8 STRATEGY PLANNING

8.1 GENERAL

Urban stormwater strategy planning is undertaken fundamentally to establish stormwater quantity and quality management objectives for a catchment. It is ideally undertaken for large catchments such as Metropolitan or Municipal river basins, but may also be incorporated with stormwater master planning into a single plan for smaller rural towns and villages. The information in this Chapter has largely been adapted from NSW EPA, 1996a.

A stormwater strategy plan should identify the stormwater-related social and environmental characteristics that the community considers desirable or valuable enough to be preserved or restored. The plan should also develop appropriate management objectives and investigate strategies to satisfy these community values in an economical and ecologically sustainable manner.

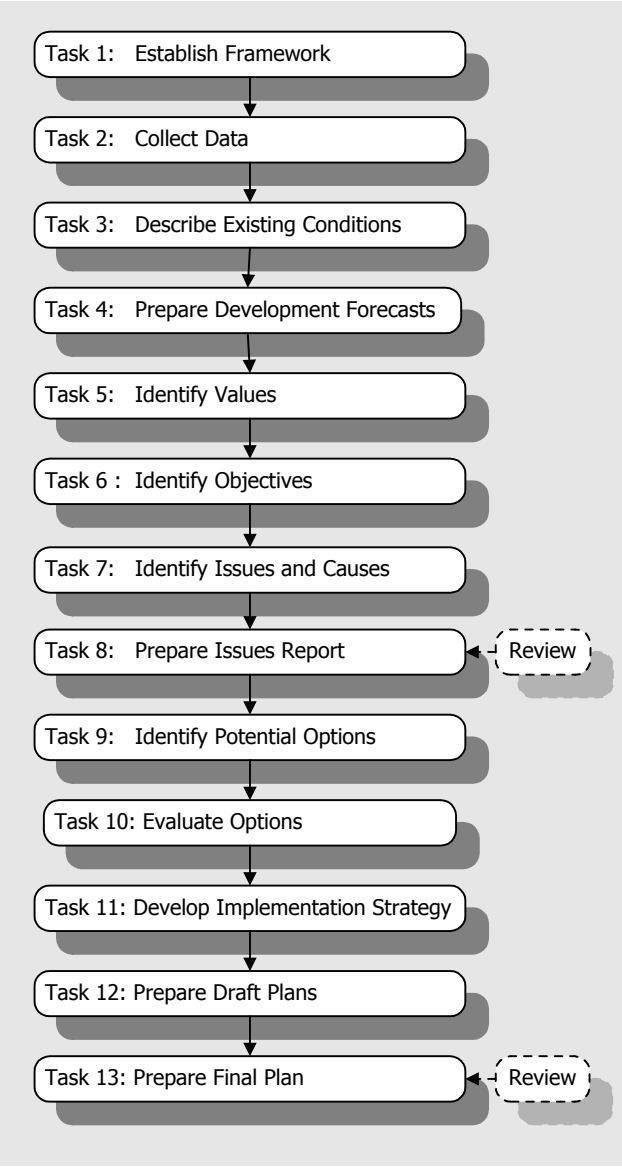

Figure 8.1 Stormwater Strategy Plan Tasks (after NSW EPA, 1996a)

Stormwater strategy planning is an ideal mechanism to:

- identify stormwater problems within urban areas that may warrant further detailed investigation and planning, such as flood mitigation works for major watercourses and local flooding or pollution problems
- provide a framework for the preparation of detailed stormwater master plans for new development, redevelopment, or specific problem areas
- enable a holistic approach to local area planning that is consistent and responsive to community values and expectations

8.2 PLANNING PERIOD

Stormwater strategy plans must be prepared to meet conditions up to some future point in time and should be based on a reasonable time period for implementation. The following factors should be considered in selecting an appropriate planning period:

- The expected economic life of treatment control management measures recommended in the strategy plan. The planning period should be of sufficient duration to assure essentially that full benefit will be derived from the recommended facilities throughout their useful life.
- The period over which future development forecasts will be reasonably accurate. The accuracy of forecasts is likely to decrease as the planning period increases. Inaccuracy of long-term forecasts, coupled with the small present values of benefits and costs far in the future, tends to favour shorter planning periods.

8.3 PREPARING STRATEGY PLANS

There is no rigid process for preparing stormwater strategy plans. The process to be adopted for a particular catchment will depend on the physical, ecological, social, and administrative characteristics of the catchment.

Figure 8.1 outlines a number of tasks that can be undertaken when preparing stormwater strategy plans. The planning process should be flexible and responsive to the characteristics of the catchment. The tasks outlined therefore serve as an example process rather than a prescriptive process.

