Government of **Western Australia**
Department of **Water and Environmental Regulation**

Stormwater management manual for Western Australia

Chapter 8 Education and awareness for stormwater management

Department of Water and Environmental Regulation

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Cover photo: Lane Gardens Park 2021, Southern River, Western Australia (Source: Department of Water and Environmental Regulation).

Disclaimer

Preface

Stormwater is water flowing over ground or built-up surfaces and in natural streams and drains, as a direct result of rainfall over a catchment (ARMCANZ and ANZECC 2000). Stormwater consists of rainfall runoff and any material (soluble or insoluble) mobilised in its path of flow. Stormwater management examines how the runoff quantity and these pollutants can best be managed from source to the receiving water bodies using the range of management practices available.

In Western Australia (WA), where there is a superficial aquifer, drainage channels can commonly include both stormwater from surface runoff and groundwater that has been deliberately intercepted by drains installed to manage seasonal peak groundwater levels. Stormwater management is unique in WA as both stormwater and groundwater may need to be managed concurrently.

Rainwater has the potential to recharge the superficial aquifer, either prior to runoff commencing or throughout the runoff's journey in the catchment. Urban stormwater on the Swan Coastal Plain is an important source of recharge to shallow groundwater, which supports consumptive use and groundwater-dependent ecosystems.

With urban, commercial or industrial development, the area of impervious surfaces within a catchment can increase dramatically. Densely developed inner urban areas are almost completely impervious, which means less infiltration, the potential for more local runoff and a greater risk of pollution. Loss of vegetation also reduces the amount of rainfall leaving the system through the evapotranspiration process. Traditional drainage systems have been designed to minimise local flooding by providing quick conveyance for runoff to waterways or basins. However, this almost invariably has negative environmental effects.

This manual presents a comprehensive approach to management of stormwater in WA, based on the principle that stormwater is a resource – with social, environmental and economic opportunities. The community's current environmental awareness and recent water restrictions are influencing a change from stormwater being seen as a waste product with a cost, to a resource with a value. Stormwater management aims to build on the traditional objective of local flood protection by having multiple outcomes, including improved water quality management, protecting ecosystems and providing liveable and attractive communities.

This manual provides coordinated guidance to developers, environmental consultants, environmental and community groups, industry, local and state government, water service providers and other agencies on current best management principles for stormwater management.

It is intended that the manual will undergo continuous development and review. As part of this process, any feedback on the series is welcomed and may be directed to the Urban Water Branch of the Department of Water and Environmental Regulation, at urbanwater.enquiry@dwer.wa.gov.au

Western Australian stormwater management objectives

Water quality
To maintain or improve the surface and groundwater quality within the development areas relative to pre-development conditions.

Water quantity
To maintain the total water cycle balance within development areas relative to the pre-development conditions.

Water conservation
To maximise the reuse of stormwater.

Ecosystem health
To retain natural drainage systems and protect ecosystem health .

Economic viability
To implement stormwater management systems that are economically viable in the long term.

Public health
To minimise the public risk, including risk of injury or loss of life, to the community.

Protection of property
To protect the built environment from flooding and waterlogging.

Social values
To ensure that social, aesthetic and cultural values are recognised and maintained when managing stormwater.

Development
To ensure the delivery of best practice stormwater management through planning and development of high quality developed areas in accordance with sustainability and precautionary principles.

Western Australian stormwater management principles

- Incorporate water resource issues as early as possible in the land use planning process.
- Address water resource issues at the catchment and sub-catchment level.
- Ensure stormwater management is part of total water cycle and natural resource management.
- Define stormwater quality management objectives in relation to the sustainability of the receiving environment.
- Determine stormwater management objectives through adequate and appropriate community consultation and involvement.
- Ensure stormwater management planning is precautionary, recognises inter-generational equity, conservation of biodiversity and ecological integrity.
- Recognise stormwater as a valuable resource and ensure its protection, conservation and reuse.
- Recognise the need for site specific solutions and implement appropriate non-structural and structural solutions.

Contents

Summary

This chapter explains how to develop an education and awareness program. Programs can be developed by various sectors of the community to raise awareness and provide a catalyst for a behaviour change to reduce pollution entering the stormwater system. Education and awareness is one of the non-structural methods that can be used in an integrated approach to best practice stormwater management.

The chapter expands on the concepts in the Australian Guidelines for Urban Stormwater Management (ARMCANZ and ANZECC, 2000), which place primary importance on education and awareness. This is consistent with the principle that any attempt to incorporate sustainability into the community must also explicitly address education and awareness.

Stormwater pollution from residential, industrial, commercial and agricultural areas is the result of many actions at various locations within the catchment. People are often unaware that their activities can impact on stormwater. Once they are aware and have learnt simple solutions to reduce or avoid causing stormwater pollution, changes to their behaviour are more likely. However, it has been found that in addition to education, it is important to have supporting infrastructure and social structure close to people so that it is easy for them to comply with educational messages (e.g. providing adequate recycling stations).

The development of an environmental education program for stormwater can be split into a nine-step process. These steps recognise that for the program to be effective, a thorough understanding of the environmental issues, stakeholders, behaviour targeted and the best way to achieve an improved environment is needed.

Stormwater education programs have been shown to have many benefits over 'engineering' solutions, including favourable cost-benefit comparisons.

1 Introduction

Traditionally engineered stormwater systems capture water runoff from roads, roofs and land and direct it through stormwater pipes to rivers, streams, wetlands, compensating basins and oceans. Pollution from many sources within the catchment can be carried by stormwater into the streams and wetlands. Pollutants such as refuse, chemicals and oils can enter our rivers, streams and the ocean, or into compensating basins for infiltration through untreated stormwater. These pollutions can harm our wildlife and degrade local waterbodies or groundwater quality.

Contemporary stormwater management is aimed at reducing the impacts of development on the natural water cycle (Victorian Stormwater Committee, 1999, ARMCANZ and ANZECC, 2000, Institution of Engineers Australia, 2003). Stormwater management now emphasises stormwater quality, health of aquatic ecosystems and public amenity, in addition to managing stormwater quantity. By necessity, stormwater management needs to be broadly based, requiring multi-disciplinary inputs.

People are often unaware that their activities can impact on stormwater quality and result in environmental degradation. Once aware and informed of simple solutions that reduce or avoid causing stormwater pollution, a change in people's behaviour is more likely, keeping in mind other motivators behind behavioural change. However, although environmental education has shown to be successful in a number of cases, stormwater management usually requires an integration of approaches.

Figure 1 illustrates the numerous stormwater management approaches and that education and awareness is only one of these approaches. Other approaches are detailed in various chapters of this Manual.

