EWCE 461

River Engineering and Flood Management

3 Credit Hour

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Lecturer

Department of Environmental, Water Resources and Coastal Engineering

Sec-B: Flood Management- 1.0 Credit

Syllabus of Sec-A: 2.0 Credit

- Behavior of alluvial rivers
- River channel pattern and fluvial processes
- Aggradations and degradation
- Local scours
- River training and bank protection works
- Navigation and dredging of sediment movement in river channels
- Bed form and flow regimes
- Case studies

Syllabus of Sec-B: 1.0 Credit

- Flood and its causes
- Flood process in urban and rural area
- Flood management measures: structural and non-structural measures such as dams, reservoirs
- Diversion channels and floodways
- Improvement of channel capacity by dredging
- Land management, Flood proofing, Flood zoning, Flood hazard mapping
- Flood forecasting and warning, Flood damage assessment

Course Outcome (CO)

CO1	Be able to explain the relationships of river planforms with the river Morphological parameters
CO2	Be proficient in calculating and estimating sediment distribution and sediment load of a river
CO3	Be able to apply different engineering perceptions to estimating the scour depth.
CO4	Be familiar with different bank protection and river training work and understand the dredging and navigation processes
CO5	Apply knowledge of flood processes and management strategies to analyze and assess flood risk.

Reference Books

- Any book on Flood Management and Mitigation
- **Water Resources Engineering by R. K. Linsley, J. B. Franzini, D. L. Freyberg and G. Techobanojlous**
- Fluvial Processes in River Engineering (1992) by H. H. Chang
- **Flood Control and Drainage Engineering, Fourth Edition, S.N. Ghosh**
- Urban Flood Management; by Chris Zevenbergen (Author), Adrian Cashman (Author), Niki Evelpidou (Author), Erik Pasche (Author), Stephen Garvin (Author), Richard Ashley (Author)
- Flood Risk: Planning, Design and Management of Flood Defence Infrastructure, By: Paul Sayers

Lecture 2

Flood Process in Urban and Rural Area

Urban Drainage

- A drainage system is built-up (urban or industrial) areas
- Traditionally this has been achieved by using underground pipe systems
- 3 different types of urban drainage :

Storm sewer : Drains excess rain or GW of a urban catchment

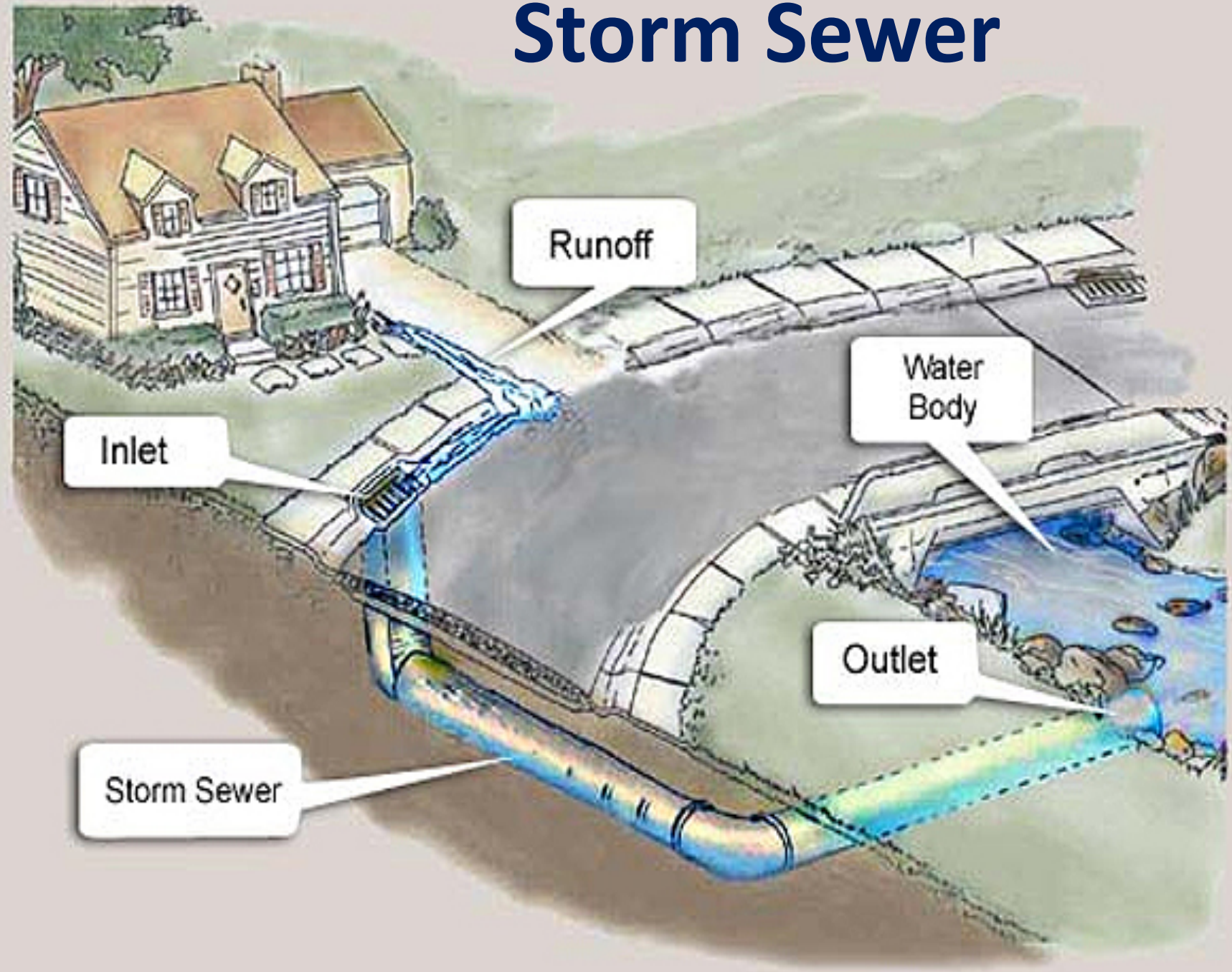
Domestic sewer or **Sanitary sewer**: Transports sewage from houses and commercial buildings to treatment or disposal