The planning process outlined is relatively detailed and may place a burden on available resources. This detail is not intended to inhibit the development of strategy plans, but to provide an idealised scenario if resources were not limited. However, where resources are limited (either financial or staffing), interim or preliminary plans could be prepared. These plans could provide a framework for stormwater management that could be improved over time. There can be significant benefits associated with preparing and implementing interim or preliminary plans in

the short term rather than waiting until sufficient resources are available for a comprehensive plan to be prepared.

(a) Task 1 : Establish Framework

The first task in the process involves establishing the overall framework for the plan and the plan preparation process. This can involve establishing:

- the purpose of the plan
- the scope of the plan (e.g. interim, final)
- responsibilities for stormwater management within the catchment
- the presence of any existing stormwater management framework, including a Catchment Management Plan or a Metropolitan/Municipal Plan
- resource requirements for the preparation of the plan
- the physical boundaries of the plan (e.g. catchment, metropolitan area)
- consultation processes with the community and other stakeholders

(b) Task 2 : Collect Existing Data

Existing data must be collected on the physical, social, and ecological characteristics of the catchment, and its major stormwater infrastructure, such as rivers, streams, lakes, ponds etc. This data is useful for a number of purposes, including:

- describing the existing conditions within the catchment
- enabling the values of a catchment to be determined, from which management objectives can be derived
- assisting with catchment audits, by prioritising areas for investigation
- identifying constraints and opportunities for improved treatment control and houskeeping/education stormwater management practices

The data that can be collected in this task should be related to one of the above purposes to avoid collecting unnecessary data. A list of potential data needs is as follows with items italicised that may have a lower importance.

(i) Physical Characteristics

- soils, *including permeability, erodability, and dispersivity*
- *bedrock geology, including geochemical characteristics*
- topography, including slope characteristics
- climate, including rainfall, evaporation*, and temperature distributions*
- major services that may influence stormwater management practices (e.g. major telecommunication cables, major gas mains)
- bridge and culvert crossings
- point sources of pollution (e.g. sewage treatment plants)
- major sewer overflows
- existing treatment control stormwater management practices (e.g. detention basins, constructed wetlands)

(ii) Social Characteristics

- *population characteristics, including demographics and language characteristics*
- recreational areas, including water-related (e.g. riverside parks) and water-based (e.g. swimming, boating, fishing) activities
- landuse zoning
- landuse (e.g. commercial, residential, industrial, recreational) and land ownership categories (e.g. private, Local Government, State Government, Federal Government)

(iii) Waterway Characteristics

- physical characteristics of the stormwater conveyance system (e.g. piped, grassed floodways, lined or natural channels)
- physical characteristics of receiving water bodies (e.g. lakes, reservoirs, wetlands and estuaries) *including bathometry, flushing rates, and tidal conditions for estuaries*
- fluvial geomorphology processes for natural (or modified natural) stormwater systems and receiving waters, *including erosion and sedimentation patterns*
- surface hydrology, including flooding *and baseflow characteristics*
- water quality in stormwater conveyance systems and receiving water bodies, under wet and dry weather conditions

(iv) Ecological Characteristics

- aquatic fauna and flora characteristics, *including habitat* (this applies to both the stormwater conveyance system and receiving water bodies)
- riparian zone fauna and flora characteristics, *including habitat value*
- areas of urban forest

It is expected that for the majority of catchments, a large proportion of this data will not be readily available or cannot be quantified. It is difficult to provide a 'priority list' for identifying these characteristics, as their importance will vary between catchments.

For an initial stormwater management plan, a preliminary assessment could be undertaken using existing or readily available data. Any requirements for further information

that arise during the plan preparation process could be identified in the plan as an action to be implemented.

(c) Task 3 : Describe Existing Conditions

Using the available data collected in Task 2, the existing conditions within the catchment can be described. These conditions can include:

- topography, landuse, and soils
- hydrology (e.g. location, type, and severity of historic flooding, and low flow characteristics)
- water quality (e.g. wet and dry weather catchment and receiving water quality, major point and non-point sources of pollution)
- prohibited or prevented water uses
- watercourse and water body physical characteristics and fluvial geomorphology (e.g. channel erosion, sediment transport)
- aquatic habitat characteristics (e.g. aquatic ecology)
- aquatic ecosystems
- riparian and foreshore vegetation
- urban forest, and existing stormwater-related impacts on urban forest

A comprehensive assessment of these characteristics can be an extensive exercise. However, following the precautionary principle, the lack of detailed knowledge on these characteristics should not prevent the development of a plan to improve current stormwater management practices and prevent serious environmental degradation. Options for undertaking an assessment of existing conditions, which may provide additional data for the plan, include:

- Undertaking a preliminary assessment based on the existing or readily available information. One of the actions specified in the plan could be to undertake further detailed investigations. This information could also be supplemented by the use of engineering or scientific judgement.
- A site visit by a series of experts in fields such as hydrology, hydraulics, water quality, ecology, and geomorphology, who would use their knowledge of other stormwater systems to provide a preliminary assessment of these characteristics in a short report.
- Undertake additional studies before proceeding further. This may be appropriate where there is limited knowledge on significant characteristics that may have a strong influence on the strategy plan. This approach may not be warranted for an initial stormwater strategy plan.