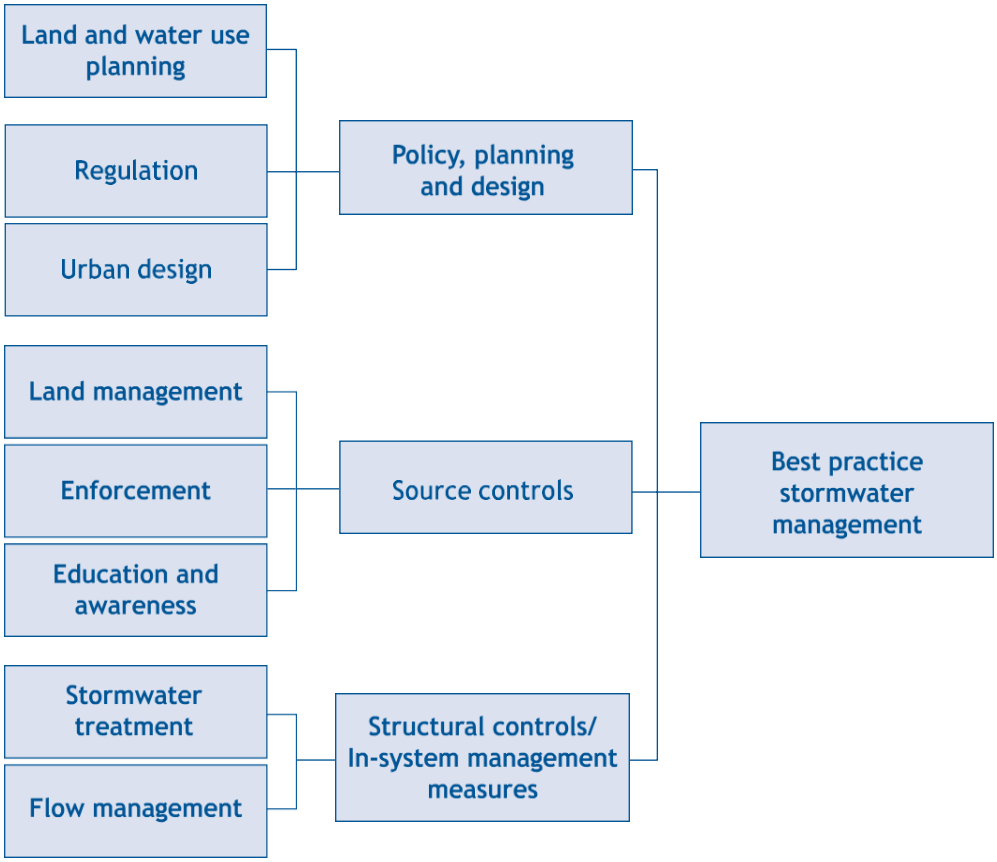

Figure 1. Best management practice of stormwater requires integration of a range of measures (ARMCANZ and ANZECC, 2000).

This chapter describes a methodology for developing education and awareness programs for stormwater pollution. A number of tools, techniques, methods and examples of successful programs are presented to help in the process of developing an education and awareness program.

1.1 What is stormwater pollution?

The main types of stormwater pollution include:

- litter, such as cigarette butts, cans, paper or plastic bags
- chemical pollution, such as detergents, oil or fertilisers
- 'natural' pollution, such as leaves, garden clippings or animal droppings.

Everyone has a part to play in reducing the amount of pollution contaminating our valuable water resources.

2 The broad policy context

There are a number of national and state strategies and policies that provide the framework and principles for the development of best management practice for stormwater management in WA and the development and implementation of education and awareness programs as an integral part of stormwater management in this state. Sections 5.4 and 5.5 of Chapter 2 provide a short description of some of the key policies and guidance that provide a framework for stormwater education in WA.

Sustainability in WA

The Department of Water and Environmental Regulation develops and implements water and environmental management policies and practices that contribute to sustainability outcomes. The department aims to increase awareness on sustainability, by providing advice and supporting sustainable practices in the community, industry and government sectors.. Other state agencies, the private sector, local governments and non-government organisations have also developed, implemented and advanced a wide range of sustainability initiatives. Academic institutions, community groups and individual households have also taken up the challenge of promoting and/or adopting practices, and pursuing initiatives aimed at contributing to sustainability throughout the state (DWER, 2021).

The WA Stormwater Management Hierarchy

In line with the Australian guidelines, a stormwater management hierarchy approach for managing urban stormwater is taken in WA. The stormwater management hierarchy applied in WA is provided in the *Decision process for stormwater management in Western Australia 2017*.

3 Who will benefit from this chapter?

This chapter has been developed for people interested or involved in planning an environmental education program for stormwater, including local governments, state government, environmental groups, industry associations (and groups) and the community.

Table 1 gives some examples of how environmental education for stormwater can be delivered by various sectors.

Table 1. Delivery methods for stormwater environmental education projects

Sector	Example projects
Local government	Providing subsidised composting bins Talks, presentations and seminars Exhibitions and displays Targeted mail-outs
State Government	River cleanup programs Joint government/industry programs Courses through schools, universities, TAFE and other educational bodies
Environmental/community groups	Planting days Project development Drain stencilling Permanent displays and signs erected adjacent to waterways School visits Professional development for teachers
Industry associations	Teachers notes Workdays Member accreditation

4 What will an education and awareness program achieve?

Stormwater pollution from residential, industrial, commercial and agricultural areas is the result of many actions at various locations within the catchment. People are often unaware that their activities can impact on stormwater. Once aware and informed of simple solutions that reduce or avoid causing stormwater pollution, a change in people's behaviour is more likely. However, it has been found that in addition to education, it is important to have a supporting infrastructure and social structure around individuals so that it is easy for them to comply with educational messages (e.g. providing adequate recycling stations) (Taylor and Wong, 2002).

It also should be noted that education is only one factor that influences an individual's behaviour. Other factors that influence behaviour include:

- social values
- demographics
- recent events
- laws, regulations and policies – and how these are monitored, implemented and enforced
- the availability of technology, products and services; and economic factors such as financial incentives or disincentives
- convenience factors.

Education should be considered as one of a number of mechanisms to address issues that arise from people's actions. Other mechanisms include:

- enforcement: policy, legislation and regulation
- economics: monetary incentives and disincentives
- engineering, science and technology
- evaluation, monitoring and research.

The aim of environmental education for stormwater is to influence behavioural change to reduce the amount of pollution that enters the stormwater system. The programs are more likely to show results if they are planned as part of an holistic approach towards stormwater best practice management.

4.1 What is environmental education and what makes it effective?

'Environmental education' is to encompass raising awareness, acquiring new perspectives, values, knowledge and skills, and formal and informal processes leading to changed behaviour in support of a ecologically sustainable environment.

Community education is a process used to:

- create awareness of issues
- enhance knowledge, understanding and skills
- influence values and attitudes
- encourage more responsible behaviour.

Community education can include formal education such as schools and tertiary institutions, public involvement activities, vocational education and training and community marketing campaigns.

Effective community education projects:

- involve stakeholders and learners in decisions about the planning, management, content, style and delivery of the project
- create a supportive environment for influencing behaviour
- support and strengthen existing community networks and help create new ones
- motivate and encourage ownership
- provide opportunities for examining beliefs and values
- identify and promote positive actions rather than discourage undesirable ones
- are relevant, accessible and affordable, recognising the differing circumstances and constraints in a community
- use two-way communication methods
- respond to the diverse needs of the community (Source: NSW EPA and DLWC, 2001).

Community involvement in stormwater management is important to enable the community to develop ownership of both issues and the solutions. Raising the profile of stormwater issues in the community is likely to encourage greater involvement in stormwater management.

