28/06/2021
Monday

1. Introduction

→ Urban Hydrology deals mainly how the urban development effects the hydrological cycle.

Ex: on Newspaper some incidents, (Chennai, Mumbai) causes stagnation
Rainy season our campus

→ Main reason we are obstructing the natural drains where their is no development {Note: virgin lands (not used lands like forest)}

→ hydrologic cycle
→ " components } imp concepts.
→ water - budget

→ outcome - Basic principle & concepts of UH of UH

Hydrology
↓ (+)
Drainage system

→ (storm water collect & reuse)

→ urban/rural water damages roads also.

→ If a pond is their in some place, few days later some one occupied the place of pond, then rain water (storm water) will goes on road. it effects roads & etc.

→ above is one of the engineers & poucal problem also.

- Return period {Ex: 2 years (i.e, the amount of rain water may equal or exceed once in a 2 years}
- DM-

* urban water budget :-

→ A water budget describes the stores (or) volumes of water in the surface (on ground), subsurface (as a ground water) and atmospheric (moisture) compartments of the environment over a chosen increment of time.

→ The water cycle has to do with characterizing the flow paths and flow rates of water from one store to another.

→ understanding how urbanitation affects the water budget and water cycle first requires an appreciation of how conditions work in a natural system.

→ A water budget or water mass balance can be calculated for any time increment for a chosen control volume, where

Inflows - Outflows = Δ storage.

→ For natural systems, a control volume is often defined laterally by watershed boundaries {~~top~~ topographic highs} and vertically from the top of vegetation to the bottom extent of water-bearing subsurface sediments or fractured rock.

Natural boundaries

political boundaries → district, mandal, etc.