Combined sewer: Collects sanitary sewage and storm water runoff in a single pipe system

Flood Water Vs Storm Water:

- Flow directions in major streams
  - o Flooding – water overflows the channel and moves away from the stream
  - o Storm water – water runoff flows towards the channel or conveyance structure
- Size of drainage area
  - o Flooding – the contributing drainage area is greater than one square mile
  - o Storm water- the contributing drainage area is less than one square mile
- Nature of stream
  - o Flooding – large natural channel, typically in a rural area
  - o Storm water – small constructed or modified channel in urban area
- Stream flow
  - o Flooding – continuous
  - o Storm water – discontinuous

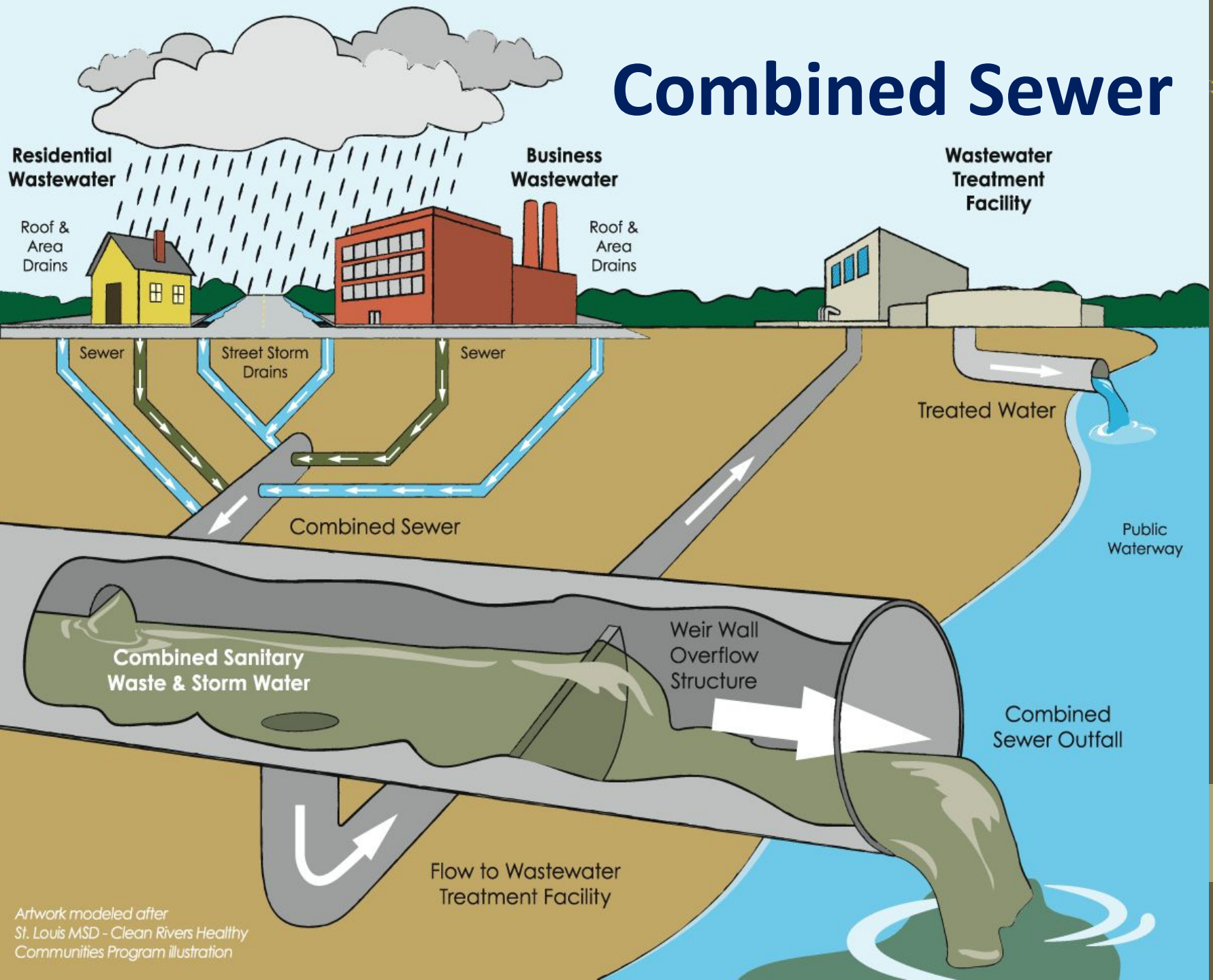
Storm Sewer

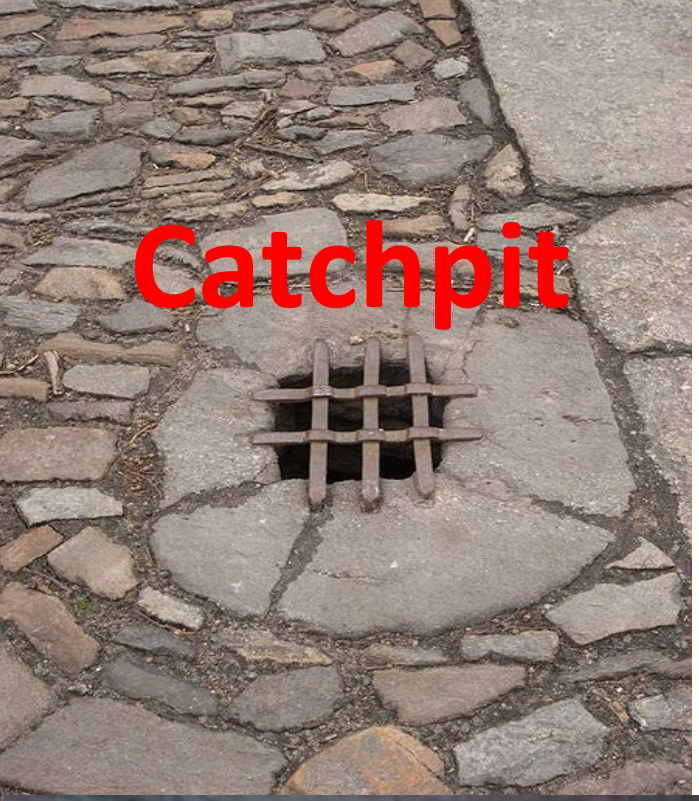


Sanitary Sewer



Combined Sewer









Add suitable tag

Merits and Demerits of Urban Drainage

Merits

- Provides facilities to dispose of storm water or liquid waste
- Prevents local flooding or long time water logging conveying storm water as quickly as possible
- Sanitary sewers serving industrial areas also carry industrial wastewater

Demerits

- Causes urban flooding overwhelming capacity of drainage during excessive rainfall or flash floods
- Potential source of pollutants discharge at natural outlets conveying contaminated pollutants with untreated waste water