Projects such as the Clean Drains River Gains drain stencilling managed by the South East Regional Centre for Urban Landcare (SERCUL) create a broad educational water quality campaign and aim to raise awareness of the link between drains and natural waterways. The drain stencilling kit is available for use by community groups and other organisations, including businesses, wishing to increase pollution awareness in their area or workplace (SERCUL 2021).

A successful stormwater management program includes the following general goals in response to stormwater pollution problems:

- educating the public about the nature of the problem
- providing information to the people about what they can do to solve the problem
- involving the local community in hands-on activities to achieve pollution reduction or restoration targets.

Environmental education is a process that promotes knowledge and understanding of an issue, links processes, and encourages ownership that leads to positive behaviour changes.

4.2 Key principles of education for sustainability

There are seven key principles of education for sustainability in *Living Sustainably – The Australian Government's National Action Plan for Education for Sustainability* (Commonwealth of Australia, 2009):

(i) **Transformation and change:** Education for sustainability is not simply about providing information but involves equipping people with the skills, capacity and motivation to plan and manage change towards sustainability within an organisation, industry or community.

(ii) **Education for all and lifelong learning:** Education for sustainability is driven by a broad understanding of education and learning that includes people of all ages and backgrounds and at all stages of life and takes place within all possible learning spaces, formal and informal, in schools, workplaces, homes and communities.

(iii) **Systems thinking:** Education for sustainability aims to equip people to understand connections between environmental, economic, social and political systems.

(iv) **Envisioning a better future:** Education for sustainability engages people in developing a shared vision for a sustainable future.

(v) **Critical thinking and reflection:** Education for sustainability values the capacity of individuals and groups to reflect on personal experiences and world views and to challenge accepted ways of interpreting and engaging with the world.

(vi) **Participation:** Education for sustainability recognises participation as critical for engaging groups and individuals in sustainability.

(vii) **Partnerships for change:** Education for sustainability focuses on the use of genuine partnerships to build networks and relationships and improve communication between different sectors of society.

4.3 Current level of understanding and improvement through programs

As part of Engaging communities with Water Sensitive Cities Project A2.3, a study was conducted within the Cooperative Research Centre for Water Sensitive Cities (CRC for Water Sensitive Cities) program in 2014 and 2015 to establish a baseline understanding of Australians' knowledge of water and water-related issues (Fielding, K., et al. 2015).

The survey, a component of this study, asked a broad range of questions relating to demographic and cultural background; water conservation and pollution prevention behaviours; knowledge of water and water management issues; attitudes and acceptance of alternative water sources; extent of engagement in water-related activities; and sources of information about water.

The following are the key findings from the study taken from the study report (CRC WSC 2015):

A majority of Australians demonstrated good knowledge of some water issues. These included that:

- fertilisers and pesticides used on gardens, large amounts of sediment, and soil erosion can negatively impact on waterway health (68%, 59%, 54%, 62% understand this respectively)
- 69% understand that waterways can be damaged by storm water flows
- 73% understand that the actions of households have consequences for waterway health
- 74% understand that individual water conservation can significantly reduce water demand
- 68% understand that planting native vegetation along waterway banks can improve the health of waterways
- a majority (74%) have a clear or general sense of how the water cycle works and 56% know where their drinking water comes from.

There were some aspects of water issues that were less well understood. Only a minority of the sample had good knowledge of the following:

- 27% understand that domestic wastewater receives treatment before entering waterways
- 32% of respondents understand that stormwater from roofs and roads does not get treated before entering waterways
- 30% understand that wastewater and stormwater are carried through different pipes to get to waterways
- 39% of respondents know what catchment their household is part of
- 46% understand the definition of a catchment
- 41% understand that the amount of water available for use is finite.

Overall, a minority (42%) of respondents think that the cost of water is too high with 23% disagreeing and 24% providing a neutral response.

The overwhelming majority of respondents (between 80% and 90%) believe that a range of behaviours and policies (e.g. reducing litter, upgrading sewage treatment plants, reducing industrial pollution, building rain gardens, installing rainwater tanks) can positively impact on waterway health.

Attitudes to recycled wastewater mirror past research in that there is greater acceptance of its use for non-drinking than drinking purposes.

More people are unwilling to use recycled water for drinking than are willing. In relation to support for desalinated water, the dominant response is support for non-drinking purposes and neutral for drinking purposes. Most people support the use of stormwater for public space irrigation but only a minority support the use of treated stormwater for drinking. A majority of people are not willing to install a rain garden in their property, but a majority support the installation of rain gardens in their street.

Respondent activities undertaken near local waterways include passive bystander activities (enjoying scenery/photography/native animals and plants/bird watching); physical activities (walking, hiking or cycling); meal-related activities (picnics and barbeques); water-based activities (swimming, surfing, going to the beach).

In the national sample, the majority of respondents (51%) had not seen or heard any information about water in the past six months. Among those who had seen or heard information, the three most frequently cited sources of information (in order of frequency) were: water utility bill (26%), TV (24%), and newspapers (18%).

The general pattern is that WA and Queensland respondents had higher levels of knowledge and Victorian respondents' lower levels; respondents with higher education (e.g. university degree) had higher levels of knowledge and homeowners had higher levels of knowledge than renters. Western Australians, homeowners, and more educated respondents were also more likely to have seen information about water in the last six months from a range of sources.

For further details, refer to *National Survey of Australians' Water Literacy and Water-related Attitudes April 2015* and *Valuing stormwater management: Who is willing to pay? 2014*, via watersensitivecities.org.au.

Local levels of understanding

In WA, a number of examples show the community's level of awareness and understanding of stormwater's benefits and challenges at catchment scale. One good example is the Urban Waterways Renewal Program.

The program drew together national, state and local government agencies, community, landcare and natural resource management organisations, local schools and more than 1,600 volunteers to achieve on-ground water management and environmental outcomes in degraded waterways and urban drainage systems. The program resulted in several demonstration sites that:

- increased awareness among traditional practitioners that urban water can be better managed by using water sensitive urban design principles, approaches and practices
- resulted in integrated use of public open space
- improvements in the health of waterways and drainage including flood storage basins
- provided the opportunity to involve and educate the local community
- developed a connection between people, water and nature that contributed to community awareness and learnings on better stormwater management approaches
- became places to study the amenity and economic benefits of urban waterways renewal works by the CRC for Water Sensitive Cities
- showed anecdotal evidence of the community living along the creek starting to value the living stream
- resulted in community ownership and delivery with environmental interventions in several local government areas

- resulted projects which can be used for ecological, hydrological, drainage rehabilitation engineering, social and environmental studies
- resulted in projects which can increase awareness within the highly industrialised catchment to avoid unauthorised discharges to the Wungong River
- resulted in a high degree of engagement from the community, with eight community groups participating, nine partners involved, and 10 schools engaged.

