

water

NEW ZEALAND

The New Zealand Water & Wastes Association Waiora Aotearoa



Understanding Stormwater

A quick start resource guide for schools



Introduction

This resource provides a quick starting point for teachers and educators to introduce the basic concepts of stormwater in their classroom. It has been developed to help teachers quickly respond to recent weather events in New Zealand and help them connect with content and experts.

Stormwater is the runoff of water generated by rainfall or melting snow from urban surfaces. There are quality and quantity elements with stormwater. In most areas in New Zealand, stormwater is not treated before it is discharged. Stormwater needs to be managed to minimise flooding, to prevent harm to buildings and people and to protect the environment.

Water New Zealand (Water NZ) is a national not-for-profit organisation which promotes the sustainable management and development of New Zealand's water environment, particularly the three waters (drinking water, wastewater, and stormwater). Water NZ provides leadership and support in the water sector through advocacy, collaboration, and professional development. Its ~3,000 members are drawn from all areas of the water management industry including regional councils and territorial authorities, consultants, suppliers, government agencies, academia and scientists.

Key concepts you may like to explore within stormwater include:

1. What is stormwater?
2. Te Mana o te Wai
3. Understanding stormwater and the urban environment (and climate change)
4. What is in stormwater, - quality, contaminants.
5. Flooding - quantity
6. Ways of managing stormwater (e.g., catchment management, nature-based solutions, WSUD)



Key concepts and resource links

1. What is stormwater?

The urban water system includes drinking water, wastewater and stormwater.

Stormwater is water that runs off urban hard surfaces such as roads, driveways, footpaths and rooftops, whether flowing overland or in channels, down sumps or pipes through a catchment.

Stormwater is traditionally drained through an engineered pipe system designed to move runoff and discharge away from urban areas towards the nearest water body (stream or the sea). During heavy and prolonged rain, cross-connections and too-small pipes can cause drainage systems to be overwhelmed and for sewage to overflow into harbours and coastal waters. Higher flows can also cause erosion and flooding of urban streams.

More information on stormwater can be found:

- https://www.waternz.org.nz/Resources/Article?Action=View&Article_id=24

2. Te mana o Te Wai

Te Mana o te Wai means the first priority must be to ensure the life-supporting capacity of water. Te Mana o te Wai is part of the legal framework that underlies all water management in New Zealand. It has six principles:

1. Mana whakahere
2. Kaitiakitanga
3. Manaakitanga
4. Governance
5. Stewardship
6. Care and Respect.

More information on Te Mana o te Wai can be found:

- <https://environment.govt.nz/publications/essential-freshwater-te-mana-o-te-wai-factsheet/>
- <https://tft.org.nz/projects/integrated-catchment-management-plans/>

Education resources to explore Te Mana o te Wai:

- <https://www.sciencelearn.org.nz/resources/3091-te-mana-o-te-wai>
- https://www.waternz.org.nz/Article?Action=View&Article_id=2260
- <https://www.youtube.com/watch?v=KIldjMa6Oc4>
- <https://waicare.org.nz/Files/Full%20doc.pdf>

3. Understanding stormwater and the urban environment

Stormwater is a function of the urban environment. Impermeable surfaces (rooves, roads, drives, carparks) lead to runoff which needs to be captured and reused or channelled away from buildings



and houses to avoid flooding. A key part of understanding stormwater is understanding what surfaces and areas cause runoff, how they influence the contaminants and where the water will go.

More information on stormwater and runoff can be found:

- <https://www.learnz.org.nz/water172/bg-standard-f/stormwater>
- <https://www.youtube.com/watch?v=wdcXmerZWDc>

Education resources to explore stormwater:

- <https://www.hbrc.govt.nz/assets/Document-Library/Enviro-education/HBT11392-AS-StormwaterWalk-2017.pdf>
- <https://www.sciencelearn.org.nz/resources/2885-mapping-water-at-my-school>

4. What is in stormwater?

As water passes over different surfaces it picks up rubbish and chemical contaminants. Hard surfaces speed up runoff. Urban surfaces heat up stormwater. Because most stormwater in New Zealand is not treated, any rubbish and chemicals that are in the stormwater will go straight in the receiving environment – streams or the sea (i.e., where the water ultimately ends up). The heat, speed and pollutants can be toxic to plants and animals such as fish in streams/ rivers or in the ocean.