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→ The urban water cycle :-

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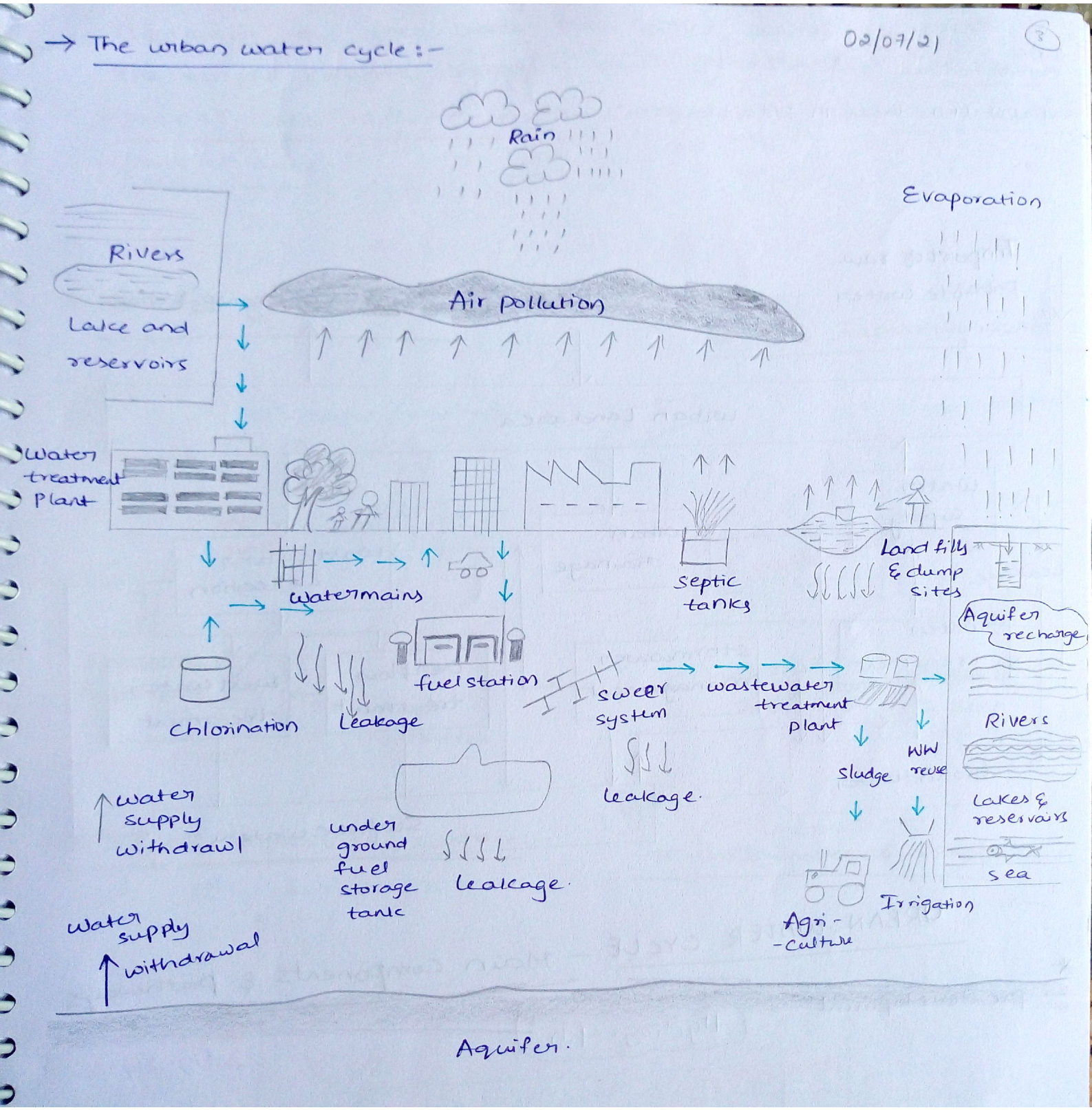
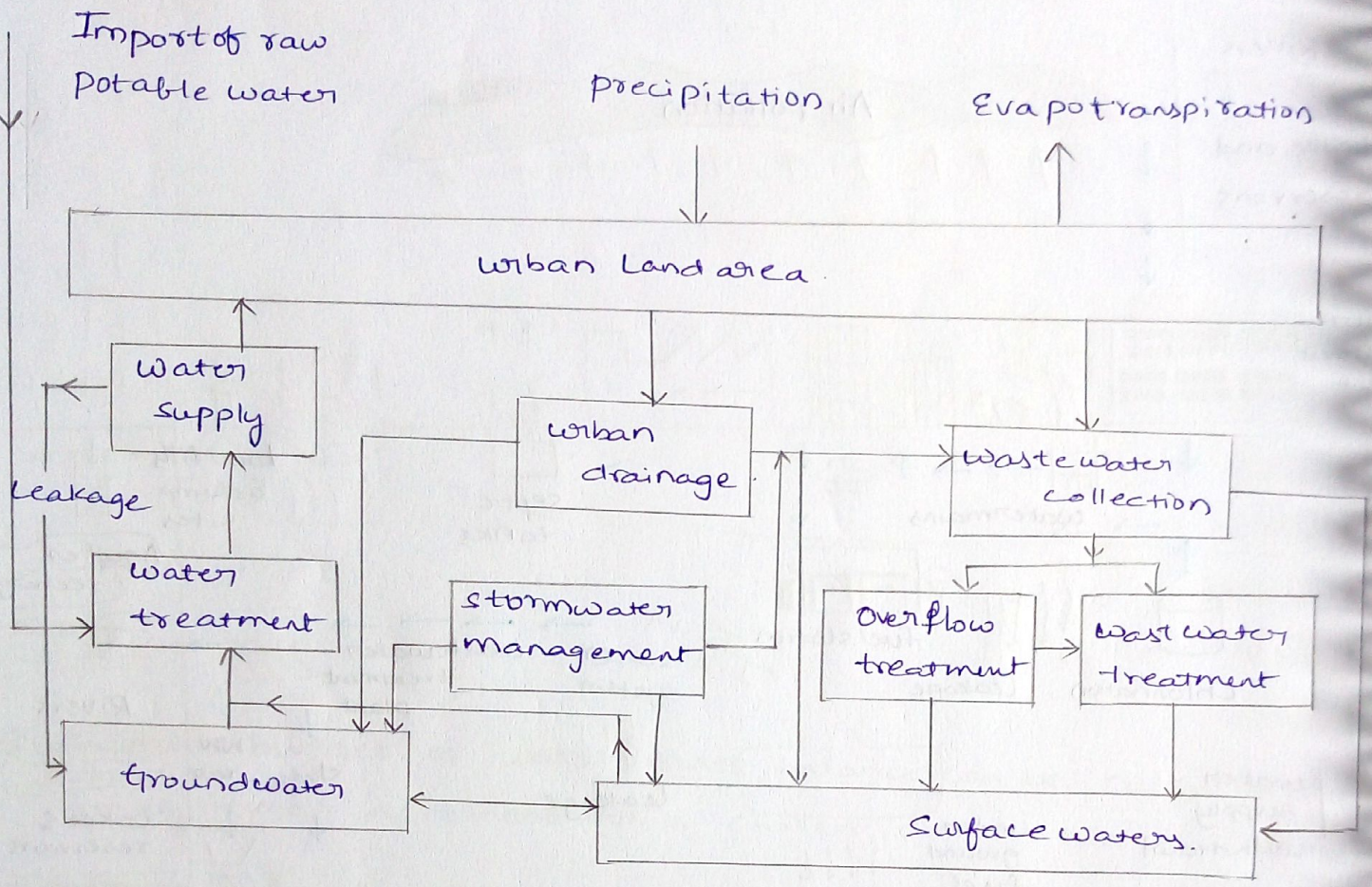