Where a preliminary assessment is used to describe existing conditions, this should be identified in the plan.

(d) Task 4 : Prepare Development Forecasts

Potential future urban development areas and redevelopment areas should be identified and forecasts of the likely type and density of development estimated. The major issues that should be investigated for this task are:

- How will development progress in the catchment in the absence of any additional special controls?
- Assuming that mitigation measures are not implemented, to what extent will existing flooding problems be aggravated as a result of future land development scenarios in the catchment?
- Assuming that corrective measures are not implemented, to what extent will existing stormwater pollution problems be aggravated as a result of future development scenarios?

(e) Task 5 : Identify Management Values

There are a number of techniques available for assessing catchment and water body values that are relevant to stormwater management. In general, these values will not be quantitative, but qualitative or relative (i.e. high, medium, or low values). A preliminary assessment of these values could be undertaken, which may be refined following receipt of additional information. It may be useful to establish these values by holding a stakeholder workshop to obtain community input into the identification of values. These values may also be mapped over the catchment area.

(i) Ecological Values

The ecological values of a stormwater system relate primarily to the physical habitat characteristics, streamflow, and water quality conditions. A measure of the ecological value of a stormwater system is the extent to which a healthy and diverse ecosystem exists. Values for the following categories can be assessed:

- *Aquatic fauna* : important habitats in freshwater systems include substrate (bed material and geometry), woody debris, and aquatic plants. For estuarine and coastal systems, seagrass beds, mangroves, and saltmarshes are valuable habitats.
- *Terrestrial fauna* : habitats for terrestrial fauna including reptiles, mammals, and amphibians are extremely variable. From a stormwater management perspective, these habitats relate principally to riparian zone vegetation.
- *Aquatic flora* : the principal habitat for freshwater aquatic flora such as macrophytes is a substrate with appropriate attachment sites such as sediment. Streamflow characteristics and water quality also influence the value of a watercourse to macrophytes, particularly floating species. A sandy substrate is also required for seagrass beds in estuaries and coastal

waters, with flow characteristics, depth, and water quality also relevant.

- *Terrestrial flora* : the habitat value of a stormwater system to terrestrial flora is related to the morphology of the banks and floodplain, and the prevailing streamflow and groundwater conditions.
- *Avifauna* : the riparian zone, the stormwater conveyance system, and receiving water bodies can all provide habitats for land-based and water birds.

(ii) Social Values

- *Public health and safety* : a value of a stormwater system is that it should be capable of conveying stormwater runoff with an acceptable degree of risk to public health and safety. This also applies to water quality, particularly for bacterial pollution (and other pathogens) and mosquitoes.
- *Recreation* : stormwater systems can provide valuable water-based or water-related opportunities for both passive and active recreation.
- *Visual amenity* : stormwater systems and the riparian zone can provide aesthetically pleasing landscapes.

(iii) Economic Values

- *Minimising property damage* : surface water and groundwater can be managed to minimise their potential to cause property and infrastructure damage and associated economic loss.
- *Water use* : surface water or groundwater can be used to provide a water source for domestic, irrigation, stock, and industrial purposes.
- *Stormwater reuse* : stormwater can be re-used for potable or non-potable purposes to minimise the demand for reticulated water, potentially reducing the costs for major headworks projects and reticulation for conventional water supply systems.
- *Property values* : stormwater systems can enhance adjacent property values, particularly those adjacent to ponds, wetlands, lakes, and natural channels.
- *Fishing* : amateur and commercial fishing can be affected by stormwater, with the former often associated with tourism.

(f) Task 6 : Identify Management Objectives

Following identification of the values of a stormwater system and its catchment, management objectives can be developed to protect these values. If a Catchment Management Plan, Metropolitan/Municipal Plan, or other relevant plan has recommended a set of management objectives for a catchment, these objectives should be reflected in the stormwater strategy plan. The objectives may again be interim until further data is collected.

It may be appropriate to provide two sets of objectives. The first may be long-term objectives (effectively a 'vision' for the catchment) and the second being more short-term. These short-term objectives can be the basis for evaluating the performance of the plan at the end of a certain period (e.g. 3 years).

The actual objectives (particularly the short-term objectives) will depend on the adopted catchment values. The following is an idealised example of a set of long and short-term objectives.

(i) Ecologically Sustainable Development

- Stormwater management shall be based on the principles of ecologically sustainable development. These include the precautionary principle, inter-generational equity, conservation of biological diversity and ecological integrity, and improved valuation and pricing of environmental resources.