More information on stormwater contaminants can be found:

- <https://niwa.co.nz/videos/water-sensitive-urban-design>
- <https://www.youtube.com/watch?v=QL6K3N6NN3U>

Education resources to explore what is in stormwater:

- <https://www.npdc.govt.nz/media/ofxnesw5/5-stormwater.pdf>
- <https://api.ecan.govt.nz/TrimPublicAPI/documents/download/1810590>

5. Flooding

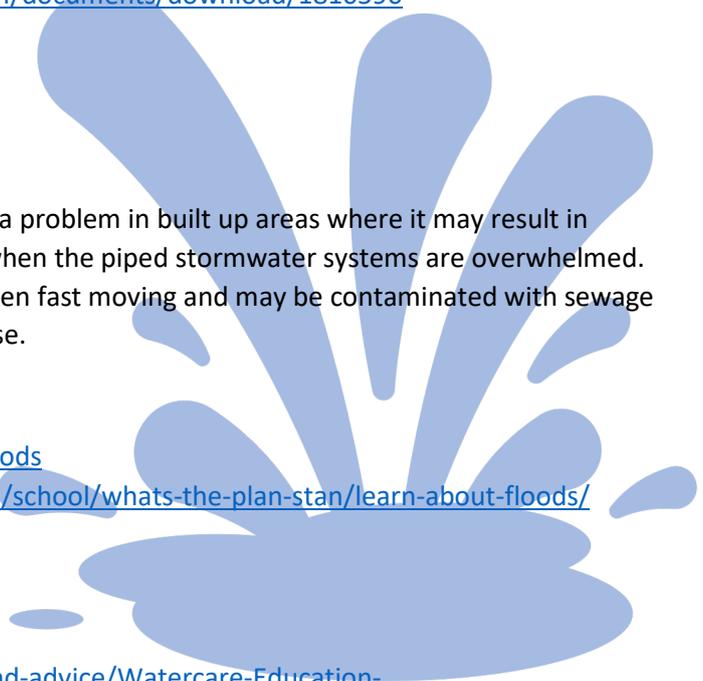
Flooding is a natural event that only becomes a problem in built up areas where it may result in damage to property or people. Floods occur when the piped stormwater systems are overwhelmed. Flood waters can be dangerous as they are often fast moving and may be contaminated with sewage which contains microbes that can cause disease.

More information on flooding can be found:

- <https://nzhistory.govt.nz/keyword/floods>
- <https://getready.govt.nz/en/prepared/school/whats-the-plan-stan/learn-about-floods/>

Education resources:

- <https://www.watercare.co.nz/Help-and-advice/Watercare-Education-Programme/Freshwater-Detectives%E2%84%A2-kit>



- <https://www.sciencelearn.org.nz/resources/2887-build-a-model-water-catchment>

6. Ways of managing stormwater

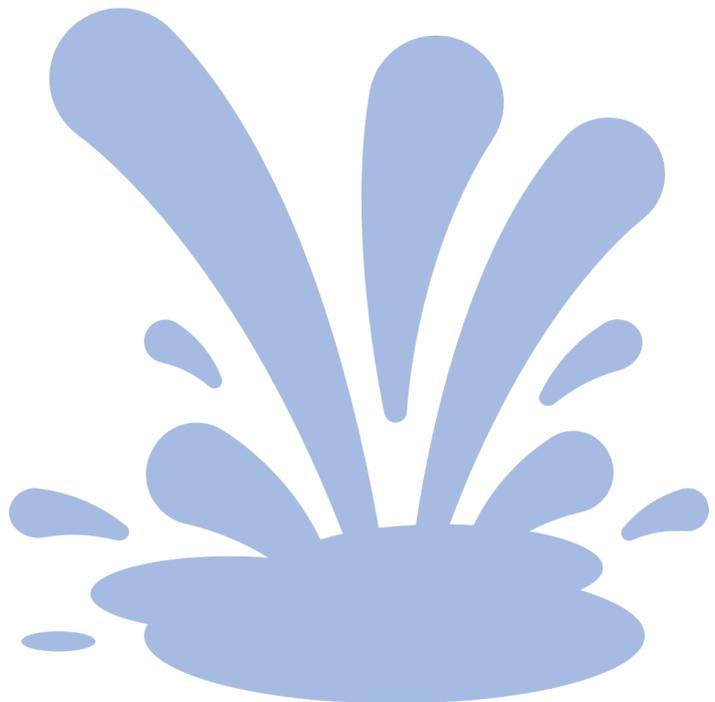
Historically stormwater was managed by channelling it through ditches and pipes. As we learn more about the damage that stormwater can do to the environment and during floods, management practices are changing. There are lots of exciting initiatives being developed including integrated catchment management, green blue cities, sponge cities and more.