Residence time: Moisture from atmosphere, taken time to stay in atmosphere

→ Population table in ppt.

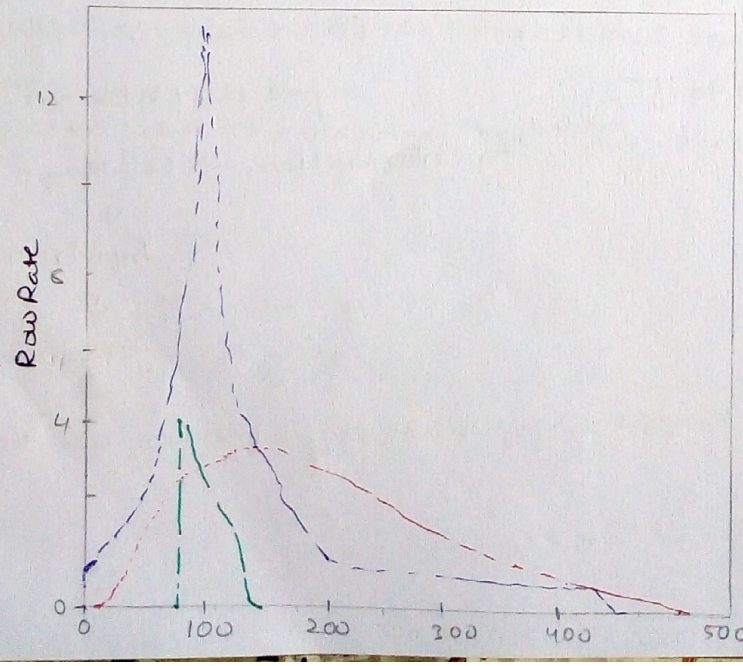


URBAN WATER CYCLE – Main Components & Pathways.

* – pre development

Hydrograph

fig. 2.4



– post development with detention basin

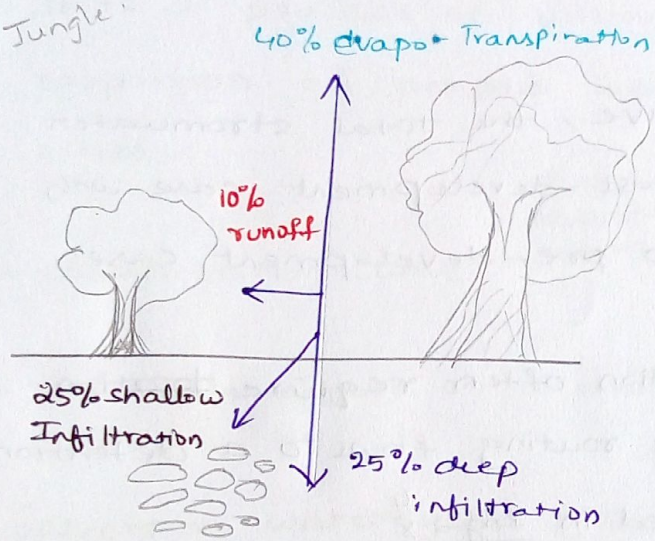
– post development without detion basin

→ However, the area under the curve, which represents the runoff volume, remains much greater for post-development case with detention compared to the pre-development case.

(1)

* Natural ground cover :-

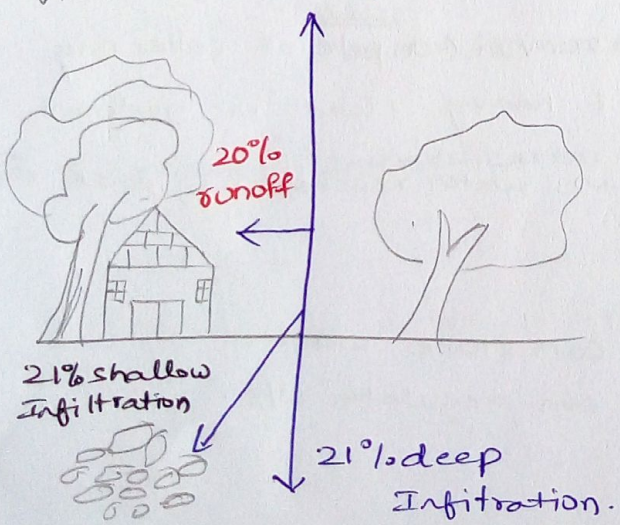
Jungle



(2)

