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# Guidance for Operations and Environmental Quality Management System

## Water and Wastewater Utilities

Titan Engineering, Inc.

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# 1. Introduction

The IDB generally requires its clients to develop and implement an environmental management system (EMS) when investing in water and wastewater capital projects.[1] The EMS is typically developed after completion of the environmental assessment process. Depending on the project, this would include the performance of an Environmental Impact Assessment (EIA).

EMSs for IDB funded projects build upon information gathered in the environmental assessment process, in that the EMS is the mechanism to ensure the information, findings and decisions from the project evaluation process are captured and fully incorporated into an EMS for project management. However, a capital project[2] EMS is developed very early in a project's life cycle, at which point attention and understanding of operations are often limited. This is also the case for most public- and private-sector water and wastewater capital projects throughout the world. Typically, only a preliminary plan of operations is prepared, describing the general works that will need to be performed during operations based on a proposed plan for renovation, repair or construction. Thus, it is normal practice to limit the initial operations component of an EMS for a water and wastewater capital project to an outline of the general approach and key elements, and to design it to be expanded upon and detailed during the commissioning and startup of treatment facilities. For sewers and water main installation projects, it is somewhat easier to execute operations planning early in the project, because operational phase activities are more standardized and comparatively less complex than those of water or wastewater treatment plants.

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[1] Most projects require the development an Environmental and Social Management Plan (ESMP); for projects with significant impacts, development of an EMS is also required.

[2] This guidance addresses construction activities that are performed during utility companies' normal operations (e.g., ongoing maintenance and repair work at existing facilities), as opposed to during major construction of new works or major renovation of existing works, also called "capital projects", a term related to the separate and distinct way these projects are financed within an organization. Most companies (i.e., not just UCs) have a separate and distinct process for financing and performing major construction (i.e., capital projects) vs. ongoing maintenance and repair work.

A recently completed assessment of the environmental management programs of three water and wastewater utility companies (UCs) receiving funding from IDB indicated that additional guidance would be helpful to UCs regarding the development and implementation of environmental management programs[3] during the operational phases of UC projects. The findings show that construction-phase environmental management systems were generally effectively designed and implemented, but operations-phase environmental management programs were less so. The reasons for this disparity relate not only to the aforementioned comparative difference in available detail regarding activity in the operations phase, but also to the standard approach among UCs to managing major construction activities. That is, while most UCs perform routine operation and maintenance activities, they do not themselves perform major construction activities. These projects are typically outsourced to construction contractors that are responsible for environmental, health and safety requirements for all aspects of the project. Further, the major costs associated with implementing a management program can be calculated and included in the construction project budget. For these reasons, construction-phase management plans for IDB projects are typically more comprehensive and representative of actual activity performance than operations-phase plans.

Thus the primary objective of this Technical Note is to provide guidance to UCs either for improving the operations-phase implementation of a current environmental management system or for developing a system. The guidelines presented herein provide the approach, content and implementation protocols for developing a completed operations component of the EMS (i.e., the Operations and Environmental Quality Management System, or "OEMS").

An OEMS can be organization-wide or site-specific. Therefore, the basic steps for developing an OEMS are the same whether it applies to a single operating unit, such as a treatment plant, or is utility-wide. In cases where there is already an existing OEMS for operations, there would typically

[3] The term "Environmental Management Programs" is meant to include all types of management programs used by different companies.

be (or should be) a process or procedure that governs the preparation and integration of changes required by system additions or modifications.

This guidance establishes the content for a new or revised OEMS, as well as criteria for developing system elements. The document is designed to assist project sponsors in understanding what IDB expects in an OEMS for water and sanitation system operations. This document is not a model OEMS. This document is intended to provide direction on the preparation of an OEMS.

## 2. Approach

The primary functions of water and wastewater utility operations are to provide potable water and to collect, treat and dispose of wastewater within a defined service area. The objective behind the establishment of most water and wastewater utilities is the promotion and protection of the public health. Protection of the environment is a much larger, more complicated and more difficult task.[4] If a utility is unable to demonstrate excellence in providing quality water and wastewater service, it is unlikely that it will be successful in protecting the environment. Hence, this technical note proposes an OEMS based on integrating protocols promoting excellence in service delivery with those directly targeting environmental responsibility and sustainability. It does so in part by requiring the establishment of UC-specific performance metrics for both**.**

While IDB traditionally has required that an EMS for Borrower activities be consistent with the International Organization for Standardization (ISO)'s ISO 14001 (Environmental Management Systems), there are also other protocols that are equally effective, if not more so, for use by UCs. Indeed, ISO 14001 — or any other protocol — does not in and of itself indicate that operations are environmentally responsible and sustainable.[5] For example, ISO 14001 has several known areas for improvement, which are anticipated to be addressed in the 2015 revision to the standards.[6] Principal among these

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[4] As promoting public health is their core objective, UCs protect the environment by providing high-quality water and wastewater service. In other words, providing good water and wastewater service does not need to be in conflict with protecting the environment.

[5] http://opim.wharton.upenn.edu/risk/library/WP2007-07_ISO-Cert.pdf

[6] http://www.iso.org/iso/home/news_index/news_archive/news.htm?refid=Ref1547

deficiencies is a focus on **processes** rather than **outcomes**. Another key recommendation for improvement is that the new requirements be written so that they prescribe more than just "best in class levels," as such definitions have been shown in some cases to discourage and/or impede implementation for entry-level organizations.[7] Recommended methods to address these issues include the use of "maturity matrices," which can be applied in increasingly comprehensive manners.[8] An example of a typical maturity matrix in the context of ISO 14001 is shown below.

## Figure 1. Example of a maturity matrix

| System Maturity | | | |
|---|---|---|---|
| **Management System Criteria** | **Newly Established** → | | **Fully Embedded** |
| **Training and Awareness Raising** | Basic environmental awareness provided; further training provided as required. | Frequent awareness raising programs run; specific training needs periodic evaluation. | Continual awareness raising programs; staff training needs continual assessment, including planning for future needs and capacity. |

[7] http://opim.wharton.upenn.edu/risk/library/WP2007-07_ISO-Cert.pdf

[8] The term "maturity matrix" is taken from the management process known as "Implementation Maturity Model Assessment" (IMM). IMM is an instrument to help an organization assess and determine the degree of maturity in its implementation processes. It is not the intent of this document to add to the complexity of environmental and quality management by introducing another management approach. In the context of this technical note, the concept of organizational maturity refers to the process of allowing an organization to self-assess its current situation and implementation capabilities and to determine how and when it should pursue change. At the heart of a maturity matrix is a self-evaluation of the degree of sophistication (or "maturity") a particular aspect of a management system. This enables the identification of weaknesses and targets areas for improvement. Noted recommendations for improvements to ISO14001 include the use of Maturity Matrices, as reflected in http://www.iema.net/system/files/ems20briefing.pdf.

This guidance, therefore, while consistent with ISO 14001, also incorporates elements that are designed to increase the effectiveness of a developed program and its implementation. This approach is based on the view that the environment is improved by the very existence of water and wastewater utilities. There are obvious and substantial environmental benefits stemming from the existence of an agency focused specifically on protecting watersheds in order to preserve and improve runoff water quality, as well as on collecting, containing and treating wastewater. To the extent that the utility continuously improves an aspect of service quality, such as wastewater treatment effectiveness, it improves (i.e., reduces) environmental impact. This technical note recommends an OEMS committed to "continuous improvement," guided by the practices of institutional self-awareness and self-improvement. Such practices should underlie the development of "maturity matrices" in order to achieve performance quality and environmental success.

