

## Urban development affects the water cycle

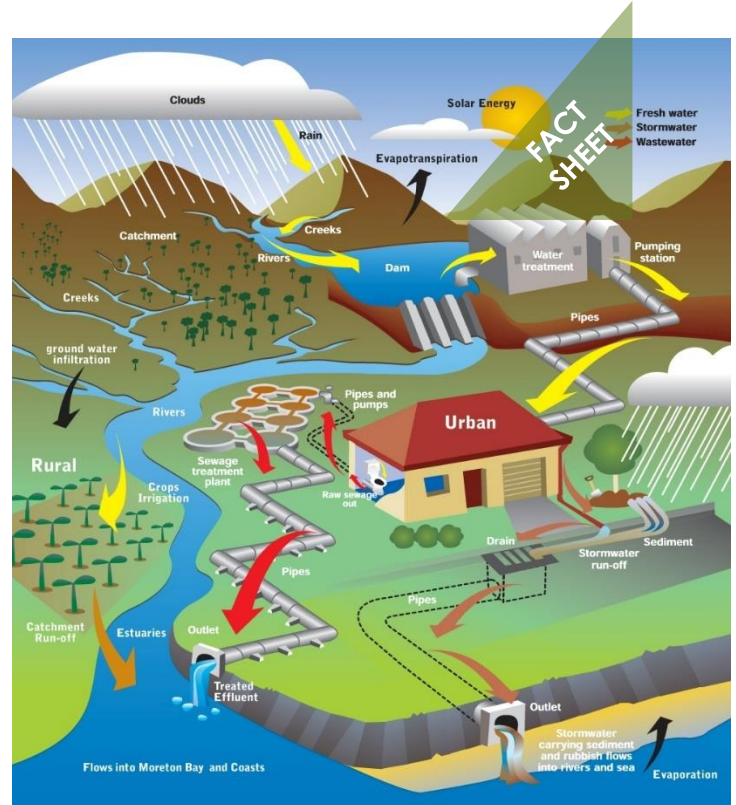
The development of cities, or urban areas, greatly changes the dynamics of the natural water cycle. The water cycle refers to the continual circulation of water between the earth's atmosphere, land and oceans.

Under natural conditions, a large amount of rainfall soaks into the ground (infiltration) to replenish groundwater and provide a source of water for plants. The leaves of these plants then release this water as vapour (transpiration), returning it to the atmosphere as a gas. Rainfall which is not absorbed by plants or the soil becomes runoff which drains into local streams and creeks, and eventually the ocean.

In urban areas, impervious or hard surfaces such as roads, buildings and roofs reduce the amount of rainfall that can soak into the ground. This means that much more water becomes runoff which, in urban areas, is called stormwater. Stormwater travels through drains and underground pipes into our creeks and rivers, carrying with it a range of pollutants and increasing the potential for erosion.

Other aspects of urban development that impact waterways include the damming of rivers to supply drinking (potable) water. Water from dams is treated and piped to homes and businesses then another system of pipes carries away the used water, called wastewater or sewage, which is treated and released back into waterways.

As cities are built, soil from poorly managed construction sites can be washed into waterways and the discharge of wastewater from industry may contain pollutants.



The water cycle is a continuous circulation of water between the earth and the atmosphere.



Wash your car on the grass so the soapy water doesn't end up in our creeks and rivers.

## Stormwater and wastewater impacts

Urban stormwater and poorly treated wastewater can potentially deliver large amounts of pollutants into waterways.

The types of pollutants found in stormwater include litter, nutrients such as nitrogen and phosphorus, and coarse to very fine sediments (soil and mud). It is easy to see litter and coarse sediments but the very fine sediment and dissolved nutrients can cause greater harm as they are small enough to be easily consumed by aquatic plants and animals.

Sediment in the water may reduce water clarity and smother important areas of aquatic habitat, such as seagrass and corals.

The volume and speed of water being discharged from stormwater pipes into waterways can also disrupt ecosystems and cause flooding and erosion problems.

Poorly treated wastewater and sewage can contain high levels of dissolved nutrients, which have the potential to promote the growth of algae. The effects of these pollutants may also act to reduce dissolved oxygen in the water, which is essential for most aquatic life.



Stormwater drains can deliver pollutants into our waterways.

## Water Sensitive Urban Design

Water Sensitive Urban Design (WSUD) is a holistic approach to city planning and development which also embraces the management and conservation of water.

WSUD aims to retain the natural water cycle balance as much as possible in urban areas. This means water supply, wastewater and stormwater systems are all managed together in order to protect natural aquatic ecosystems.

According to the National Water Commission some WSUD objectives are to:

- Minimise impacts on existing natural waterways and ecological processes
- Protect the water quality of surface and ground waters
- Minimise demand on the piped water supply system
- Improve the quality of and minimise polluted water discharges to the natural environment
- Incorporate collection, treatment and/or reuse of stormwater runoff
- Reuse treated wastewater and reduce the amount created
- Increase social amenity in urban areas through multi-purpose green areas, landscaping and water art.



WSUD makes use of plants to improve the quality of urban stormwater runoff.



## Water Sensitive Urban Design approaches

Two key methods to reduce the demand for potable water are through water saving activities and the use of alternative water supplies.

Water efficient fittings such as dual flush toilets and water saving showerheads can reduce water use in homes and businesses. Waterwise gardens reduce the need for watering and education programs encourage people to cut their water use.

Alternative water supplies include rainwater tanks that can be used in homes to provide water for toilets, gardens, hot water systems and laundry. Some activities do not need water that is treated to the high standard of drinking water. The term 'fit-for-purpose' means 'appropriate, and of a necessary standard, for its intended use'.

Using locally sourced, fit-for-purpose water supplies can save on energy needed for treatment and pumping, and lessen the amount of wastewater reaching waterways.

Wetlands are often referred to as the 'kidneys' of our river systems. Constructed wetlands (shown above) and 'raingardens' can be designed in urban areas to capture and filter stormwater whilst also supporting biodiversity values and boosting scenic amenity.



Rainwater tanks can provide water for toilets, gardens, hot water systems and laundry.



Some new urban areas in South East Queensland have been built on water sensitive urban design principles.