* 10% - 20% impervious surface:-

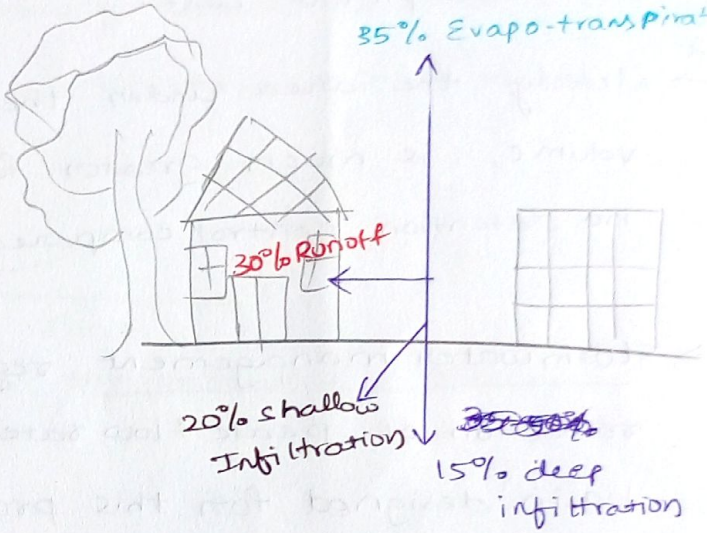
Villages



(3)

Towns

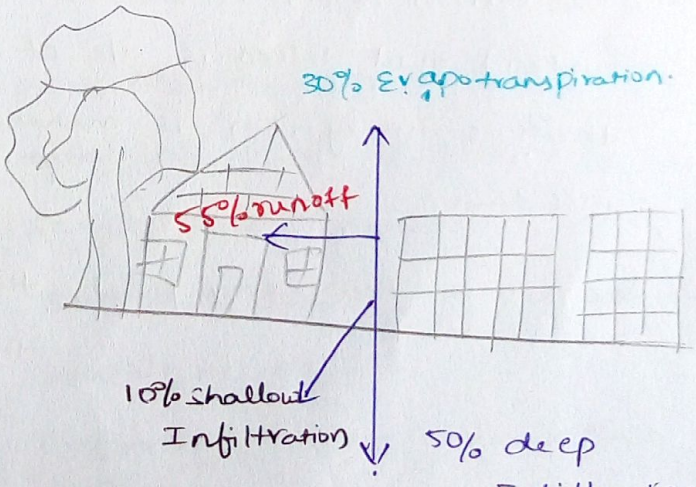
35-50% Impervious surface



(4)

urbanisation

75-100% Impervious surface.



→ The peak flow rate of the post-development hydrograph (with no detention) is more than 3 times greater than the hydrograph of the pre-development cases;

→ and the first arrival of surface runoff of post development case with no detention is within several minutes as compared to a delay of about 90min for runoff from the pre-development case.

→ clearly the area under the curve, the total stormwater volume, is much greater for post-development case with no detention control compared to pre-development case.

→ stormwater management regulation often require ~~location~~ reduction of peak flow rate by routing flows to a detention basin designed for this provided in fig 2-5

→ If drainage designed for 6cfd and peak is 13cfd then overflow occurs and come to roads. so we should decrease the peak.

→ flood control reservoir: If their is no reservoir (a pole of collecting water) that takes is u/s of dam, (If heavy flood is godavari, then is heavy rain is maharastra, then water reaches Rjy point in 6 days)

→ Reservoir is their some point, then we can store water. then we can regulate d/s.

→ To decrease the peak → ① may construct retention ponds
② increase size of drains
③ decrease the impervious layers

Mynotes:

*Urbanization:

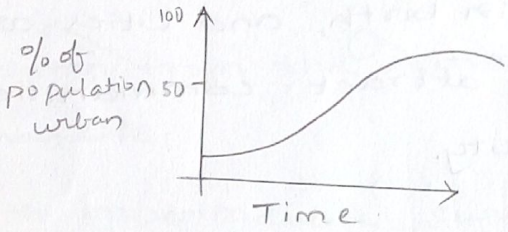
It is the process through which cities grow, and higher and higher percentages of the population comes to live in the city.