The development of the OEMS requires a thorough assessment of potential environmental risks and positive or negative environmental impacts. The process provides a system for prioritizing and addressing environmental risks and opportunities, within the bounds of fiscal and organizational reality. An OEMS is not only an internal management system; it is also a mechanism for communicating performance to outside entities. This important topic is discussed further in Section 2.1.2.

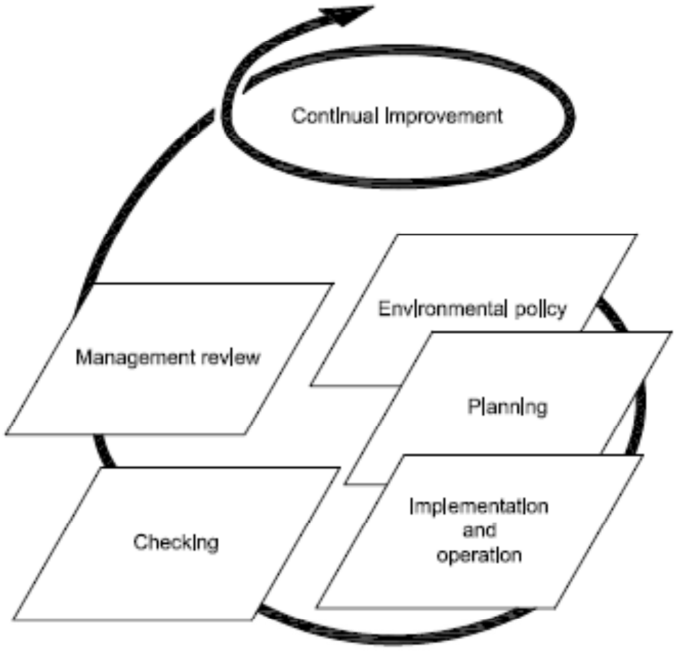
The proposed OEMS provides a framework to identify and manage the environmental aspects of ongoing utility operations, as well as those aspects that arise after completing a major new capital project or upgrading an existing one. Development of an OEMS ensures environmental issues associated with operating water or wastewater utility are identified, evaluated, and managed in a systematic way, and that management of those issues is integrated.

Thus, this technical note uses the ISO 14001 format as the backbone of water and wastewater utility OEMS, with certain sections of ISO 9001 paraphrased for clarity and embedded to promote quality in operations. Requirements of the Drinking Water Supply and Wastewater Standards (ISO 24510, ISO 24511 and ISO 24512) are incorporated to provide performance standards for water and wastewater operations. This integrated approach is a fundamental element

of the OEMS development protocol and is consistent with the standard quality system principles of the "plan-do-check-act" (PDCA) model.[9]

Figure 2 below illustrates the PDCA framework, while Figure 3 illustrates an interpretation of PDCA in the context of quality management.

## Figure 2. PDCA framework




NOTE This International Standard is based on the methodology known as Plan-Do-Check-Act (PDCA). PDCA can be briefly described as follows.

— Plan: establish the objectives and processes necessary to deliver results in accordance with the organization's environmental policy.

— Do: implement the processes.

— Check: monitor and measure processes against environmental policy, objectives, targets, legal and other requirements, and report the results.

— Act: take actions to continually improve performance of the environmental management system.

Many organizations manage their operations via the application of a system of processes and their interactions, which can be referred to as the "process approach". ISO 9001 promotes the use of the process approach. Since PDCA can be applied to all processes, the two methodologies are considered to be compatible.

[9] The PDCA model is a standard iterative four-step management method used in business for the control and continuous improvement of processes and products.

### 2.1. Integrated standards

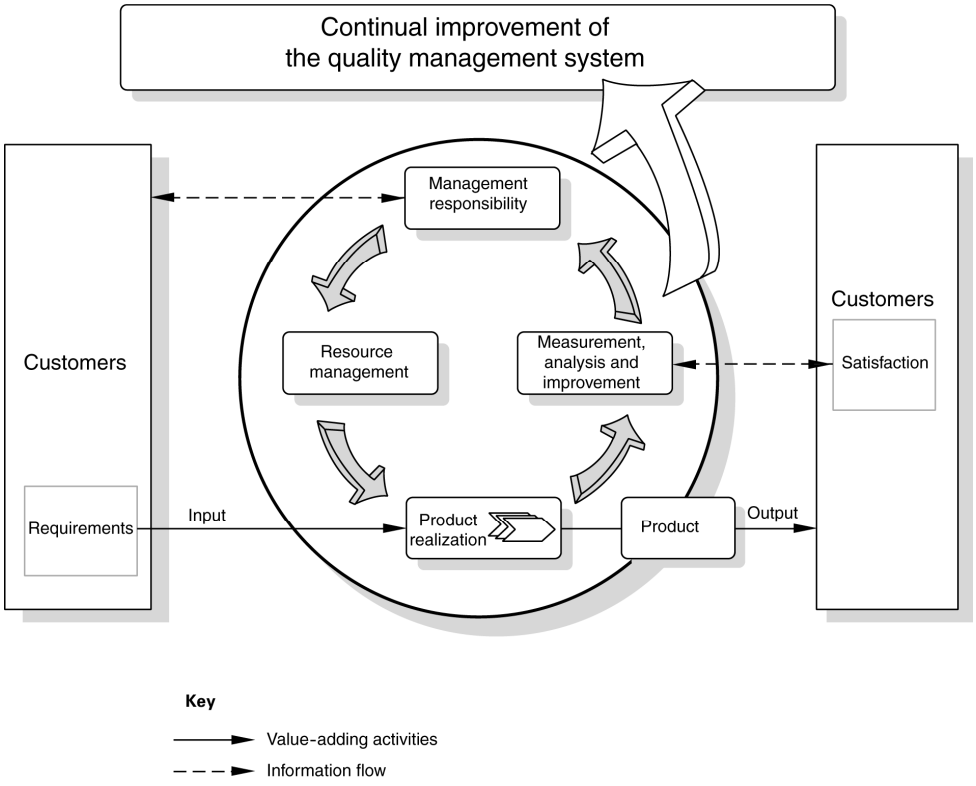
As described above, this guidance proposes an integrated management system based on incorporating ISO 9001 and ISO 14001 quality protocols, as well as ISO Drinking Water Supply and Wastewater Standards (ISO 24510, ISO 24511 and ISO 24512).

#### *2.1.1. ISO 9001 and ISO 14001*

As previously mentioned, communities and the environment benefit from the existence of properly operated water and wastewater utilities, even without specific environmental improvement programs or objectives. Quality of the environment and the health of a local community are both greatly improved when a country, society or community has an organization or organizations that provide safe drinking water and/or adequate collection, conveyance and treatment of wastewater. Environmental improvement is realized because clean water requires that its source be protected and managed. Collection, safe conveyance and treatment of wastewater have high-value health and environmental benefits. The quality of utility operations and planning are important determinants of the degree to which the environment and health are improved.

ISO 9001 was first published in 1987, and is the best-known standard for quality assurance and quality management in the manufacturing and service industries. ISO 9001 defines the quality management process as a regimen of planning, executing, checking and assessing opportunities for continual improvement in understanding customer requirements and providing customer satisfaction. The ISO 9001 operating diagram is presented in Figure 3 below.