(ii) Long-term Objectives

- The impact of stormwater on public health and safety should be minimised.
- The risk of property damage due to stormwater and groundwater should be minimised.
- Disruption to traffic and pedestrians during frequent storm events should be minimised.
- Water quality in the catchment is to meet ambient water quality objectives.
- Flows within the catchment are to meet receiving water flow objectives.
- The impact of urban stormwater on weed propagation and growth in forests should be minimised.
- The value of indigenous riparian, floodplain, and foreshore vegetation is to be optimised.
- The watercourses within the catchment are to be in a state of dynamic equilibrium from a fluvial geomorphology perspective.
- The value of physical habitats for aquatic fauna within the stormwater system is to be optimised.
- Degraded ecosystems should be restored where practical, including aquatic habitats and riparian zones.
- The visual amenity of the stormwater system should be optimised.
- Opportunities for the multiple use of stormwater facilities are to be optimised, to the degree that they are compatible with other management objectives.
- The reuse of stormwater for non-potable water supplies should be encouraged in the context of total water cycle management.
- The impact of new urban developments on these objectives is to be minimised.

(iii) Short-term Objectives

- The ambient concentrations of nutrients within the catchment are to be reduced by [a specified amount].
- Litter is to be trapped from high litter generation areas, including [names of major city centres, shopping centres, active recreation areas, etc].
- The annual average flow from the catchment is to be reduced by [a specified amount].
- The majority of the urban stormwater entering the [name of forest reserves] is to be treated to minimise weed propagation and growth.
- Riparian vegetation along [name of watercourse] is to be restored with indigenous species.
- Erosion in [name of watercourse] is to be addressed, to create a watercourse in a state of dynamic equilibrium.
- The physical habitats for aquatic fauna in [name of watercourse] are to be restored.
- Recreational facilities and access adjacent to [name of watercourse] are to be improved.
- A strong emphasis should be placed on the management of stormwater at or near its source for both quantity and quality.
- The impact of new urban developments on these objectives is to be minimised.

Compromises may need to be made between these objectives for practical and economic reasons, to achieve balanced environmental outcomes, and to meet community expectations.

(g) Task 7 : Identify Issues and Causes

This step of the plan preparation process involves identifying the issues or problems that currently prevent, or may prevent, the adopted management objectives from being satisfied. These may be environmental, social, and managerial, and may include the following factors.

(i) Environmental Issues

- poor water quality, under both wet and dry weather conditions
- an inappropriate streamflow regime, for both flooding and baseflows
- degraded aquatic habitats
- channel erosion and sedimentation
- weed growth in urban forests
- degradation of ecologically-sensitive water bodies

(ii) Social Issues

- health risks associated with recreational use of polluted waters
- insufficient integration of stormwater systems and recreational facilities
- low visual amenity and landscape value of the stormwater system
- inadequate community involvement in stormwater management

(iii) Managerial Issues

- inconsistency between existing legislation and stormwater management objectives
- inadequate funding allocated to stormwater management or, management practices are not cost-effective
- inadequate coordination of Local Authority operations affecting stormwater management

These issues can be identified by a combination of:

- *a desktop study*, involving a review of existing information contained in reports, studies, and monitoring programs. This is particularly appropriate for identifying environmental issues
- *field work*, involving an inspection of the catchment, possibly by a catchment audit. This approach is appropriate for identifying environmental issues, although some social and managerial issues may also be identified
- *discussions*, involving staff from Local Authorities and relevant Federal and State Government agencies, which can provide information on a range of issues

The community and other stakeholders can also be involved in identifying management issues, which may encourage greater community 'ownership' of the management decisions.

Management issues and their causes can be generally identified, to a qualitative level, using existing information and the use of scientific or engineering judgement. However, the exact scope and causes of the management problems may not be quantifiable with existing data. Following the precautionary principle, this lack of quantifiable data should not prevent the preparation of a plan to address the issues. Further studies or monitoring may need to be undertaken in the longer term. If necessary, this can be undertaken during the plan preparation process, which may be applicable for important issues. Alternatively, this information can be collected as a recommendation of the management plan and interim decisions made based on the existing information.

A list of management issues that may exist in a catchment and their possible causes are outlined in Table 8.1.