Another WA example of the level of understanding at catchment scale is the 'Phosphorus Awareness Project (PAP). This is an education campaign that educates the general community about the impact of nutrients in the Swan and Canning River systems and wetlands and how to reduce the nutrient levels. The PAP aims to see a decrease in nutrient loads and algal blooms through changes in community and industry behaviour and practices resulting in biodiverse and sustainable rivers and wetlands throughout the Perth Metropolitan Area. The PAP, formally known as the Phosphorus Action Group (PAG), was formed in October 1998 as a subgroup of the Canning Catchment Coordinating Group, now South East Regional Centre for Urban Landcare (SERCUL 2021). Refer to the SERCUL's website for further details.

5 Developing an education and awareness program

Effective community education requires a thorough understanding of the environmental issues and the stakeholder behaviour being targeted, and is the best way to achieve an improved environment. There are eight key steps to plan an effective community education program. Figure 2 shows the steps in the process:

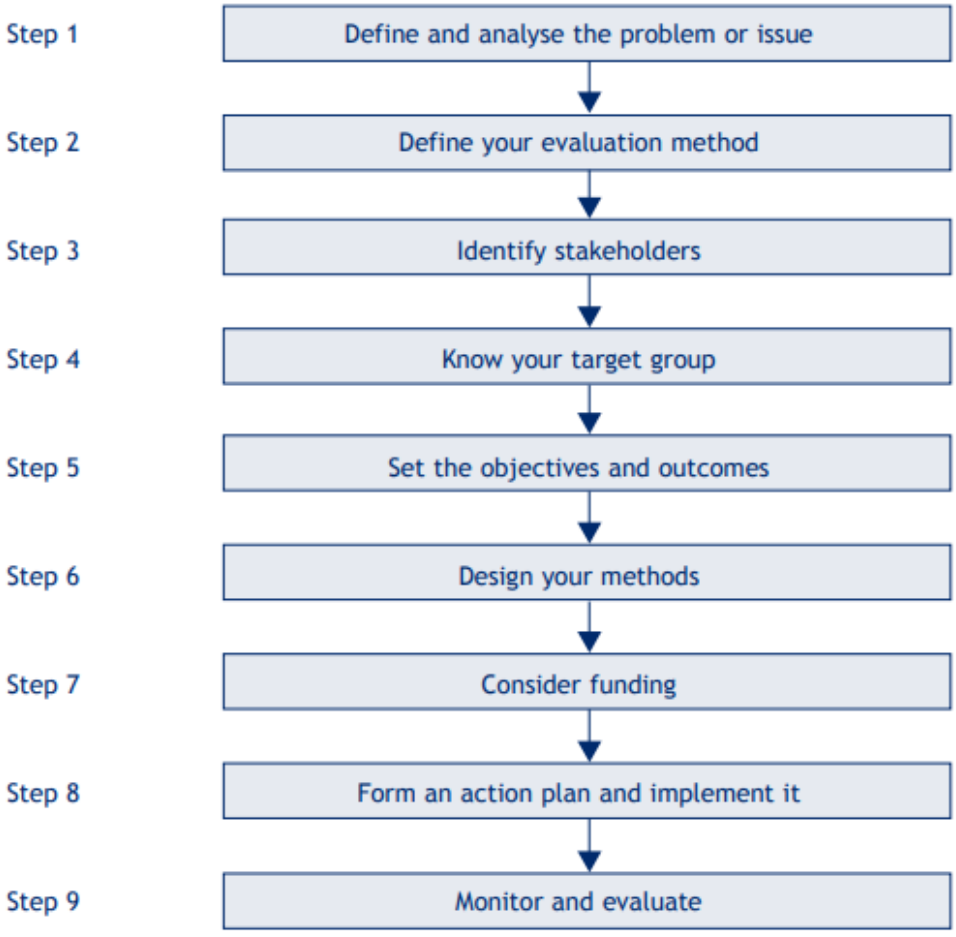

Figure 2. Steps in developing an education program (adapted from VSC, 1999)

Step 1: Define and analyse the problem or issue

The first step is to establish what is causing concern. It is essential to determine the sources of pollution and who impacts on these sources.

Find out how much is already known about the problem by professionals working in the area and the community members who are associated with the issue or problem location. To define an issue or problem, you need to investigate, discuss, analyse and review with inputs from stakeholders. If you look for solutions before you fully understand the issue, you could have trouble clarifying what you want and are able to achieve.

Some of the questions that you may want to ask are:

What is the problem? Does the community realise the problem? What are the causes of the problem? What is the level of understanding? Have there been any campaigns in the area before? What has been done before? Is education the best way to deal with the problem?

If you know where you are, it is easier to define where you are going and produce an effective outcome.

Table 2 shows a few of the problem pollutants, with some examples of impacts the pollutant may have and some possible causes. This list is by no means extensive, but provides a starting point from where an issue can be identified and analysed. The importance of doing some research and preparation, and analysing a situation is clearly shown to be of prime importance at the inception of developing an education program. Issue identification is a vital step in developing a program that is effective, and for continual improvement, monitoring and evaluation of the program.

Table 2. Examples of pollutants and their possible cause and effects

Issue	Potential negative impact	Possible cause
Sediment or turbidity	• Smothering of plants and animals on the bottom of the waterbody • Clogging of fish gills • Negative aesthetic effects	• Erosion of sediment from catchment (e.g. building sites) or stream banks • Hosing path material into the stormwater drains
Nutrients (algae problems)	• Stimulates the growth of algae, with the resultant decay leading to low dissolved oxygen levels affecting animal and plant life	• Excessive use and inappropriate use of fertilisers, resulting in wash off into waterways, streams and wetlands • Animal faeces • Washing cars and disposing of water into drains
Gross pollutants	• Reduces aesthetic appeal of waterways • Detrimental to aquatic life	• Littering e.g. plastic bottles,wrappings or cigarette butts • Waste dumping
Petrol, oils and grease	• Reduces aesthetic appeal of waterways • Toxic effect on aquatic life	• Car maintenance activities (individuals or businesses) • Illegal dumping of waste lubricating or food oils • Leaks from vehicles
Pesticides and herbicides	• Harms aquatic plants and animals	• Inappropriate use of pesticides and herbicides • Pesticides and herbicides washed off into waterways and wetlands

Depending on what the land use is within your catchment, or what activities are known to be of most prevalence, the education program can be tailored to suit a target audience. The following steps go through the process of identifying your target audience, defining objectives and forming methods to deliver the objectives. This starts with an investigation into the state of the issue and understanding the various conflicts and pressures, before reacting with a response.

The message might be: pick up your dog droppings, wash your car on the lawn, use less fertiliser, don't use fertiliser, pesticides or herbicides if it is just about to rain, or don't tip paint or chemicals down the drain. Step five details the process of creating and delivering a message.

Education and awareness programs focus mainly on quality source control; however, an education program may want to target or include quantity source control. For example, a program may want to encourage porous pavers so that stormwater can be infiltrated at source, and not enter stormwater infrastructure. In this way, the scouring and erosion effects of delivering high quantity bursts of stormwater through engineered drainage systems into wetlands or waterways can be decreased.

Step 2: Define your monitoring and evaluation methods

Monitoring and evaluation is detailed in Step 9. It is important to determine how the stormwater education program is going to be evaluated when you are designing the program. As each step in the design of the stormwater education program is worked through, the methods of how you will monitor and evaluate will be refined.