**Figure 3. Model of a process-based quality management system from ISO 9001**




Just as ISO 9001 is the best-known quality standard, ISO 14001[10] (initially published in 1996), has become the best-known standard for environmental management systems. Over the years, updates to the two standards have made them structurally and technically correspondent.[11]

[10] ISO 14001 is in fact a series of international standards on environmental management. It provides a framework for the development of an environmental management system and a supporting audit program. ISO 14001 was first published as a standard in 1996 and is often seen as the cornerstone standard of the ISO 14000 series. It specifies a framework of control for an Environmental Management System (EMS) and is the only ISO 14000 standard for which it is currently possible to be certified by an external certification body.

[11] Both standards have been updated since initial publication (ISO 9000 was last updated in 2008 and ISO 14001 in 2004). Updates will be published to both in 2015.

ISO 14001 and ISO 9001 are integrated throughout this guidance to promote and ensure the quality of utility operations and environmental protection.

### *2.1.2. ISO 24510, ISO 24511, ISO 24512*

ISO and multiple international organizations led by the United Nations have recognized the universal need to provide specific guidance to utility operators on the management of water and wastewater utilities in order to improve quality in the delivery of water and wastewater services. To address this need, ISO in 2007 developed three separate but linked standards:

- **ISO 24510:** Activities relating to drinking water and wastewater services — guidelines for assessing services and improving them for users
- **ISO 24511:** Activities relating to drinking water and wastewater services — guidelines for managing wastewater utilities and assessing wastewater services
- **ISO 24512:** Activities relating to drinking water and wastewater services — guidelines for managing drinking water utilities and assessing drinking water services

These standards were designed to help water utilities meet the expectations of consumers and conform to principles of sustainable development.[12] They provide guidelines for the assessment, improvement and management of water and wastewater services and have been published in English, Spanish and French. The new standards also provide multiple criteria and methods for the assessment of service quality. The objectives in developing the standards consisted of the following:[13]

- Improve dialogue among stakeholders;

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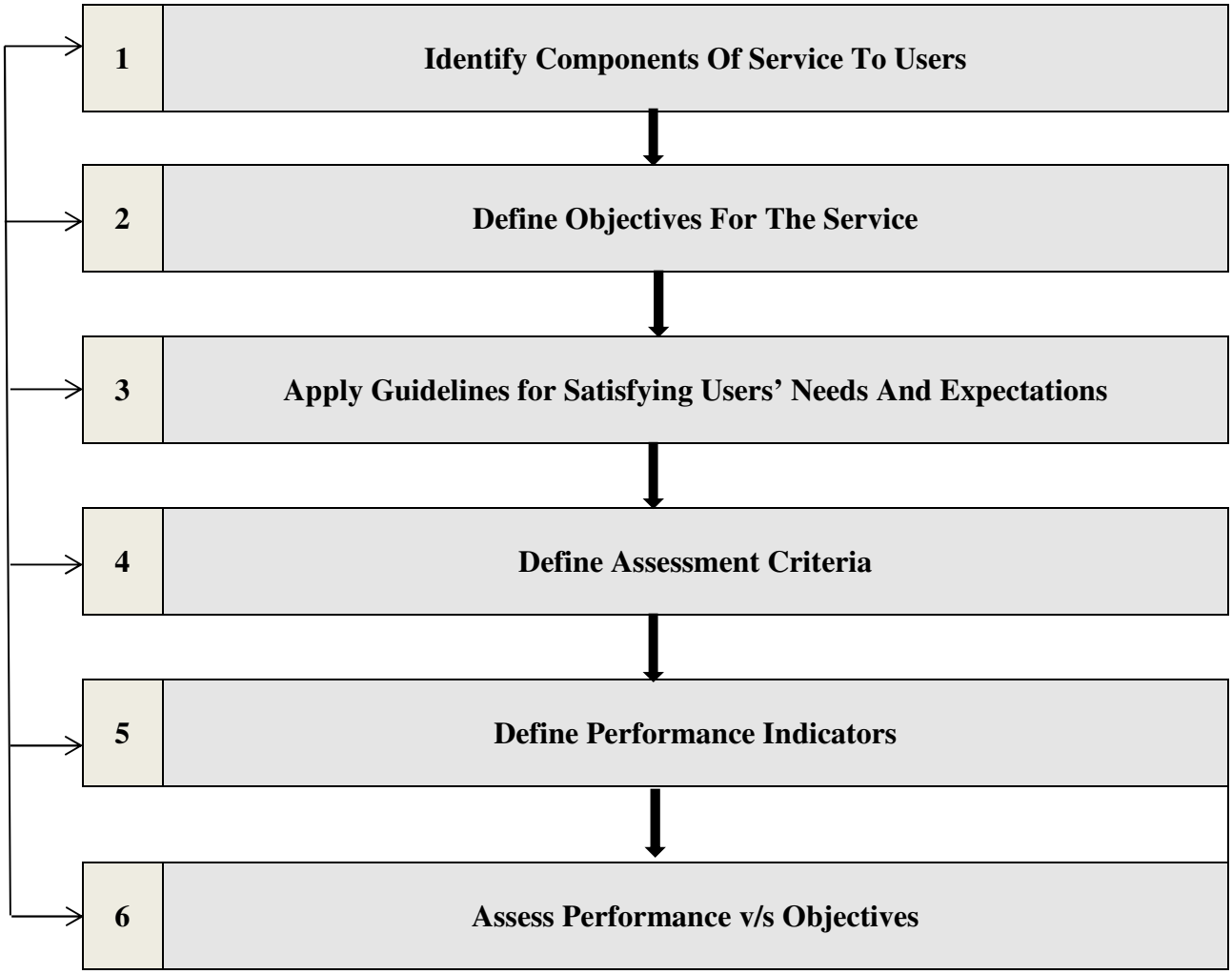
[12] A standard for crisis management of water utilities is also underway. See http://www.iso.org/iso/iso_and_water.pdf.

[13] http://www.wau.boku.ac.at/fileadmin/_/H81/H811/Skripten/811317/rohrhofer_KaRo_CapitalWater_ISO.pdf

- Develop a mutual understanding of responsibilities and tasks;
- Establish Service Provider objectives that can be adapted locally and comply with mandatory requirements laid down by the relevant authorities;
- Assess the quality of services provided; and,
- Monitor the performance of water utilities for both the interest of users and the protection of the environment.