More information on managing stormwater can be found:

- <https://wellington.govt.nz/climate-change-sustainability-environment/water/stormwater/water-sensitive-urban-design-guide>
- <https://www.tauranga.govt.nz/council/water-services/stormwater/water-sensitive-design>
- <https://climatechampions.unfccc.int/what-are-sponge-cities-and-how-can-they-prevent-floods/>

Education resources:

- https://www.asla.org/uploadedFiles/CMS/Chapters/CD_MiniGreenRoof.pdf
- <https://nzcurriculum.tki.org.nz/content/download/66705/530262/file/A%20Taste%20of%20Town%20Planning%20-%20L3%20Cross%20curricular%20unit%20plan.docx>



Finding out more about careers in water

Stormwater experts are justifiably proud of the work they do to protect the health of people and the environment. The field includes people with expertise across a wide range of sectors including environmental sciences, urban planning, infrastructure development, engineering, landscape architecture, conservation, freshwater science, toxicology and many more.

To connect with stormwater experts in your area please contact WaterNZ or Inspiring Futures

- <https://www.waternz.org.nz/>
- <https://www.inspiringthefuture.org.nz/#/>

For more information on careers and career pathways please visit

- <https://www.connexis.org.nz/water/>
- <https://www.careers.govt.nz/searchresults?q=water>
- <https://www.lutra.com/blog/jemmas-internship-roundup/>
- https://www.youtube.com/watch?v=jk_jtp1lonI

Senior secondary students may be interested in the WaterNZ digital badge in stormwater which provides an introduction to stormwater and its management as well as interviews with stormwater experts.

For more information see <https://www.waternz.org.nz/training>.

Glossary

Catchment – a basin shaped area of land from which water flows into streams, rivers, and wetlands.

Contaminant – something that spoils or corrupts a solution such as pure water.

Impermeable – a hard surface that doesn't let water through e.g., concrete.

Integrated catchment management – a type of sustainable environmental planning that integrates water with ecological, social, and political information from an entire catchment area.

Permeable – a surface that will let water through to layers below e.g., grass and soil.

Receiving environment - the part of the environment where stormwater ultimately ends up e.g., the ocean or streams, rivers, and wetlands.

Runoff – excess water that flows over the surface of the land after the ground is saturated.

Sewage – waste matter such as human urine or faeces.

Sewerage – the system of pipes and treatment works that collect and safely dispose of sewage.

Stormwater – water from rain or snow that flows across urban areas resulting in runoff.



Other resources

Organisations offering education sessions:

- <https://www.waterforlife.org.nz/water-education-lessons>
- <https://www.sciencelearn.org.nz/resources/3088-smart-water-a-context-for-learning>
- <https://www.stormwater360.co.nz/assets/Uploads/3.-An-Applied-Stormwater-Education-Programme.pdf>
- <https://citycarewater.co.nz/community-guardians/new-event-title-placeholder/>
- <https://tread-lightly.org/programmes/drain-game>
- <https://www.es.govt.nz/environment/education/what-we-can-offer>
- <https://www.kapiticoast.govt.nz/media/vooh0pdt/water-is-precious-water-is-wonderful.pdf>

Case studies of stormwater education in schools:

- <https://enviroschools.org.nz/creating-change/stories/stormwater-awareness-campaign-kaniere-school-water-of-life-case-study/>
- <https://greenroofs.co.nz/projects/remarkables-primary-school-queenstown-new-zealand/>
- <https://enviroschools.org.nz/creating-change/stories/%E2%80%8B%E2%80%8Benviroschools-wairstoration-flows-into-other-regions/>
- <https://enviroschools.org.nz/creating-change/stories/fish-appear-on-drains-in-tirimoana/>

Stormwater Management Plans:

For those who want to go a little deeper, each region will have it's own stormwater management plan. As an example you can view Auckland's plan here:

- <https://www.aucklandcouncil.govt.nz/environment/looking-after-aucklands-water/stormwater/docsassetmanagementplan/stormwater-asset-management-plan-summary.pdf>



**‘Ka ora te wai, ka ora te whenua,
ka ora ngā tāngata’**

**‘If the water is healthy, the land is
healthy, the people are healthy’**