Table 8.1 Potential Management Issues and Causes (NSW EPA, 1996a)

Category	Issue	Possible Cause
Environmental	Elevated nutrient concentrations	• excess fertiliser application in residential areas • excess fertiliser application in parks and gardens • washing cars in streets • sewer overflows • atmospheric deposition
	Elevated suspended solids concentrations	• poor erosion and sediment control of construction activities • channel erosion • washing cars in streets • sewer overflows
	Elevated bacterial concentrations	• faecal contamination from domestic animal droppings • sewer overflows
	Litter in watercourses	• insufficient number of rubbish bins • insufficient emptying of rubbish bins • littering in retail, commercial, and industrial areas
	Erosion of watercourses	• removal of riparian vegetation • increased flood flows following urbanisation • deposition of sediment from upstream sources
	Weed growth in urban forests	• nutrients from stormwater • weed propogules from residential gardens • removal of canopy vegetation
	Degraded aquatic habitats	• physical alteration of habitats • increased flood flows • increased sediment deposition • removal of riparian vegetation
	Degraded riparian vegetation	• physical removal of vegetation • introduction of exotic species
	Inappropriate streamflow regime	• increased runoff due to impervious areas • increased flow rates due to hydraulic efficiency of stormwater systems • insufficient stormwater re-use • reduced baseflow due to reduced infiltration • increased baseflow due to leaking water services
	Barriers to aquatic fauna migration	• culvert over watercourse • weir in watercourse • narrow bridge over estuary
Social	Insufficient integration of stormwater systems and recreational facilities	• no walking paths adjacent to watercourses • no fishing areas • no swimming areas
	Low visual amenity and landscape value of the stormwater system	• hard lined channels • degraded 'natural' channels • litter along watercourses
	Inadequate community involvement in stormwater management	• no catchment management committee
Managerial	Inconsistency between environmental planning instruments and stormwater management objectives	• environmental planning instruments do not reflect stormwater management objectives
	Inadequate funding for stormwater management	• insufficient allocation of rate income
	Inadequate coordination between government agencies and authorities	• poor communication between government bodies • poor integration of responsibilities across government bodies
	Inadequate coordination between stormwater managers within a catchment	• poor communication between managers • absence of a stormwater strategic plan for the catchment

A weighting system can provide a valuable means for assessing the relative contribution of each issue to catchment problems. Following identification of the major problems, a weighting can be allocated to the causes of the problems. A weighting can also be applied to the sources of each of the problems, in terms of their relative impact. The weightings can then be combined to yield a total score for each source, which can then form the basis of a priority listing. Although this is a subjective process, it is 'transparent' and avoids unstated assumptions. This process is illustrated in Figure 8.2 for a water quality issue.

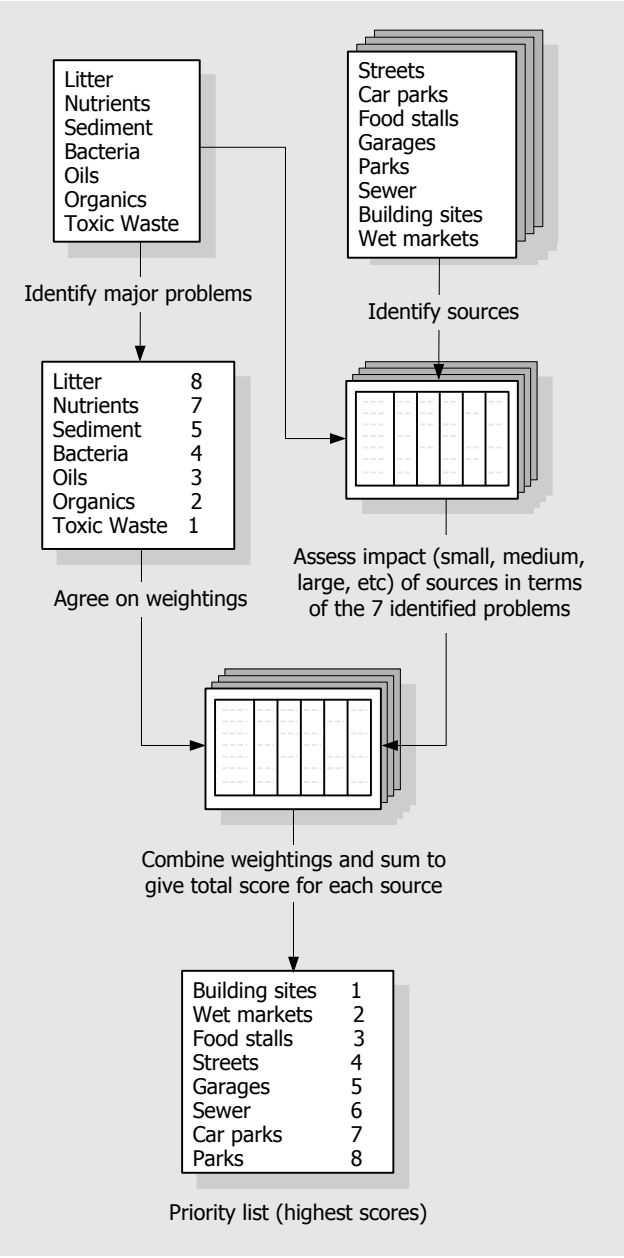

Figure 8.2 Priority Setting Process
(after NSW EPA, 1996a)

(h) Task 8 : Prepare Issues Report

The results of the previous investigations can be presented in a Stormwater Management Issues Report, which can be directly incorporated into the final Strategy Plan. The aim of this report is to summarise the management issues to enable stakeholder review before investigating potential management options. This may result in useful input from stakeholders on the importance of management issues and the values and objectives used to derive the issues, and potentially highlight additional issues.