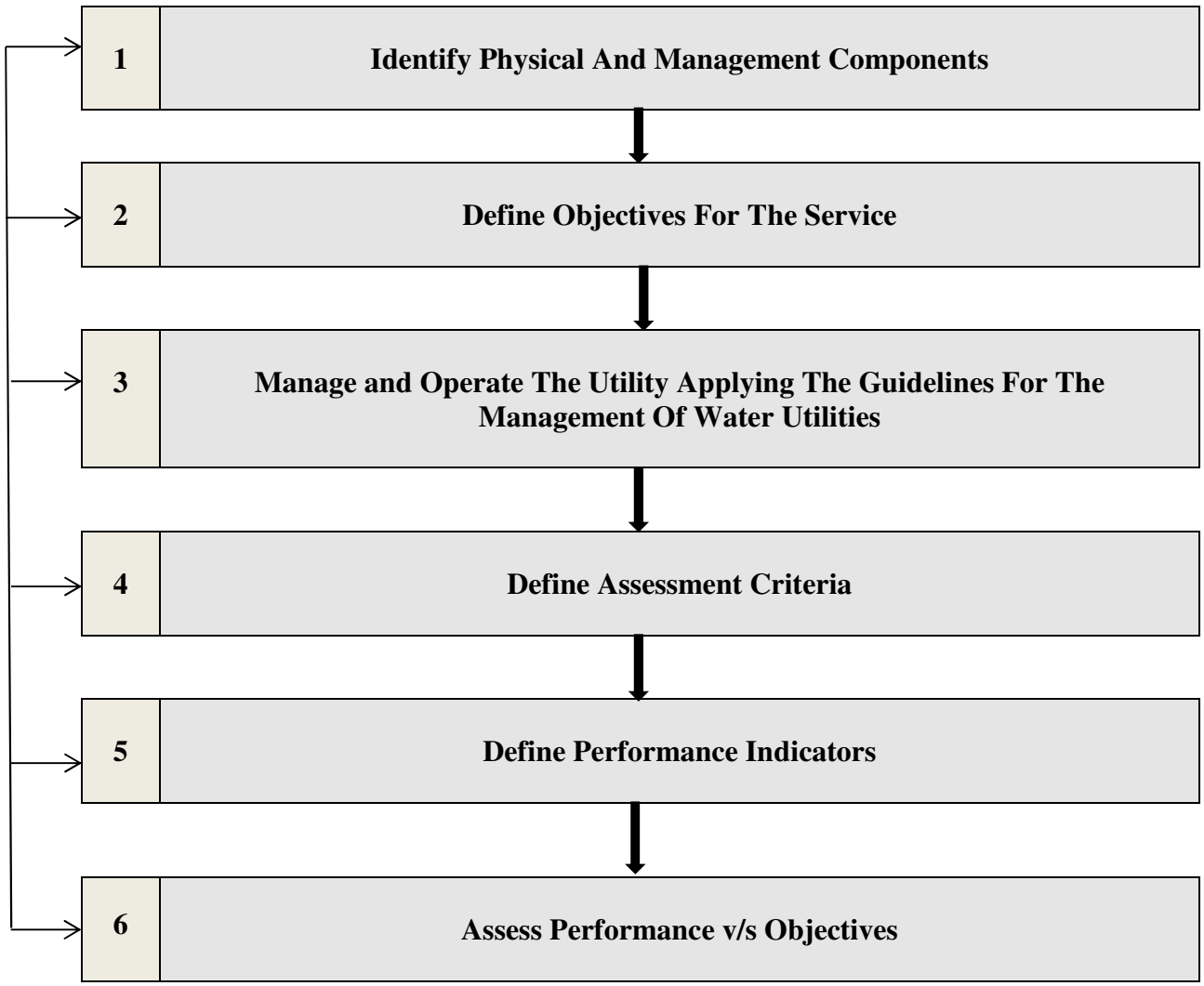
**Figure 4. Content and application of ISO 24510**



The recommendations of the three standards were intended by the ISO Technical Committee to be adopted by water and wastewater utilities. Because the standards were developed for water and wastewater utilities, they are written so that concepts and requirements are easily understandable and relatable for utility management and staff. Importantly, these standards also incorporate concepts of continual improvement and development of performance indicators not as clearly addressed in ISO 14001. As shown in Figures 1 and 2, the components of these standards align with both ISO 14001 and 9000. They moreover specifically require development of performance indicators.[14]

[14] However, as will be discussed, they do not include the development of specific targets to meet established objectives included in this guidance.

**Figure 5. Content and application of ISO 24511 and ISO 24512**




These standards do not explicitly assign environment impacts or aspects a level of importance that meets the requirements of ISO 14001 and other environmental management system standards. However, in many ways, these standards elevate the importance of the environment by assigning the environment and users coequal stakeholder status. Furthermore, the standards go even farther than ISO 14001 and ISO 9001 in that they specifically require attention for resource conservation and sustainability. The new standards were designed to conform to the

requirements of ISO 9001 and ISO 14001. Each of these important standards is discussed in more detail below.

## ISO 24510

ISO 24510 includes an inventory of user[15] needs and expectations and provides for each one a suggested performance indicator and/or guidance for improving to meet that expectation. For various reasons, the guidance and performance indicators may not be applicable in all circumstances or may not be applied yet in some countries. In such cases, they have to be adapted to local conditions or they considered a goal for continuous improvement. Aspects considered include: access to water and sanitation services, service quality (price, continuity of water supply, etc.), contract management and billing (e.g., response to billing complaints), relationships with users (visits to users, participation of the users, etc.), protection of the environment (efficiency in the use of resources, environmental impact, etc.), safety and emergency measures and water quality, among other considerations.[16]

## ISO 24511 and ISO 24512

The ISO 24511 and ISO 24512 standards address wastewater and drinking water systems at any level of their development (e.g., collective or semi-collective networks, on-site systems, treatment facilities). These standards set out in sequence a description of water services and briefly describe the physical (infrastructural) and managerial (institutional) components of utilities. Core objectives for water services considered to be globally relevant at the broadest level (e.g., protection of public health, provision of services, sustainability of water utilities, environmental protection) are set out, followed by guidelines for managing utilities. These objectives are then related to examples of possible actions that may be taken to achieve them. Each objective can also be characterized by related service assessment criteria.

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[15] Users include those receiving water and sewer services.

[16] This explanation of the content of ISO 24510 is adapted from http://planbleu.org/sites/default/files/upload/files/EPI_1_ES_35_Enrique_final_EN.pdf

Both standards contain similar objectives, including the following:

- Protection of public health
- Meeting users' needs and expectations
- Provision of services under normal and emergency conditions
- Sustainability of the water/wastewater utility
- Promotion of sustainable community development
- Protection of the natural environment
- Protection of the built/public environment

Extensive discussion and examples of service assessment criteria, written in language that should be familiar to UC operators, can be found in Annex E of both ISO 24511 and ISO 24512.

Finally, for each service assessment criterion, there is a range of possible related performance indicators that may be used to assess the performance of the service. Implementation of these ISO standards does not depend on adoption of the ISO 9000 and/or ISO 14000 series standards. Nevertheless, these standards are consistent with and supportive of those management systems standards. ISO 9000 and ISO 14000 mainly deal with the quality and environmental management of processes.

The ISO 24511 and ISO 24512 standards and guidelines were designed not to be subject to certification. Implementation of an overall ISO 9001 and/or ISO 14001 management system may facilitate the implementation of these standards. Conversely, these standards help achieve the technical provisions of the ISO 9001 and ISO 14001 standards for organizations that choose to implement them. These standards are also consistent with the principle of the "plan-do-check-act" (PDCA) approach: they link, through a dynamic and interactive process, general methods and tools for developing locally adapted specifications and objectives, together with the management components and activities necessary for assessing performance.[17]

[17] Ibid.