In Step 1, some level of understanding of the problem or issue should have been identified. Steps 3 and 4 outline the process of defining the stakeholders and target audience. This would be a good time for collecting some baseline information. This could be done by using phone or mail surveys with target questions or desktop research. This is discussed further in Step 4.

Other monitoring and evaluation methods you may wish to consider using include: change in practice, or water quality monitoring.

Step 3: Identify stakeholders

It is imperative that the education program identifies those individuals or groups that have responsibilities or are involved in some way in managing or protecting stormwater. Due to their involvement and ownership of the issue, many stakeholders will have knowledge, networks and resources that can add significant value to your project, such as: local government, Department of Water and Environmental Regulation, water service providers, a catchment management group and media.

It is important to identify the stakeholders, to involve them and to establish their views about the issue.

Partnerships can be formed to work together to solve an issue. At least one stakeholder should be from the target group.

Who are the key people in solving the problem? How will stakeholders be involved?

Step 4: Know your target group

Who do you need to reach? Who are you trying to influence with the project?

It is important to identify, get to know and involve your target group early in the project. Knowing the target group means much more than simple identification. A complete profile should be developed to identify the most effective communication methods to use.

A complete profile includes detailed demographic information such as age, locality, occupation, culture, interest, gender, socio-economic status and level of education. An understanding of the group's current knowledge, attitudes and practices concerning the issue will have to be gained. Finding out how the target audience receives information will help you develop, format and distribute your messages. What radio and television stations do they use; which magazines, newspapers or newsletters do they read? Do they belong to any organisations? Whose opinions do they value?

Any information that can be gathered on the target group will serve to benefit the education program. Researching the target group need not be complicated. It may involve setting up a focus group or discussion with a sample of people who are representative of the group. Other methods of gathering information may include surveys by mail and phone. These are both useful ways to get baseline information about a target audience, or by accessing information that may have already been gathered (from one of the stakeholders or a database for example).

Step 5: Determine objectives and outcomes

What do you want to achieve? What outcomes do you want? What are the key messages you want to create? How will achieving the objectives help solve the issue or problem?

Once the issues and the target groups are identified, it is necessary to determine the result you want from the education and awareness program. This can be defined by setting the goal, educational objectives and desired outcomes. The goal is a broad statement of what you want to achieve, such as, to undertake an education program to increase awareness of the connectiveness of stormwater pollution issues and encourage behaviour change. The objectives are how you want to achieve your goal, such as, to increase knowledge about the environmental impacts of stormwater pollution and to develop an understanding of the benefits of improved environmental management to the audience (e.g. economic). Outcomes are defined in terms of the effects and outputs you hope will result from the program, such as, increased knowledge and change of behaviour with respects to stormwater pollution.

How will the goals, objectives and outcomes be monitored and evaluated?

Step 6: Determine your methods

Determine which education tools and techniques are likely to work most effectively with the target group and whether the methods reflect the educational needs of the target audience.

Investigate methods, tools and techniques that will achieve the goals, objectives and outcomes – given time and financial constraints.

A mixture of techniques may increase the chances of success. Consideration will also need to be made whether there is an appropriate mix of informing techniques and those that facilitate action. Combining formats can reinforce the message considerably. For example, promoting environmentally friendly fertiliser use to homeowners through newspaper articles, community action days such as waterway and wetland walks, displays at shopping centres and promotional material such as stickers and pens creates interest in and supports such practices.

Education tools and techniques may include the following:

- printed material – in the form of newsletters or brochures, sent to each individual reader (household or business)
- other distribution material – fridge magnets, pens and car stickers
- media – newspapers, television, magazines and radio. Can be paid advertising or publicity through media releases or interviews
- interactive computer packages including CD ROMs and the internet
- launches and public releases by influencial community citizens (e.g. ministers and advocates)
- signs – at bus stops or on billboards
- displays – at local shopping centres or at special functions, festivals and trade displays
- courses through schools, universities, TAFE and community colleges
- training or train the trainer courses
- awards or accreditation programs as part of an integrated program
- demonstrations such as water quality monitoring
- talks, presentations and seminars
- individual advice, communication or instruction
- participation/involvement (meeting and discussions, road gully stencilling, planting and cleanup days and tours or field days, such as drain walks).

The application of some of these tools and techniques can be seen in the example section of this chapter. The mixture of tools and techniques can be quite different depending on the target audience.

Messages

There are two basic concepts that can form the basis of the messages in a stormwater education program, namely highlighting:

- the impacts of community activities on stormwater quality and the natural environment
- suggesting appropriate actions (from NSW EPA, 1998).

A key element to the success of your program will depend on how well you highlight the connection between people's activities and the resulting environmental damage. Highlighting the 'cause-effect' relationship in an education campaign can assist people to recognise that their actions can reduce their environmental impact.

To be effective, messages must be understood by the target audience and appeal to them on their own terms. The message should be specific and tied directly to something your target audience values, such as money or health. These are the customers and you want them to 'buy your product'.

Issues and impacts have been identified in step 1: analyse the problem or issue. Examples of issues and their impacts with possible causes are presented in Table 2. Table 3 gives some examples on messages that you may form based on the analysis of the problem.

Table 3. Example messages for stormwater education projects (adapted from: NSW EPA, 1998).

Key message	Actions to do more often	Actions to avoid
Changing motor oil It takes only one litre of oil to contaminate one million litres of water	Maintain the car, check that there are no oil or radiator water leaks and that fuel is burnt 'cleanly' by keeping your car tuned.	Don't maintain cars (including oil changing) where oil and grease may enter drains or groundwater. Never pour oil into the street drains.
Landscaping and construction (sediment) Sediment can be eroded from disturbed areas and be deposited into waterways.	Protect stockpiles from wind and rain by storing under secured plastic sheeting or tarpaulins.	Avoid piling sand and soil on areas where it can wash into the stormwater system. Don't wash cement mixers into the drains.
Gross pollutants (rubbish) Litter can blow into stormwater systems which reduces aesthetic appeal and can kill aquatic life.	Make sure that litter such as cigarette butts, cartons, fast food containers, plastic bottles and bags are disposed of correctly.	Never drop packaging or litter onto the ground.
Fertiliser and pesticide use Fertilisers can encourage algal growth in waterways.	Consider alternatives to fertiliser, such as compost. If you do fertilise, use slow-release fertilisers to the manufacturers directions, more will waste you money. Minimise areas of lawn, choose a water efficient and drought-tolerant lawn such as some varieties of Couch or Saltene, improve the soil before planting and apply a soil wetting agent to help prevent runoff. Grow a native garden. Consider natural alternatives to pest control chemicals.	Don't use fertilisers or pesticides when rain is forecast for the same day. Don't over fertilise, it will just waste your money and potentially threaten the environment.

