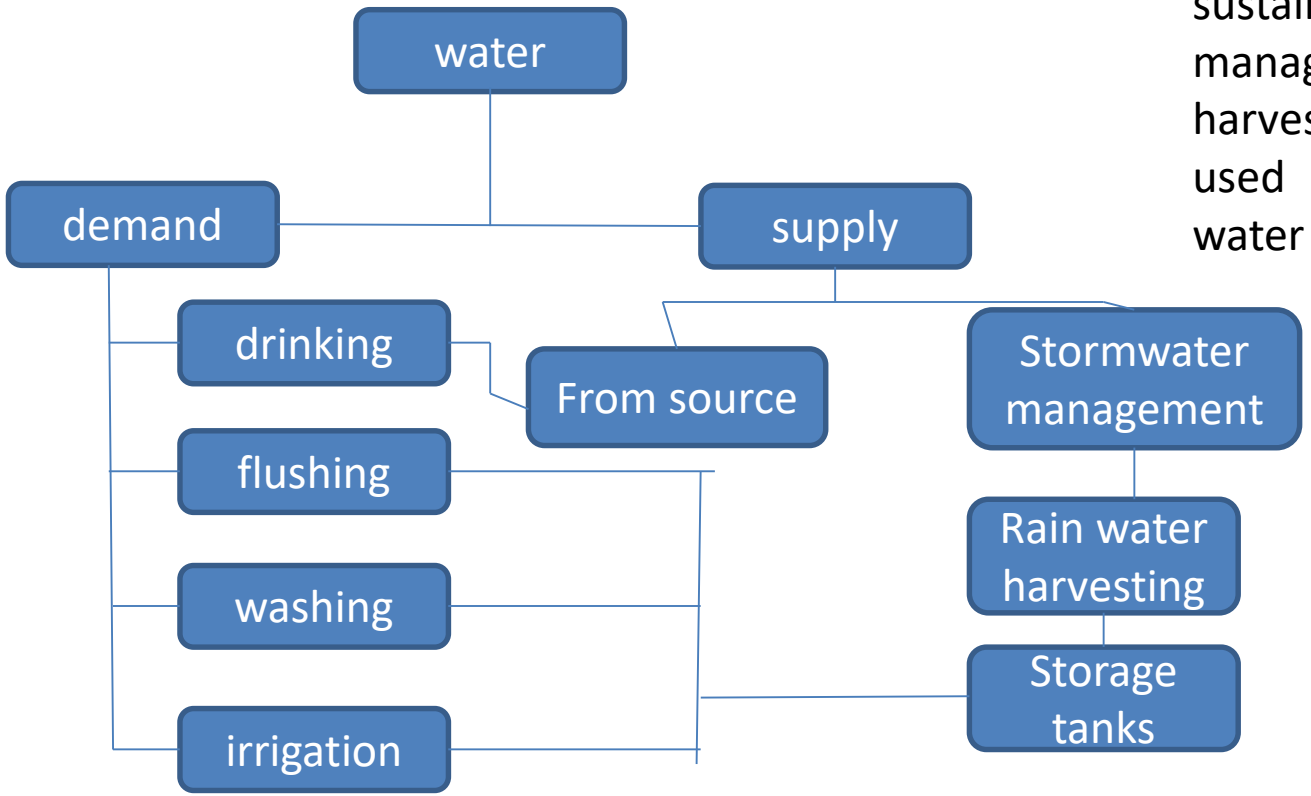
- The Runoff-Rainfall quality ratios indicates high input of terrestrial surface on the quality of surface runoff.
- A buildup of solids, dissolved ions, organics and heavy metal is clearly visible, while nutrient buildup is less.



Runoff Quality: major findings

- pH values varied from 7.35 to 8.20, indicating a neutral to sub-alkaline nature.
- Higher pH values observed in industrial streets.
- Higher TDS and TSS value observed in commercial streets.
- High TSS possibly caused by wash off accumulated solids from dry depositions and losses soil.
- Commercial streets and open areas to be the largest contributors of major ions.
- Nutrient concentration in runoff emanating from all types of land use observed to be high enough to support a high algal growth in the receiving surface waters.
- Street runoff displayed higher value of BOD, COD ,TOC and oil and grease than open area runoff
- Industrial and commercial street and open area runoff contains significant concentration of Cu, Mn, and Zn, while highways the main contributor of Cr and Pb.
- The values of runoff coefficient varied between 0.05 and 0.62 by hydrological analysis .

Sustainable stormwater management



With the help of sustainable stormwater management the harvested water can be used for non-potable water uses.

Suggestion if any?

Thank you