More specifically, the focus of the three standards, as stated in Section 0.3 of ISO 24510, is as follows:

> "The guidelines given in this International Standard, ISO 24511 and ISO 24512 focus on users' needs and expectations and on the water services themselves, without imposing a means of meeting those needs and expectations, the aim being to permit the broadest possible use of this International Standard, ISO 24511 and ISO 24512 while respecting the cultural, socio-economic, climatic, health and legislative characteristics of the different countries and regions of the world. It should therefore be understood that, in the short term, it might not always be possible to meet the expectations of local users. This can be due to factors such as climate conditions, resource availability and difficulties relating to the economic sustainability of the water services, particularly regarding financing and the users' ability to pay for improvements. These conditions can limit the achievement of some objectives or restrict the implementation of some recommendations in developing countries. However, this International Standard is drafted with such constraints in mind and, for example, allows for differing levels of fixed networks and the need for on-site alternatives. Notwithstanding the need for flexibility in terms of engineering and hardware, many recommendations in this International Standard, such as consultation mechanisms, are intended to apply universally."

Finally, as noted in Section 2, one of the major roles of an OEMS is to serve as a mechanism for communicating performance to outside entities. The standards referenced above also provide the most complete guidance for external communications. In particular, users should be referred to section 5.5 of ISO 24510, entitled, "Promoting a good relationship with users." This section provides concise guidance for communicating to utility customers (i.e., the general public). Heading titles include the following:

- Written contracts
- Telephone contacts
- User visits to the offices of the water/wastewater utility
- Visits to user
- Complaints and requests
- Notification of restrictions and interruptions
- Availability of service information
- Community activities

- Participation of users

For internal communications, ISO 24510, ISO 24511 and ISO 24512 promote the adoption of performance indicators. Performance indicators provide management with performance measures that are unique and appropriate for measuring achievements of an activity, process or organization in a true and unbiased way. The standards provide guidance and examples for developing standards.

This OEMS guidance intends for the utility to incorporate the protocols established in ISO 24510, ISO 24511 and ISO 24512 in their entirety.[18]

### 2.2. Implementation

As noted previously, IDB has recommended — and in some cases required — that an EMS be developed and adopted by any water and wastewater utility seeking financing for a capital project. The EMSs have generally been required to be consistent with ISO 14001 standards addressing environmental aspects, environmental performance indicators,[19] responsibilities and training and inspection protocols.

The referenced standards draw on:

- Identifying and reviewing the environmental impacts and risks of project siting, construction and operation;
- Defining a set of policies and objectives for environmental performance;
- Establishing a management program to achieve these objectives;
- Monitoring performance against these policies and objectives;
- Reporting the results appropriately; and,

[18] These standards are available at http://www.iso.org/iso/home/store.htm.

[19] As stated, ISO 14001 does not prescribe performance requirements per se.

- Reviewing the system and outcomes, striving for continuous improvement.

IDB funds new water and wastewater treatment projects, as well as capital improvements to existing systems. Any proposed treatment system design is established and agreed upon during IDB's due diligence screening of a project. An important consideration in developing environmental system performance objectives in the operations phase is that they be based on recognizing and understanding the performance limits of constructed systems. This is because a facility can only perform as well as it is designed to perform. For instance, a wastewater treatment plant with primary clarifiers can never achieve the effluent quality of a secondary plant. Therefore, EMSs for operations focus on excellence in service, operations and maintenance, rather than prescribing uniform "best in class" performance standards. The existence of an ISO-style quality management approach will facilitate the transition from a mindset centered on capital project development to an operations-focused one.

## 3. Indicative content for an operations and environmental quality management system

### 3.1. Objective and scope

This section should describe the objective and scope of the OEMS. Primary objectives should be:

- To meet the goals and objectives of a utility's environmental and quality performance policies;
- To establish procedures to ensure the highest quality of customer service;
- To understand customer requirements and continually enhance customer satisfaction.
- To focus on the major environmental impacts associated with utility operations;
- To prepare a management and implementation plan based on a maturity matrix;[20]

[20] Refer to Footnote 8 for a description of a maturity matrix.

- To develop a priority list of all significant environmental impacts, objectives and targets, with schedules for addressing them;
- To identify and document appropriate and measurable performance indicators;
- To comply with all applicable laws, governing government regulations and institutional standards;[21]
- To identify international performance standards related to utility operations, study their potential to improve service or environmental quality and enter a schedule for their implementation into a maturity matrix;
- To train staff and subsequently refresh their job training on a regular basis;
- To continually review utility operations, activities, products and services, in order to update the catalogue of environmental aspects and impacts;[22] and
- To drive continuous improvement in the management of environmental issues and service and product quality, as well as customer satisfaction.

The principal scope elements of an OEMS typically include:

- A policy statement that clearly communicates a utility's commitment to providing high-quality services and products (i.e., water), to preserving, improving or maintaining the physical environment and to complying with applicable legal requirements and institutional standards;
- An action plan to guide and schedule a project's actions and expenditure of resources;
- An implementation plan[23]for the OEMS that encompasses all utility operations and addresses their quality and environmental aspects, including capital project development

[21] For example, IDB standards and performance requirements.

[22] The utility's catalogue of aspects does not commit the organization to address any one. However, it does improve understanding of the effect of utility operations and facilitates assessment of impact and prioritization. Refer to Section 6.2 for additional information on aspects and impacts.

[23] It is important to develop an implementation plan that carefully considers the resources available to implement it. For that reason, it is often suggested that a company's implementation plan start with a single

for new works or repairs, design, construction, operation, recordkeeping, awareness and training and staff procedures;

- Monitoring programs to measure performance;
- Documentation appropriate to the organization and management of a particular utility, to include:
    - The company policy statement;
    - Environmental performance objectives and targets;
    - Procedures and SOPs,[24]
    - Applicable laws, regulations and governing standards; and
    - Geographical or other limits to the scope of environmental programs;[25]
- A continual review process by senior management and operating units to determine how to improve the OEMS and the level of compliance with a utility's quality policy, as well as environmental policy, laws and government regulations; and
- A continuous commitment to fostering and supporting a culture of open communication and dedicating appropriate resources to quality, quality improvement and environmental awareness, all based on a realistic assessment of the current and future availability of those resources, from top management down to the lowest-level staff.

The OEMS is based on the "Plan-Do-Check-Act" model and consists of the development steps below. Each step should be fully documented in the manner described in Sections 4 to 7.

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plant or type of operation, with a reasonable schedule for extending the plan to all company operations, based on time and resource availability.

[24] Different companies use different terminology. This is meant to include all tools used to implement company objectives and targets

[25] The OEMS can only apply to those activities it can control (typically referred to as falling within its "fenceline"). For example, a UC wastewater treatment plant may discharge wastewater to surface waters in compliance with applicable standards, but it has no control on other dischargers situated on the same body of water.

**Step 1**

Decide to adopt an integrated ISO 14001/ISO 9001-type quality management system, hereafter called an OEMS.

**Step 2**

Identify regulatory, organizational and political requirements, along with industry and/or performance standards that fit the unique needs of a particular UC.[26]

**Step 3**

Identify environmental aspects. These are project activities that interact with the environment.

**Step 4**

Identify environmental aspects that have one or more impacts (positive or negative) on the environment.

**Step 5**

Identify and prioritize significant environmental impacts.

**Step 6**

Identify objectives. These are identified actions and procedures for mitigating, managing and monitoring identified significant impacts according to their degree of risk and priority, as well as a utility's short- and long-term plans.

**Step 7**

[26] Sources of non-governmental standards include the Water Environment Federation, USEPA, the European Commission, ISO, ASTM and other international organizations. Each UC is unique according to geography, climate, culture, development status and other characteristics. International standards do not fit every UC's needs. It is recommended that UCs also seek ideas from organizations that connect cities across the world and promote the sharing of ideas. A list of organizations with general and specific interests can be found at the website of the Union of International Associations.