Tips for effective communication

Community education needs to be delivered clearly from the outset. The messages need to:

- be clear and concise – what is the issue, how does the target group contribute to the stormwater pollution, what are ways to reduce these impacts. The message should provide clear cause, effect and remedy linkages. The audience should become motivated and be given a sense of ownershipof the issue and the solution.
- use plain English – everyday language should be used, and the use of jargon or technical terms should be avoided as much as possible. The message should be pitched at your audience.
- use simple messages – avoid overloading the audience. Chances are that if too much information is given at one time, much of it will be overlooked, the audience will become disinterested, and the message will not be delivered effectively.
- link messages ensure that each message clearly relates to the last sequence. The message should have a logical sequence.
- consider translation where required.
- be correct and up to date –the message should have a sound and current technical basis.
- encourage collaboration – seek input and feedback from stakeholders.

These steps apply not only to written information, but also to verbal communication.

Step 7: Consider funding

A primary practical consideration in developing an education and awareness program is establishing how much it will cost and who will pay.

It will be necessary to identify possible funding sources and the benefits for potential funding organisations. Potential sources of funding may include grants from local and State Government and private sponsorships.

Are there any in-kind opportunities? How will the project be modified if insufficient funding is available? In seeking funding, potential benefits must be effectively illustrated to increase their chances of success.

Step 8: Form an action plan and implement it

An action plan will need to be prepared to identify steps to achieve the program objectives. An actionplan identifies who has to do what and by when, what resources will be needed and also keeps the program on track.

The action plan should cover the ‘who, what, when, where and how’ theory. Timeframe, milestones, resourcing (money and people), and responsibilities are all necessary components.

Step 9: Monitor and evaluate

This requires the collection of information to show the effectiveness of the education and awareness program.

Monitoring and evaluation of the program can:

- help make decisions and recommendations about future directions
- identify the strengths and weaknesses of your project
- enable judgements to be made about the worth of the project
- determine stakeholder and target group satisfaction
- determine the rate and level of attainment of the objectives
- be used to correct, adjust or formulate ongoing steps in the program
- measure performance
- meets demands for accountability.

Did the project succeed in reaching the target community? Were the messages understood? What was successful and what wasn't?

Building an evaluation component into the program from the beginning will ensure some feedback is generated. The most important stage when evaluation and monitoring should be considered is when objectives are set.

Evaluation can be divided into planning evaluation, process evaluation and impact evaluation. Planning evaluations assess the likelihood that programs will achieve their objectives. This includes asking the questions such as 'are the objectives consistent with the goals', or 'has the target audience been sufficiently defined'. Process evaluations focus on implementation of activities as they relate to budget requirements, schedules and staff resources. This includes asking questions such as, 'do I have the resources to accomplish the identified objectives', or 'have I factored in enough lead time to get the materials published and distributed'. Impact evaluations assess the outcome or impacts produced by the outreach program and are directly tied to the original objectives. Thus the question to ask would be, 'to what extent did we achieve our objectives'.

The activity that results from this step could be the production of a report that summarises strengths, weaknesses and outcomes, with recommendations for future work.

5.1 Concluding remarks in developing a stormwater education program

There are three factors influencing education effectiveness:

- How prevalent is the behaviour that the program seeks to modify?
- How effective is the program in delivering the message to the population whose behaviour needs to be influenced?
- What is the most effective educational technique to actually change the identified behaviour? (Source: The Centre for Watershed Protection)

There is evidence to suggest that in addition to education, it is important to have a supporting infrastructure and social structure around individuals so that it is easy for them to comply with educational messages (Taylor and Wong, 2002). This may mean methods as simple as providing people with easy access to litter bins and recycling locations, together with appropriate education.

6 Resourcing an education and awareness program

Cost^ of education programs

Taylor and Wong (2002, p70) found 'the costs of educational and participatory initiatives for stormwater management vary greatly but have been documented, where available, for comparative purposes. Cost information of particular note included:

- Australian and overseas case studies demonstrate that regional and statewide stormwater awareness campaigns usually run for less than one year and typically cost AUD$0.42–$0.82 per capita (averaging AUD$0.62 per capita).
- intensive training programs such as the Master Gardener Programs cost about AUD$15,326–$19,157 per year to run, or $0.23 per person per year (when the costs are spread over the entire population of the programs' area of influence), or AUD$7.76–$15.52 per hectare of lawn managedthrough the programs.
- Most education-based, US urban nutrient management programs cost less than AUD$47,893 (US $25,000) per year.

Cost^ vs benefits

The majority of attempts to measure the performance of education and participation programs utilise simplistic styles of evaluation (e.g. measuring participation rates, changes in knowledge or changes in self-reported behaviour). Few attempts have been made to link educational programs with actual changes in stormwater quality and/or pollutant loads (US EPA 1997, cited in Taylor and Wong, 2002).

Structural source controls are usually tested in laboratory situations. The information gathered is used to predict performance in terms of nutrient and pollutant retention ability, and together with associated capital and maintenance cost estimates, can be used to assess the likely unit cost rate of pollutant removal.

It is more difficult to predict the effectiveness of non-structural source controls in water quality management because they cannot be readily tested by conventional methods. However, it can be concluded that control of pollutants at source using non-structural measures has the potential to be a very efficient water quality management option through minimisation or prevention of input.

Education programs are much less likely to have high engineering maintenance costs when compared with structural controls, such as Gross Pollutant Traps. Other benefits of education programs are:

- they can target diffuse sources and specific pollutants – the diffuse source nature of stormwater pollution means that structural control techniques are less effective and more costly.
- programs can be changed, so are flexible – structures are fixed into the landscape.
- programs can target the individual.
- programs can mobilise the community into a different mindset to achieve a more sustainable environment.

^: *The costings used in section 6 are from around 2000. Please adjust the costings for present day.*

7 Examples of program development and planning

The following examples follow eight steps (i.e. they do not explicitly address 'Step 2: design your evaluation methods' presented in this manual). The design of the evaluation methods, however, would have been planned at an early stage in all of these cases.

Example 1: Green Stamp Program

This is an accreditation program for the automotive industry developed and initiated by the Motor Trades Association WA in conjunction with the former Department of Environment that is now being adopted nationally.

For more information, please contact the WA Motor Trades Association.

Step 1: Issue

Due to the nature of the chemicals used and traditional processes undertaken automotive repairers are often seen as polluters of their local environment.

Traditionally, a lack of succinct, industry-specific information and training has seen this trend continue within the industry, with many businesses struggling to comply with their legislative requirements.

Consumers, though concerned about the environment, often don't consider the other environmental impacts of their vehicles and hence fail to recognise the additional commitment that many automotive repairers will make to manage their environmental responsibilities.

Step 2: Identify stakeholders

- Motor Trade Association of WA (MTA-WA).
- The former Department of Environment.

Step 3: Target group

- All facets of the automotive industry, including mechanics, spray painters and panel beaters, engine reconditioners, wreckers, car yards, detailers, mobile mechanics, radiator repairers, etc.
- Vehicle owners.

Step 4: Objectives

- To assist small to medium businesses in the automotive service industry to incorporate processes that avoid, reduce, reuse, recycle or dispose of their wastes in a cost effective, efficient and environmentally sensitive manner.
- Raise consumer awareness of the 'other' environmental impacts of their vehicles and encourage them to utilise the services of Green Stamp Accredited businesses to service and repair their cars.
- Raise the profile of those industry leaders that are including the environment in their operating objectives.
- Work with relevant government agencies to promote and encourage better environmental management within the industry.