(or)

→ Today, more than half of the world's population lives in cities

It is a process of urban growth which leads to a greater proportion of people being concentrated into towns & cities.

→ urbanization curve



→ It mainly effects on Economic & environmental effects.

* Effects on watercycle. (4) & (5)

Diagram

→ changes in urban streams
shape of runoff hydrograph
water/river body functions

→ Increasing / Intensification the peak flow rate runoff
total volume of runoff
Severity of flooding
Bankfull flow
water velocities
Frequency of high stream flows
contaminants / pollution of riversystem

→ Decreasing / destruction the Infiltration rate, Base flow, downstream channel erosion, Ground water recharge, water quality, aquatic enviroment, water levels during summer, time of flow concentration etc.

* trends in urbanisation:

→ Trend is a general direction in which something is developing or changing.

→ There will be more, and bigger, cities in the future, In 1900, 10% of world's population lived in cities. Today the figure is over 50%, and it will reach 75% by 2050 (urban age project, London school of Economics)

→ In 2010, well over 200million people lived outside of the country of their birth, and cities are becoming more diverse as they attract communities of diff nationality faith and ethnicity.

→ Cities will play a role in a number of ways:

① urban resilience:

lessen the impact of an unavoidable shock, and respond effectively so that disruption to the city and inhabitants is as little as possible and so short as possible.

② urban inclusiveness:

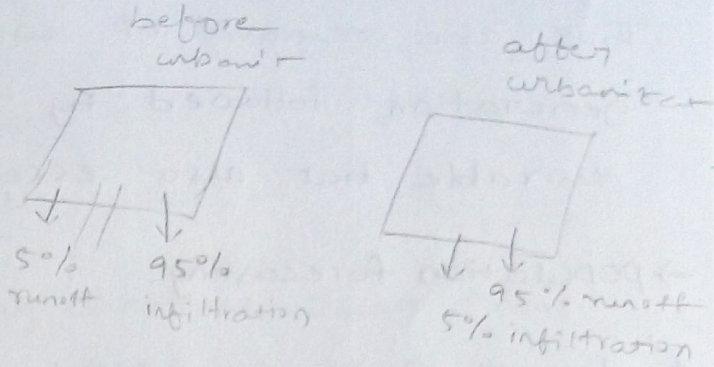
→ To ensure that religious, gender, tribal and racial identities lives shoulder to shoulder without becoming fragmented.

→ win public trust that resources & servics are provided in a fair & equal way.

③ urban violence:

reduce the fear of residents & visitors in that they may be the victims of violence of any kind.

* Need of urban drainage system:



→ urban drainage system mainly handle 2 types of flow

① wastewater

② storm water.

→ urban drainage systems are needed in an area because of interaction blw human activity and natural water cycle. This interaction has 2 main forms,

① The abstraction of water from the natural cycle to provide water supply for human life.

② covering of land with impermeable surfaces that divert rainwater away from the local natural system of drainage.

→ If untreated wastewater is allowed to accumulate, the decomposition of organic materials ~~its~~ contains can lead to the production of large quantities of gases causing unfavorable smell in atmosphere.

→ wastewater contains numerous pathogenic micro-organisms from human being, animals, or from toxics from industrial wastes.

→ The presence of nutrients in wastewater can stimulate the growth of aquatic plants, which contains toxic materials

→ wastewater contains dissolved material, solids organating from water closets · from washing, industry and other uses.

→ If rainwater is not properly drained, it would cause inconvenience, damage, flooding and even health risks, It may also carry pollutants from air or from catchment areas.

Thus, the removal of wastewater from its source of generation, followed by treatment & disposal is not only desirable but also essential for a civilized society.

→ population forecasting:

* design of water supply and sanitation scheme is based on the projected population of a particular city, estimated for design period
* Any under estimated value ~~of~~ will make system inadequate for the purpose intended, similarly overestimated value will make system ~~is~~ costly.
* changes in population of the city over the year occurs and the system should be designed taking into account of population at the end of design period.

→ Factors affecting changes in population are:

* Increase due to birthy
* decrease due to deaths
* Inc/dec due to migration
* Inc. due to anexation

→ Methods:

* Arithemetical increase method
* geometrical " " (geometrical progression method)
* Incremental Increase method
* graphical method
* comparitive graphical method
* Master plan Method
* Logistic curve method.