Identify target actions and performance indicators to meet objectives. These are specific actions and timelines for meeting a utility's environmental policy and objectives.

**Step 8**

Identify environmental and quality control procedures. Control procedures (e.g., standard operating procedures [SOPs] and quality manuals) are only necessary to the extent that their absence could cause a significant impact. The conditions requiring control procedures should be recorded along with details and monitoring data for a related process. One example is the need to treat wastewater prior to its discharge into the environment and gather data from monitoring any effluent discharge.

The Objective and Scope Section may identify related procedural and supporting documents. Annex A contains an indicative list of typical OEMS documentation that includes the supporting programs, plans and procedures identified herein, as well as additional documentation that is commonly developed yet utility-specific.

## 4. Quality and environmental policy of the utility

The OEMS must have a policy statement. The following are guiding principles in developing such a policy statement:

- Serve as a formal statement by top management speaking to the utility organization's commitment to quality and actions, activities, programs and procedures that produce measurable results, which should quantify the continuous improvement of operations and service quality, as well as the management of environmental aspects and impacts;
- Be clearly documented, communicated and understood at all levels of the utility organization;
- Commit to complying with all applicable laws, regulations and governing standards;
- Be publicly available;
- Commit to environmental protection and resource conservation;

- Commit to striving for improvement by setting objectives and targets;
- Be relevant to all utility operations; and
- Commit management at all levels to the successful implementation of the OEMS.

An example policy is presented in Annex B.

It is important to include environmental performance in presenting an organization's policies on operational quality in all areas. For maximum success, it is important that policy concepts become part of the utility culture. Embedding organizational goals and policies in the corporate culture means they should be the same at the lowest and highest rungs of the corporate ladder. The content of the policy says to an observer, "This is who we are." The inclusion of policies in this context allows rank-and-file employees to adopt them and feel that they are team members rather than subordinates.

## 5. Description of company activities and organization

This section should provide a general description of a utility's operations, operating units, management structure and organization. The introduction should contain a short history of the organization, highlighting important milestones in its growth and vision for the future.

The section should also incorporate a presentation of the current role of the utility in the community, as well as the organization's operations quality and environmental management policies. It should further describe general responsibilities for developing, managing and implementing the OEMS, and it should identify management positions that figure prominently throughout the OEMS. The most prominent roles are those responsible for operations quality and environmental management. In utility management structures, the roles of quality manager and environment manager are technical, interrelated and unique to each utility.[27]

Furthermore, to be successful, operations quality and environmental management functions should be aligned. It is recommended that responsibility for both efforts be assigned to a single position — typically, a utility's Chief Engineer. Subordinate positions can be established or assigned

[27] For example, the issues related to water distribution and wastewater collection are very different for CAESB, the utility in Brasilia, Brazil, compared to EPM, the utility serving Medellín, Colombia.

according to the size and organization of the utility. In small utilities, one person may fill both principal and subordinate positions.

The office of the Chief Engineer and subordinate department or unit managers should participate in the determination of quality requirements; the identification of environmental aspects and impacts; and the establishment of objectives, targets and programs. They should also be responsible for checking and monitoring operations quality and environmental performance.

This OEMS section should include an organization chart.

# 6. Environmental compliance requirements

### 6.1. Legal register

A register of applicable regulatory and other governing standards should be developed and filed in a document typically called the "Legal Register." The Legal Register displays all government-issued requirements pertaining to the environment and other operational considerations. As part of the OEMS, processes must be developed to accomplish the following:

- Determine the applicability of laws and regulations tied to general utility operations and identified environmental aspects (see Section 6.2, "Identification of environmental aspects and impacts);
- Identify and monitor legislative, regulatory and institutional changes that impact operations;
- Update the Legal Register;
- Communicate the requirements to contractors, employees and other interested parties.

The types of requirements expected to apply to utility operations include:

- Applicable and/or required national and local regulatory authorizations and permits;
- Any other requirements or standards that a utility must comply with, including company standards, applicable IDB standards, utility-specific certification standards and international guidelines, such as the International Energy Conservation Code.

This OEMS section should reference all associated supporting documents or plans including, but not limited to the following:

- ✓ Legal Register
- ✓ Process for identification and continual review of recordkeeping procedures
- ✓ Records retention procedure

### 6.2. Identification of environmental aspects and impacts

This section should identify and describe activities within an organization's operations that interact directly or indirectly with the environment.[28]

An "environmental aspect" is any activity or service under an OEMS that a utility can control or influence, taking into account planned or new developments, as well as new or modified activities, products and services.[29] Environmental aspects should be determined by identifying ways that UC activities interact with the environment. They include all utility operations and activities that can or do affect air (e.g., controlled and uncontrolled emissions); water (e.g., controlled and uncontrolled discharges); waste (e.g., solid and other types); soil (e.g., land use or contamination); vegetation; resource depletion; and aesthetics (e.g., noise, odor, dust, vibration and aesthetic and visual aspects). Moreover, they encompass indirect aspects (e.g., use of land, water resources and energy); cumulative impact aspects; and beneficial aspects. Finally, they should consider present and future conditions; normal and abnormal conditions; shut-down and start-up conditions; and potential emergency situations (e.g., weather events and emergencies).

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[28] For the purposes of this document, indirect impacts are defined as effects caused by the activity that develop later in time, or farther away in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects related to changes in the pattern of land use; changes in population density or growth rate; and effects on air and water and other natural systems.

[29] Companies are not expected to manage issues outside their sphere of influence or control. For example, a typical UC has no influence over how electricity is produced (unless the UC also generates electricity). Government legislation and rulemaking constitute a major arena for utilities' efforts to influence aspects they cannot directly control. Where the rulemaking process allows input from affected parties and organizations, the utility should use its experience and expertise to influence the process in a positive way. Where the process for creating laws and rules is closed, the utility should participate in the political process in accordance with local and national protocol.

Environmental aspects can be either positive or negative and can relate to past activities, as when responding to a release of materials into the environment. It is often helpful to create a flowchart of the major processes in order to understand inputs and outputs, as well as how chemicals and materials are used. A utility does not have to consider each product, component or raw material input individually. A utility might prefer instead to select categories of activities, products and services to identify environmental aspects. Table 1 below provides examples of aspects and impacts that might be identified by a UC. Note that one of these examples represents a positive impact.[30]

[30] Note that this table is added for correspondence to ISO 14001. The referenced ISO 2451X standards, although consistent with ISO 14001 as described previously, provide a different approach, integrating quality, environmental, and social aspects. They also address the noted deficiencies in the current ISO 14001 protocol. Table 4 presents the integrated approach provided by the ISO 2451X standards.