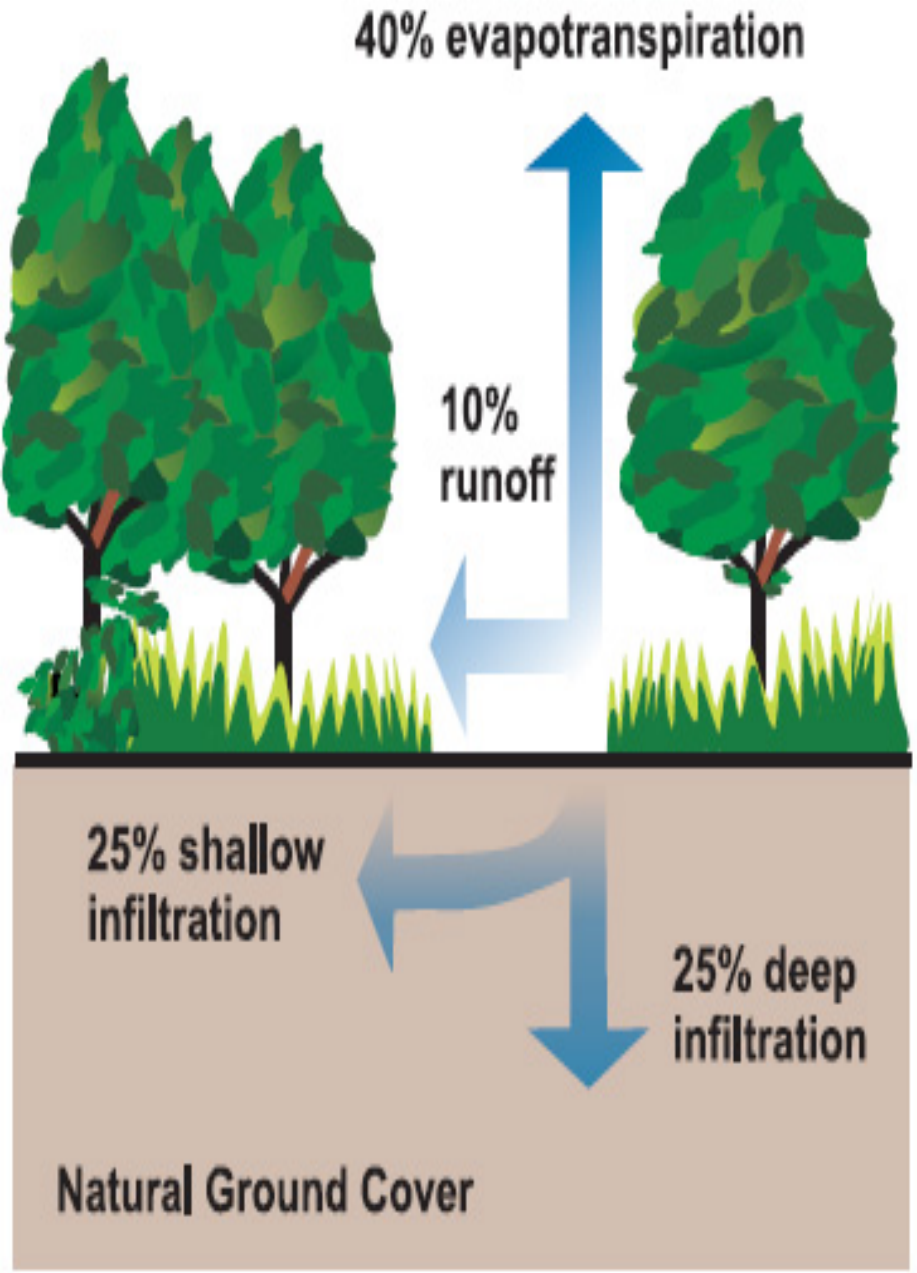
Urban Flooding

- Urban flooding is the inundation of land or property in a built-up environment caused by stormwater overwhelming the capacity of drainage systems, such as storm sewers