Step 5: Methods

- Conduct obligation-free environmental audits to identify an individual business's current environmental impacts and provide practical solutions and if necessary, follow-up support.
- Compilation of industry-specific environmental guidelines that identify the environmental problem, the practical solutions and parties that can assist in their implementation.
- Via the Environmental Product and Service Directory, the Green Stamp has identified for automotive businesses the product and service providers in Perth that can help them to minimise or abate their environmental impacts.
- Delivery of environmental training seminars to managers and employees, educating them on the environmental impacts and practical solutions for responsible environmental management.
- Compilation and distribution of the Cleaner Times, an environmental newsletter for WA's automotive industry and related organisations and departments.
- Free drain stencilling to remind employees, contractors and visitors to premises that nothing exceptrain water should enter stormwater systems.
- Simplified environmental management plans to help businesses to monitor their practices and set a plan for future consideration.
- Dissemination of a range of Green Stamp information at www.greenstamp.green. This includes a list of Green Stamp accredited businesses, the environmental guidelines, the environmental self-audits for mechanical repairers and body repairers and the Environmental Product and Service Directory.
- Promotion of automotive businesses that have received the Green Stamp Accreditation. Launched at the end of 2002, the Accreditation is rewarding those businesses that are incorporating environmentally friendly practices by promoting them as industry leaders. It also provides an incentive for those businesses that are not incorporating environmentally sensitive processes to do so.

Step 6: Funding

- In May 2003, the Commonwealth government through Environment Australia's eco-efficiency agreements began to support the program at the national level. This funding support was directed towards assisting the other affiliated associations of the Motor Trade Association of Australia to implement the Green Stamp program's initiatives in their own states.

Step 7: Action plan

- Continued implementation of the Green Stamp program in WA, including the dissemination of the program's resources and initiatives throughout the automotive industry.
- Promotion of Green Stamp Accredited workshops to consumers.

Step 8: Monitor and evaluate

- Follow-up visits on 40 workshops that received an environmental audit found that 90 per cent improved at least three of their practices within three months and 86 per cent of those improved their overall environmental rating to the next level. (The 'environmental rating' is a four-tier scoring system developed by the Green Stamp to show businesses their current level of achievement and help them identify priority issues they should address to improve.)

- To improve the efficiency of the auditing process and the number of businesses surveyed, the audit was modified. Since then, over 200 environmental self-audits for mechanical repairers and body repairers have been distributed throughout the industry.
- The Green Stamp has presented several three environmental seminars. The seminars have attracted 126 participants from 99 companies and organisations. Though initially set up for automotive businesses, the Environmental Seminars have also attracted TAFE lecturers, Chamber of Commerce and Industry representatives, Local and State Government officers and students.

Example 2 (sourced from NSW EPA and DLWC, 2001): Hawkesbury-Nepean Phosphorus Action Program

A community education and awareness project initiated by the Hawkesbury-Nepean Catchment Management Trust to improve water quality in the catchment.

Step 1: Analyse the issue or problem

The problem was the current health of the Hawkesbury-Nepean River, including the growth of algal blooms and water weeds (caused by excessive amounts of phosphorus and increasing population growth).

Step 2: Identify Stakeholders

The stakeholders were:

- local government/catchment councils
- Hawkesbury-Nepean Catchment Management Trust
- Department of Land and Water Conservation
- Environment Protection Authority (NSW)
- Sydney Water Corporation.

Step 3: Know your target group

The target group comprised:

- catchment residents and the general community
- local government
- industry
- agriculture
- schools
- recreational and tourist groups.

Step 4: Determine objectives and outcomes

The goal was a healthy, diverse and productive Hawkesbury-Nepean river system for all. The objectives were:

- to increase public awareness about the harmful effect of phosphorus on river health
- to provide information about the sources of phosphorus
- to encourage individual and corporate actions to help minimise phosphorus and pollutants,
- to provide monitoring data to verify changes in the generation of phosphorus to reduce the incidence of algal blooms.

The outcomes were:

- increased community awareness about the harmful effect of phosphorus on the river
- less phosphorus generated in the catchment and entering watercourses
- change in attitude and behaviour within the community, leading to sustainable gains
- reduced chemical dosing required to treat phosphorus at sewage treatment plants.

Step 5: Design your methods

Methods comprised:

- appointing a full time project manager
- establishing a steering committee with representatives from the community, local government, government agencies and the Trust to set strategic direction for the program
- establishing a working party with joint representatives from government and the Trust to implement steering committee recommendations
- communication/marketing:
  - brochures, posters, T-shirts, drink coasters, bookmarks, carry bags, displays, catchment mail-out, calendar
  - media activities: radio and press advertising, competitions, trade journal articles
  - meetings with key stakeholders and organisations to enlist support and develop joint programs
  - regular media releases to key stakeholders
  - school activities, teaching resources, competitions
  - public awareness; operational monitoring.

Step 6: Consider funding

The program was funded by the Special Environmental Levy, the Hawkesbury-Nepean Catchment Management Trust, Department of Land and Water Conservation and some catchment councils. The agencies and the Trust also gave in-kind support.

Step 7: Make an action plan with timeframe and stick to it

The plan involved:

- a pre-benchmark survey
- strategic media and marketing plan
- a program launch
- a local radio campaign
- negotiating with Cumberland Newspaper Group for a regular column in each catchment paper and to support the program
- negotiating with John Williamson to lend his support to the program
- negotiating with Radio 2WS FM for community service time and support
- a Streamwatch Open Day
- intensive radio/print campaign
- launch of the local government Phosphorus Action Policy
- bus and carpark advertising
- mail-out to all residents in catchment
- school art, pledge and advertising projects

- a schools Presentation of Awards Day
- a field day for dairy farmers to promote dairy waste systems
- an on-site wastewater disposal training course
- an evaluation survey
- negotiating with Panthers for monthly column and to support the program
- negotiating with Sydney Water to monitor influent phosphorus at 3 STPs
- launch of the school education package Enough is Enough with Sydney Water
- preparing and circulating a report.

Step 8: Monitor and evaluate

Activities involved:

- a benchmark survey (telephone poll of 120 residents in six subcatchments)
- monitoring of progress (steering committee, monthly)
- monitoring of influent to 3 STPs (ongoing)
- media monitoring
- water quality monitoring of Hawkesbury-Nepean River and tributaries (EPA, Sydney Water, StreamWatch)
- monitoring changes in practices of local government and agriculture
- an evaluation survey (telephone poll of 120 residents in six subcatchments).

Example 3 (sourced from Douglas, 1998): Litter Awareness - Butt of our Beach, Waverley Council, NSW

Step 1: Issue: Cigarette butts are a major litter problem.

Step 2: Stakeholders: Local businesses, council, tourists.

Step 3: Target groups: smokers in public places.

Step 4a: Objectives:

- Raise awareness level of impacts of cigarette butts and other small pieces of litter on the environment
- Offer solutions to promote behaviour change
- Promote a positive image of Bondi Bay marine environment to show why it is worth protecting and how litter is affecting it
- Trial a variety of visual images to determine target group appeal.