## Table 1. Example activities, aspects, and impacts of operating and maintaining a wastewater sanitary sewer system

| Operation/Activity | Aspect | Impact |
|---|---|---|
| Repairing/Maintaining<br><br>Manholes | Use of Volatile chemical sealants | • Air pollution<br>• Contamination water/Land |
| Repairing/Maintaining Manholes | Use of air powered pneumatic tools | Noise |
| Repair Leaking Sewer Lines | Reduce the release of pollutants to soil and groundwater | • Reduce soil and groundwater pollution |
| Repair Leaking Sewer Lines | Energy Use | Depletion of a Natural Resource |
| Operate & Maintain<br><br>Pump Stations | Sewer System Overflows (SSOs) – i.e., spills | • Degradation of Water/Land (Streams, Creeks, Soil, etc.)<br>• Impact to Public Health |

*Note: The row shaded in green is a positive impact.*

The three referenced ISO Standards[31] identify environmental aspects and impacts that apply for the majority of UC operations.[32] However, there may be UC-specific additional aspects and impacts that need to be evaluated on a case-by-case basis. In identifying aspects and impacts, a UC should consider not only laws, regulations and other performance standards to which it is subject (e.g., those from IDB, local agencies and project directives), but also land, energy, resource use, contractor activities and other ways in which the company can have an influence on the environment, for better or for worse. Soliciting the views of interested parties and other

[31] ISO 24510, ISO 24511 and ISO 24512.

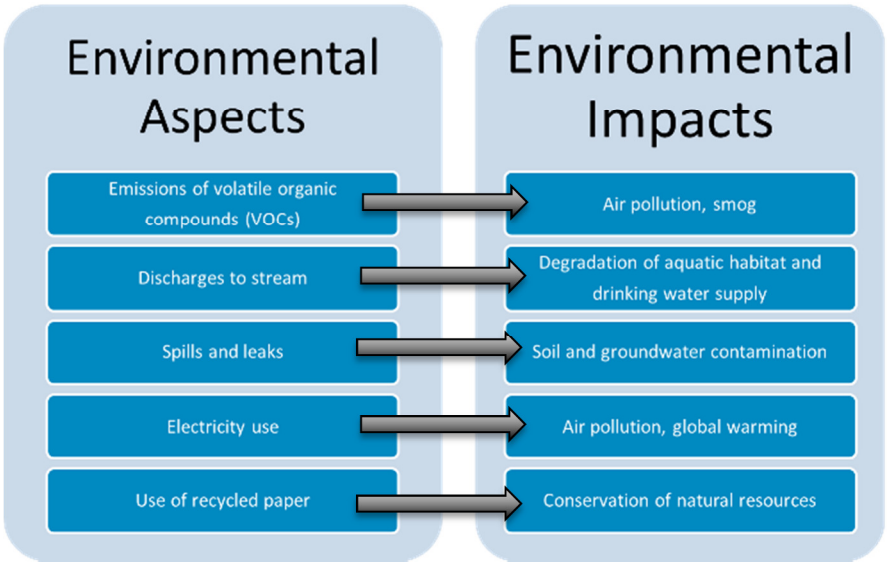
[32] The standards incorporate considerations of sustainability criteria, as well as aspects addressing health and safety and business operations.

stakeholders can also assist in identifying and assessing environmental aspects. Information obtained during project consultation, for instance, would be useful in this regard.

There are various approaches to evaluating aspects and impacts. Any format can be used, as long as it identifies each individual activity, together with each aspect of the activity. Once an organization establishes an effective process for identifying additional aspects and impacts, that process should be documented in a written procedure statement.

Once the central environmental aspects of utility activities have been identified, further elements with the potential to have an environmental impact must be determined, as it is important for an EMS to be comprehensive and consider primary and secondary impacts alike. For each environmental aspect, the associated impacts to the environment, both positive and negative, are identified. The relationship between aspects and impacts is often one of cause and effect (see Figure 6 below). Environmental impacts identified by an EIA can be referenced, but they should be reviewed against current aspects and operations.

## Figure 6. Environmental aspects and impacts




The results of the process to identify aspects and impacts are used to establish environmental objectives and targets.

With respect to EMS development and implementation, it is possible — and in some cases recommended — for an organization to start out with a simple process that addresses a single operating unit. As the organization accumulates experience narrowly applying the standard, implementation to other areas of the organization follows, one unit at a time. This approach, however, is likely to produce slow progress toward quality and environmental goals. Therefore, the alternate approach presented below should be considered.

Water and wastewater utilities have a significant number of environmental aspects and impacts. Although the list may be long, there are only items a few whose aspects and impacts eclipse the combined importance of all the others. It is recommended that utilities narrow the focus initially to these few material aspects and impacts across the full spectrum of utility operations. In general, this select group of high-value targets falls into one or more of the following categories:

- Wastewater collection system operation and maintenance;
- Wastewater treatment operation and maintenance;
- Effluent quality;
- Drinking water watershed management;
- Dam operations; and
- Sludge management.

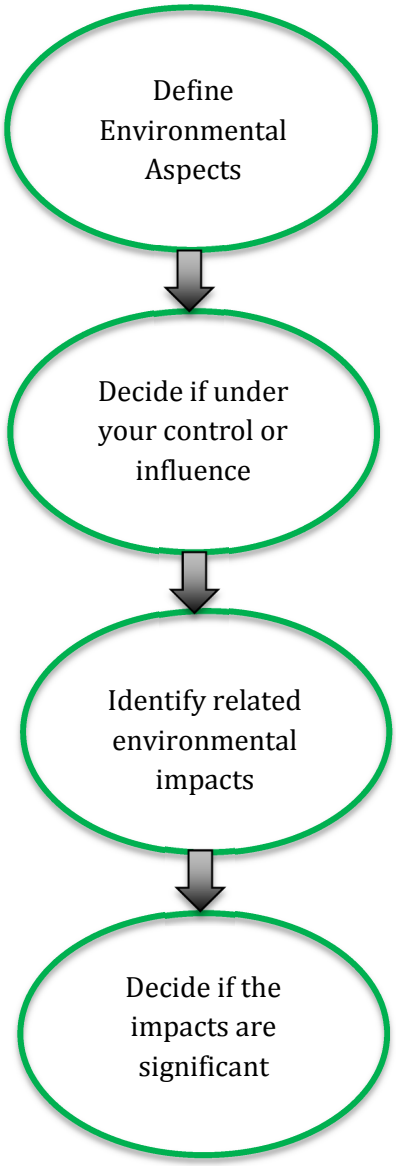
Identification of environmental aspects and impacts can be daunting for the typical resource-limited utility, as there are so many real and potential aspects. Utilities should not be daunted by the task. Identifying an aspect does not commit a utility to address associated impacts. Some aspects can be positive, such as the treatment of wastewater or the acquisition of watershed property to prevent or control polluting activities. The objective above all is simply to create a list. Still, utilities should be aware that the few major aspects generally require such large financial resources that progress to comply with policy objectives may be slower than desired.[33] Resource-driven delays, however, allow time for an organization to become comfortable with EMS

[33] Existing protocols acknowledge that there may be valid reasons to address some impacts initially and others later in time (e.g., cost or technical limitations). See http://www.epa.gov/ems/EMSguide2nded.pdf

implementation as it addresses aspects that are less complex and/or demanding of resources, all while concurrently pursuing and waiting for the resources to resolve the major goals.

This OEMS section should reference related procedural and supporting documents and plans, to include the Environmental Aspect and Impacts Inventory/Inventories:

**Figure 7. Summary of steps**[34]




[34] http://www.epa.gov/ems/EMSguide2nded.pdf

### 6.3. Assessment of impact significance

As stated, the referenced standards identify the most common significant impacts for UCs, based on standard risk assessment. A risk analysis based on consequences and likelihood is used to determine impact significance. Generally, for each aspect's impact, the significance of the impact should be assessed and documented, where:

Significance = (Severity of Impact) x (Probability of Occurrence)

The standards also require consideration of impacts under normal, abnormal and emergency conditions. Examples of such conditions can be seen below.