The contents of the report may include:

- an introduction, outlining the purpose of the report
- a description of the catchment
- a description of existing catchment conditions
- the identified catchment values
- the stormwater management objectives
- the identified stormwater management issues
- identified problem areas or 'target' areas that warrant further investigation

(i) Task 9 : Identify Potential Options

A broad range of treatment control and housekeeping/education management practices is available to address identified stormwater management issues. Options incorporating different management practices that could be applied to address global problems and area-specific problems should be identified. A range of potential management practices is provided in Table 8.2.

The essential conceptual, technical, economic, environmental, financial, legal, administrative, political, and other features of each option should be examined as illustrated in Figure 8.3.

(j) Task 10 : Evaluate Options

A preliminary evaluation of these options can be undertaken by assessing:

- estimated capital cost (including any associated costs such as relocation of infrastructure)
- estimated operations and maintenance costs
- effectiveness in addressing the issue, including the ability to address multiple issues
- ability to complement other potential management practices
- land take requirements
- proportion of the problem/issue addressed by the option
- environmental impacts
- technical and administrative viability

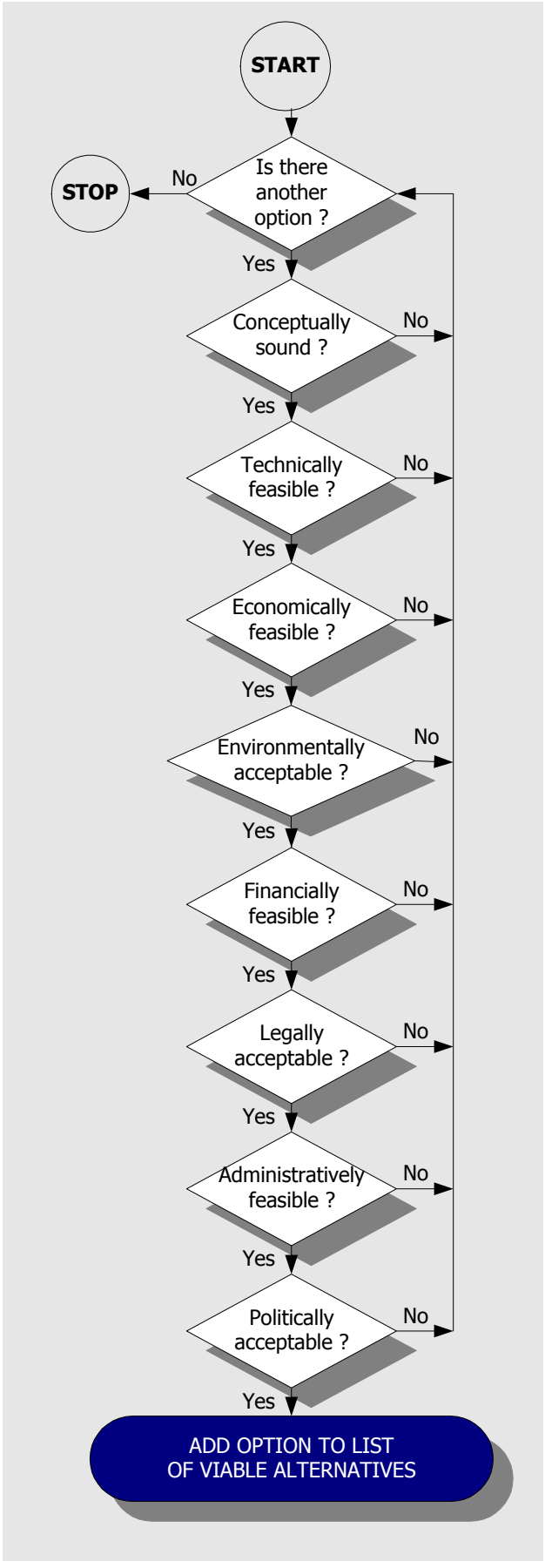

Figure 8.3 Development of Options (Walesh, 1989)

- whether legal requirements are satisfied
- consistency with policies on other related issues (e.g. public health)
- expected community acceptance

A weighting or ranking system (similar to Figure 8.2) can also be used to assess the ability of a range of options to address an issue (or multiple issues) and to allocate priorities for implementation. A weighting can be applied to each of the factors noted above and a score derived.

The most appropriate options can form the basis for detailed investigation and refinement during the preparation of stormwater master plans for specific areas.