Step 4b: Outcomes:

- Influence the behaviour of litterers and particularly smokers to dispose of their butts properly.

Step 5: Methods used:

- Development and distribution of four posters (three with beach/marine focus and one on Centennial Park)
- Distribution of butt bottles – a pocket-sized disposal option for use at the beach

- Installation of 25 ash cylinders at bus shelters, also posters were displayed at these shelters.

Step 6: Funding

Step 7: Action plan and implementation:

- Launch at Bondi Beach – with good media coverage
- Posters distributed and displayed at strategic outlets in the community
- Posters also sent to all coastal communities
- Butt bottles distributed at Bondi beach
- Ash cylinders installed at bus shelters and posters displayed.

Step 8: Monitoring and evaluation:

- No formal evaluation but anecdotally and by observation
- There has been a positive community response to the posters
- The ash cylinders and butt bottles are being used.

There is a recognised need for formal education but it was outside the scope and timeline of the project.

8 Linking programs

In WA, there are some programs and resources that already exist, which can provide resources when developing a stormwater education or awareness program. Some examples of these programs are the Healthy Rivers Action Plan, Drainage for Liveability, New WAter Ways, Phosphorus Awareness Project etc.

Your education and awareness program may wish to include linking in with one of these already existing programs.

Phosphorus Awareness Project

The aim of the Phosphorus Awareness Project (PAP) is to reduce phosphorus (P) and nutrient loads in the Swan-Canning catchment through changes in community and industry behaviour and practices resulting in healthy, sustainable river systems. This community awareness campaign seeks to promote appropriate fertiliser practices for the soils in the catchment, educate householders to use P free detergents in unsewered areas and consider P in pet droppings and bread fed to water birds. The PAP, formally known as the Phosphorus Action Group (PAG), was formed in October 1998 as a sub-group of the Canning Catchment Coordinating Group, now South East Regional Centre for Urban Landcare (SERCUL). The PAP is hosted by SERCUL and is supported by the Rivers and Estuaries Branch, Department of Biodiversity, Conservation and Attractions.

The project targets the community, schools, local government and high phosphorus using industries, through talks, displays, articles and demonstrations. The Algae Buster School Visitation Program educates school children on the effects of nutrients in river and wetland systems through hands on activities and is complemented by teacher resources. Community members are educated through presentations and displays at libraries, fairs, festivals and shows. Local government and industry are educated through presentations, seminars, trade displays and articles. A local government nutrient survey is also conducted annually to educate and assess behavioural change.

The PAP has a range of brochures, stickers and a magnet that are used to informand educate the community about nutrient sources. The Fertilise Wise Guide is also a community education tool consisting of a soil map poster with five associated brochures, one for each main soil type in the Perth Metropolitan Area, providing information to gardeners on appropriate fertiliser types and application rates for their soil type.

For more information, please contact the SERCUL.

South East Regional Centre for Urban Landcare

The South East Regional Centre for Urban Landcare (SERCUL) was formed in 2003 as an independent natural resource management body in Perth, WA. The SERCUL works together with the community, business and government to develop and implement projects that improve the health of waterways and other ecosystems. One of five sub-regional bodies, the area SERCUL covers takes in Dyarguu (the Canning River), the Southern Wungong River and their tributaries and parts of Derbarl Yaragan (the Swan River). It undertakes a variety of community and partnership projects related to water and environmental management.

For more information please contact SERCUL.

Local catchment groups

Local catchment groups can prove a source of much information when planning a stormwater education program.

For more information on local catchment groups, friends groups or conservation groups, please refer to the website of Natural Resources Management WA.

References

Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) and Australian and New Zealand Environment and Conservation Council (ANZECC) 2000, *National Water Quality Management Strategy No. 10 – Australian Guidelines for Urban Stormwater Management*.

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Reference details

The recommended reference for overall manual is:

Department of Water and Environmental Regulation, 2004-2007, *Stormwater management manual for Western Australia*, updated 2022, Government of Western Australia, Perth, available www.dwer.wa.gov.au.

The recommended reference for this chapter is:

Department of Water and Environment Regulation, 2007, *Performance Monitoring and Evaluation, Stormwater management manual for Western Australia*, updated 2022, Government of Western Australia, Perth available www.dwer.wa.gov.au.

Further information and resources

Internet resources

www.epa.nsw.gov.au

The NSW Environment Protection Authority (EPA) is the primary environmental regulator for New South Wales. It partners with business, government and the community to reduce pollution and waste, protect human health, and prevent degradation of the environment including water. The website has a wealth of information on best practice for water quality protection.

www.publish.csiro.au/book/2190/

The Urban Stormwater Best Practice Environmental Management Guidelines, published by CSIRO in 1999, were developed by EPA Victoria, Melbourne Water, Municipal Association of Victoria, local government, industry and Department of Natural Resources and Environment. These guidelines are referenced in this document.

The Urban stormwater management guidance (publication 1739) can help understand the risks from urban stormwater. It also forms part of the state of knowledge and support the preventative focus of the general environmental duty under the Environment Protection Act 2017 (the Act). It helps to minimise the risk of harm to human health and the environment through good environmental practice, and it provides information that will support the planning and design of new urban stormwater management systems.

www.environment.sa.gov.au

The SA EPA has some relevant useful information under the heading of "urban water legislation, policies and plans".

www.stormwater.asn.au

The Stormwater Industry Association (SIA) is for people and organisations involved with or concerned about stormwater in Australia. The mission of the Association is to provide an integrated Stormwater Industry of a quality that satisfies customer needs in an effective, efficient and affordable manner. Each SIA state committee has representatives from educational organisations, product manufacturers, local government and consultancies.

www.waterwatch.org.au

In recognition of the growing concern for water quality, the Commonwealth Government initiated Waterwatch in 1993.

Waterwatch Australia is a national community water monitoring program that encourages all Australiansto become involved and active in the protection and management of their waterways and catchments.

www.epa.gov/npdes/npdes-stormwater-program

US EPA has outreach kits, including an overview brochure on stormwater pollution, a homeowner's guide to preventing stormwater pollution and a poster for construction site operators on implementing sediment and erosion control practices, examples of which can be seen on these websites.

www.greenlifeindustry.com.au

The Greenlife Industry Australia has designed projects for teachers to use in schools. These projects include themes such as soil science, which provides a flow chart of the methods involved in checking and improving soil quality, design briefs to help students plan and plant native and heritage gardens, vegetables, fruit and pot

plants, and environmentally friendly pest control. The Nursery Industry Association also runs an accreditation program for nurseries and garden centres, which includes some environmental considerations. Contacts and further information can be found on the website.

ewater.org.au

The Cooperative Research Centre for Catchment Hydrology's mission is to deliver to resource managersthe capability to assess the hydrologic impact of land use and water management decisions at a wholeof catchment scale. The CRC is undertaking a number of research programs and the website is a good resource for stormwater information.

CRC have developed a model, Model for Urban Stormwater Improvement Conceptualisation (MUSIC),which enables users to evaluate conceptual designs of stormwater management systems to ensure that water quality objectives for their catchments are met. However, education programs are not one of the BMPs evaluated.