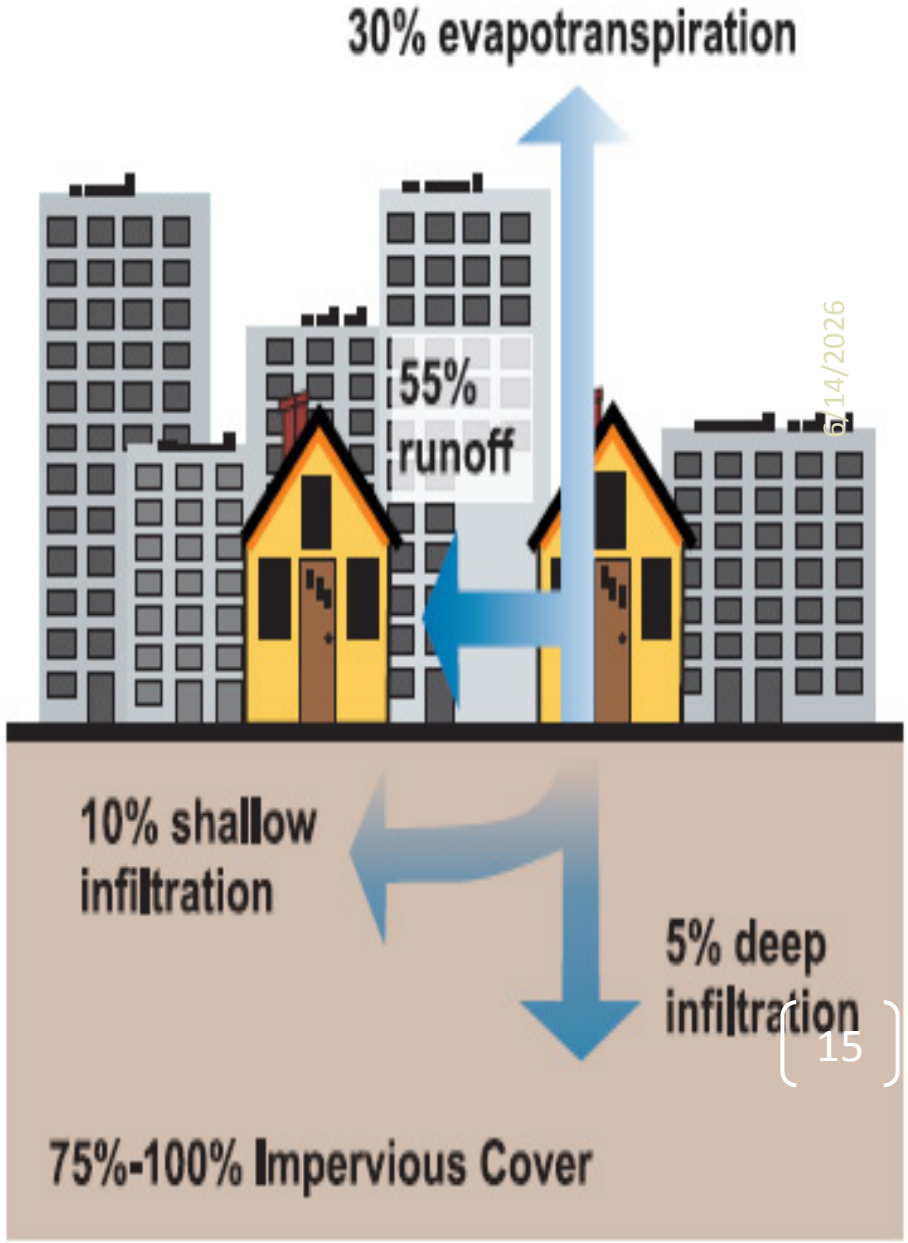
- Larger urban growth increases paved area, decreases permeability and triggers urban flooding

- Climate change is also a major issue behind urban flooding

Natural Watershed



Urban Watershed



6/14/2026

Causes of Urban Flooding

Natural causes

- Heavy rainfall
- Flash floods
- Lack of reservoirs
- Silting

Man-made causes

- Population pressure
- Deforestation
- Unplanned urbanization
- Poor water and sewage management
- Lack of flood control measures

Impact of Urban Flooding

Impact on economy

- Damage to Public buildings, Public utility works, housing and household assets
- Loss of earning in industry & trade
- Loss of earning to petty shopkeepers and workers
- Loss of employment to daily earners
- Loss of revenue due to Road, Railway Transportation Interruption
- High prices for essential commodities

After flooding, government has to put many resources for aiding e.g., police force, fire control, aid workers and for restoration of flood affected structures, persons, live-stock etc.

Impact of Urban Flooding

Impact on environment

- Damage to surroundings, forests, ridges, wild-life, zoo, urban community-trees, water bodies, shrubs, grass fruits/vegetables in go downs etc
- Results imbalance of eco-system of the city

Impact on human beings

- Large number of people become homeless and also causes death
- The people of all ages who stranded in flooding suffer a great psychological impact disturbing their whole life and the society as whole
- Brings infectious waterborne diseases i.e. dengue, dysentry, common cold, pneumonic plagues etc.

Impact of Urban Flooding

Impact on traffic

- Flooding results in the damages of roads, collapse of bridges causing traffic congestion which affect day-to-day life and other transportation system

Impact on livestock

- It is difficult to care for them particularly when human being itself is in trouble

Preventive Measures

- Sustainable urban drainage system
- Construction of flood protection structures
- Improvement of drainage efficiency
- Planned urbanization
- Rainwater harvesting
- Flood plain management
- Land use and development planning
- Planting trees and grasses

Tools or Models

- Urban Hydraulic Models
  - StormCAD
  - SewerCAD
- Urban Hydrologic Models
  - SWMM
  - SOBEK



Thank You