(k) Task 11 : Develop an Implementation Strategy

Following the evaluation and ranking of a series of stormwater management actions for the catchment, it is advisable to review this ranking from a practical viewpoint before progressing further. This may be necessary, particularly if a simplistic evaluation and ranking procedure (such as that outlined in Task 9) has been employed. It is important that this 'reality check' be undertaken on an entire catchment basis to identify potential overlaps or synergies between different management practices. Also, it is essential to check that the identified options are realistic to ensure that the goals of the plan are achievable.

Following this review, a separate Implementation Strategy can be developed for each stormwater manager within the catchment. Each strategy should include a prioritisation of specific management actions to be implemented by each stormwater manager and a tentative timeframe for their implementation. The broad prioritisation of actions is aimed at allowing each stormwater manager to budget for the proposed actions in annual business plans.

The implementation strategy will be crucial to the success of the plan. Ensuring that there are appropriate funding mechanisms to implement the recommendations of the plan or recommending a staged approach based on funding availability can enhance the credibility of the plan. Failure to adequately address financial and institutional considerations can result in the recommendations of the plan being delayed or not implemented at all. If this occurs, the credibility of the plan may be compromised which can result in a loss of community support.

(l) Task 12 : Prepare Draft Plan

A draft of the proposed stormwater strategy plan should be prepared for review by stakeholders. The contents of the draft stormwater strategy plan should include:

- the contents of the Issues Report (refer to Task 7)
- a discussion of the identified management options
- the evaluation of the management options

Table 8.2 Potential Stormwater Management Practices

Issue	Category	Stormwater Management Practice	Applicable for	
			Existing	Proposed
Water Quantity	Housekeeping/ education	• planning controls (delineate floodplains)	(y)	y
		• purchase flood prone properties	y	n
	Treatment control	• infiltration basins	y	y
		• infiltration trenches	y	y
		• porous pavements	y	y
		• grass swales	(y)	y
		• detention basins	y	y
		• extended detention basins	y	y
		• flood storage in ponds and wetlands	y	y
		• urban watercourses	(y)	y
		• levees	y	n
		• rainwater tanks	y	y
Water Quality	Housekeeping/ education	• educational material	y	y
		• planning controls (land capability assessment)	—	y
		• water-sensitive urban design	—	y
		• control sewer overflows	y	—
		• label stormwater inlet pits	y	y
		• erect signs along streams, lakes, estuaries, etc	y	y
		• provide facilities for disposal of oils and harmful chemicals	y	y
		• conduct regular catchment audits, concentrating on commercial/industrial areas	y	—
		• undertake regular maintenance of treatment control measures	y	y
		• eliminate sewer connections to stormwater systems	y	—
	Treatment control	• construction erosion and sediment control	y	y
		• litter baskets	y	y
		• litter racks	y	y
		• litter booms	y	y
		• deflective separators	y	y
		• sediment basins	y	y
		• gross pollutant traps	y	y
		• catch basins	y	y
		• buffer strips	y	y
		• grass swales	(y)	y
		• extended detention basins	y	y
		• water quality control ponds	y	y
		• artificial wetlands	y	y
		• urban watercourses	y	y
		• triple interceptor traps	y	y
		• coalescing plate interceptor traps	y	y
		• infiltration basins	y	y
		• infiltration trenches	y	y
		• porous pavements	y	y
		• sand filters	y	y
Aquatic habitats	Housekeeping/ education	• preserve existing habitats	y	y
		• planning controls (delineate riparian buffers)	(y)	y
	Treatment control	• reconstruct habitats	y	y

Table 8.2 (continued) Potential Stormwater Management Practices

Issue	Category	Stormwater Management Practice	Applicable for	
			Existing	Proposed
Riparian Vegetation	Housekeeping/ education	• preserve existing vegetation • planning controls (delineate riparian buffers)	y (y)	y y
	Treatment control	• replanting	y	y
Channel erosion	Treatment control	• streamflow management • treatment control protection measures • energy dissipaters • riparian vegetation planting	y y y y	y y y y
Weed growth in forests	Treatment control	• water quality management • plant indigenous vegetation	y y	y y

- the Implementation Strategy developed for each stormwater manager within the catchment
- a monitoring program, which includes mechanisms for incorporating the results of the program into revisions of the plan
- a program for revising the plan and linking its implementation to the management planning processes of relevant government agencies and other stormwater managers
- a mechanism for the dissemination of information on the implementation of the plan and the results of any monitoring programs
- recommendations for any further investigations or studies

It is essential that the recommendations contained in the plan are realistic, making the goals of the plan achievable, otherwise there is a risk of losing a degree of community support. Support is likely to be maintained or improved if realistic achievable actions are recommended.

(m) Task 13 : Prepare Final Plan

Following receipt of comments from stakeholders on the draft plan, a final stormwater management plan can be prepared.

8.4 IMPLEMENTING STRATEGY PLANS

There are a number of institutional requirements that may need to be satisfied for the successful implementation of a stormwater strategy plan. These requirements are from a local government perspective and include:

- *Structure and responsibility* : A senior management representative may be nominated to take responsibility for ensuring that the plan is implemented and to report to council. The staff and sections responsible for implementing the plan should be clearly identified. The council can also take responsibility for developing a coordinated approach with other stakeholders to achieve the objectives of the plan.
- *Resourcing* : council should take responsibility for ensuring adequate resources are available to appropriate sections of the organisation. These resource requirements may include staff, information, expertise, equipment, and funding.
- *Training, awareness, and competence* : Council should ensure that all staff whose activities may have an impact on stormwater are aware of the causes of the impacts, the benefits of good stormwater management, and their specific responsibilities for implementing the plan. Training of staff and other stakeholders may also be required.
- *Communication* : Council should establish procedures for effective communication between stakeholders regarding stormwater management. Internal communication between sections and staff may need to be developed by specific procedures. Council can also establish procedures for reporting on the implementation of the plan and the results of any monitoring. This can be addressed in Council annual reports and management plans
- *Operational control* : For areas of council operations that can have an impact on urban stormwater (listed in Table 8.3), councils can define operating procedures to give effect to the recommendations of the plan and monitor the implementation and effectiveness of these procedures.
- *Emergency preparedness and response* : Councils can establish procedures for identifying and responding to stormwater-related emergencies such as floods and pollutant spills.

Table 8.3 Potential Influence of Council Activities on Stormwater

Council Activities	Potential Influence on Stormwater
Environmental planning	Urban capability assessment Stormwater management practices for new developments
Building approvals and inspections	Erosion and sediment control of building sites
Environmental health	Trade waste, discharges to stormwater
Parks and gardens	Maintenance activities (e.g. tree planting, fertiliser application, grass cutting)
Road maintenance	Various maintenance activities
Drainage system maintenance	Various maintenance activities
Waste collection	Litter management
Road and drainage design	Road route selection, drainage system design
Finance	Budgets for stormwater management
Library	Community education

8.5 MONITORING STRATEGY PLANS

There are two broad types of monitoring that can be undertaken for stormwater management, namely:

- water quality and biological monitoring
- observation monitoring

This is in addition to monitoring the performance of a strategy plan, which is undertaken by comparing planned actions against their achievement and deriving strategies for addressing any problems.

Stormwater monitoring can be undertaken for the following purposes:

- assessing the prevailing conditions within a stormwater system or receiving waters
- obtaining water quality data for use in designing new stormwater management practices
- determining the performance of existing stormwater management practices

The conventional approach to monitoring lies solely on technical monitoring programs. However, there is considerable benefit in undertaking primarily non-technical monitoring by the community. If the community is involved in monitoring the success of the plan, it can be expected that the community will be more likely to modify their behaviour if the objectives of the plan are not being met. Conversely, a sense of civic pride in their achievements can be generated if the monitoring indicates that the plan is succeeding.

Making the results of stormwater quality monitoring techniques readily available to the community, including both the detailed results of the program and a more widely circulated non-technical summary can assist this. Catchment Management Committees can be useful forums for both undertaking and reporting on the monitoring programs.

It is beyond the scope of this manual to provide detailed information on water quality monitoring techniques, and the reader should refer to the references provided. Where possible, stormwater quality monitoring should be undertaken at agreed sites or sites that have been used in the past for water quality monitoring to enable results to be compared.

Observation-based monitoring can provide a general indication of the existing conditions within a stormwater system and potentially highlight the need for more scientific monitoring. This monitoring can be undertaken by council staff or interested members of the community. The value of the monitoring may be enhanced if a pro-forma is developed, which indicates the date, time of day, weather conditions, flow conditions, and possibly flow depth. This approach will improve the consistency of observations.

Items that can be identified by this technique include:

- litter
- foam
- surface scum
- surface oil

- algae – surface or attached
- water clarity – turbidity, visibility depth
- aquatic plants (macrophytes) – emergent, submerged, floating
- organic matter (leaves, etc)
- condition of riparian vegetation
- bank erosion
- sedimentation

8.6 REVISING STRATEGY PLANS

A timetable should be developed for revising the plan. A revision to the plan may be appropriate:

- if significant additional monitoring data is available
- if significant additional funding for stormwater management becomes available
- following completion of significant additional investigations
- if the monitoring data indicates that the plan will not achieve its objectives

A revision to the plan does not necessarily need to involve the preparation of a comprehensive new plan. The revision could involve the preparation of a supplementary plan or an addendum to the existing plan.

As each catchment will differ in the need for a plan revision, it is difficult to provide firm guidance on when a plan should be revised. In metropolitan and large regional centres, the plan could be revised every 3-5 years, with a longer period possibly being appropriate for smaller rural towns.