## Table 2. Examples of abnormal or emergency conditions

| Water Utility | Wastewater Utility |
|---|---|
| Serious worker injury or death due to work activity | Serious worker injury or death due to work activity |
| Gas leaks (chlorine, chlorine dioxide, etc.) | Sewer overflows, including at pump stations |
| Water main break | Gas leaks (chlorine, sulfur dioxide, biogas, etc.) |
| Sink hole development | Force main breaks |
| Critical process failure | Critical process failure |
| Drought | Hazardous material release into sewer system |
| Hazardous material spill on watershed | Discharge kills fish downstream |
| Toxic algae | Above-normal precipitation (affects combined sewers) |

The exact approach to determining significance is unique to each individual organization. An environmental aspect that is significant for one organization may not be so for another. The most common approach is to conduct the risk analysis in a way that results in a range of risk levels, from high/extreme to medium to low risk.[35] The vast majority of UCs should have at least some significant impacts. If not, consideration should be given to modifying the risk rating approach and/or the definitions of likelihood or consequences. If the UC already has an effective risk analysis procedure for assessing health and safety or financial risk, this could be used and/or modified for the environmental risk assessment process.

This OEMS section should reference related procedural and supporting documents and plans to include:

- ✓ Inventory of Significant Environmental Impacts

The identified environmental aspects and related significance information will be used to establish objectives, targets and management programs. An important consideration is that all of the impacts need not be addressed at once. As previously stated, there may be valid reasons, such as cost and technical limitations, to address some impacts immediately and others later.

[35] It is also common practice to ensure that any environmental aspect associated with a legal requirement is considered significant. An example significance framework is provided in Annex C.

## Table 3. Examples of significant impacts

| Operation or activity | Aspect | Impact |
|---|---|---|
| Gas chlorination | System gas leak | • Air pollution<br>• Employee health and safety<br>• Public health and safety |
| Industrial pretreatment program | Prevent toxic or hazardous discharges | • Treatment plant failure<br>• Discharge permit violation<br>• Damage to sewer, treatment plant or private property |
| Watershed management | Protection of water quality in reservoirs | • Public health<br>• Consumption of treatment chemicals<br>• Water treatment process failure |
| Wastewater treatment process operation | No backup power supply | • Bypass or overflow<br>• Public health<br>• Low dissolved oxygen in receiving water<br>• Fish death |
| | Non-redundant systems | |

Based on the impacts and risks identified, a risk mitigation plan needs to be developed to minimize and, where possible, eliminate the impacts of each identified risk. This plan will contain plans for mitigation and the proposed monitoring to determine the effectiveness of proposed actions. The plan should also be incorporated into the Monitoring, Renewal and Periodical Reviews process.

For risk that might cause significant environmental and/or social impacts, a utility should establish contingency plans to explore these eventualities and prepare for them, detailing the necessary actions to ensure a timely and appropriate response.

### 6.4. Objectives, targets and programs

Objectives and targets help an organization translate purpose into action. Environmental objectives are the goals that an organization establishes to achieve. Environmental targets are the specific performance requirements established to meet the objectives. They can be short- or long- term, but they must be specific and measurable milestones employed to achieve the objectives of a utility's environmental policy, as described in Section 5. Objectives and targets include the mitigation, management or monitoring (as determined necessary and appropriate) of significant environmental impacts.

Management objectives and targets must be developed for significant impacts over which the company has control/influence, and they must be "SMART":

- Specific;
- Measurable;
- Agreed and understood;
- Realistic; and,
- Traceable.

For example, an objective or target may be to reduce water losses for a water service area by 10%. The objective or target is specific and measureable. 10% is a realistic objective, and because it is measurable, it is traceable. The specificity of the objective or target makes it easily understood, which facilitates agreement among responsible parties. Further examples can be found in Table 4 and Figure 8.

Guidance in ISO 14001 provides the following useful advice regarding objectives and targets: "When considering its technological options, an organization should consider the use of best-available techniques where economically viable, cost-effective and judged appropriate."

The "Objectives and Targets" section of an OEMS should reference related procedural and supporting documents and plans to include:

- ✓ Register of Environmental Targets and Objectives

Programs are important to successful environmental management. Specific programs, plans and procedures to meet objectives and targets should be prepared once the objectives and targets are finalized and assigned to specific departments or individuals for implementation. The programs, plans and procedures must clearly define levels of participation and responsibilities. They must also define activities, persons responsible, time frames and resources to achieve the objectives and targets.

Interactions and interdependencies between objectives and targets on the one hand and programs and documentation on the other should be addressed. Achieving continuous improvement requires a process for regular review of objectives and targets, as well as the assignment of responsibilities for tracking and reporting progress.

Development programs, plans and procedures typically include:

- Documented work instructions;
- Procedures;
- Monitoring programs; and
- Performance criteria.

A list of typically developed plans and procedures to satisfy OEMS objectives and targets is contained in Annex A.

### 6.5. Performance indicators

In order to assess and improve service to users and to ensure proper monitoring of improvements, an appropriate number of performance indicators (PIs) or other methods for checking compliance with objective and target requirements can be established. The use of PIs is only one of the possible support tools for continuous improvement. Stakeholders can select PIs from the examples provided in the referenced ISO water and wastewater standards or develop other relevant PIs, taking into account the principles described in these standards, which can be found in ISO 24510, ISO 24511 and ISO 24512. The PIs logically relate to the objectives for which they are defined through the assessment criteria and are used to measure performance. They can also be used to set required or targeted values. The standards do not impose specific indicators or any minimum value or

performance range. They respect the principle of adaptability to local contexts, facilitating local implementation.

This guidance requires each UC to establish performance targets and schedules for significant and appropriate objectives and service assessment criteria. Examples based on the format presented in ISO 24510, ISO 24511 and ISO 24512 are below:

## Table 4. Examples of targets, schedule, and PI (performance indicator) assignments to table of objectives

| Wastewater Utility Objective | Examples of Possible Actions | Target | Schedule | PI |
|---|---|---|---|---|
| Protection of natural environment | Promote integrated water resource management in water projects | Separate storm and sanitary sewers | 5 km/year | Meters completed |
| | Control and limit pollution in the flows of water returned to the environment or reused | 100% compliance with effluent limits | Immediate | Discharge monitoring report |
| | Protect water quality in water bodies | Install real time effluent monitoring | *Date* | Analysis |
| | Promote reuse of treated wastewater | Install irrigation system on WWTP Property | *Date* | Days to complete / days scheduled |
| | Operate wastewater systems with considerations for the global environment | Reduce reactive energy use | *Date* | kVAr/kWH > 0.95 |

Targets and schedules should be assigned to Performance Assessment Criteria as illustrated below.

## Figure 8. Example of target and schedule inserted into a PI for an assessment criteria[36]

| **Service Assessment Criteria: Manhole overflow prevention and control** |
|---|
| **Performance indicator:** intermittent discharge frequency (number/overflow device/year)<br><br>**Definition:** average number of discharges per manhole device during the assessment period<br><br>**Processing rule:** (number of manhole overflows that occurred during the assessment period × 365) /<br><br>(assessment period [in days] × number of manholes at the reference date)<br><br>*Note: "× 365/assessment period" is a unit conversion expression and is not intended to be considered as extrapolation.*<br><br>**Target:** 25% reduction in the incidence of manhole overflows<br><br>**Schedule:** *Date* |

# 7. OEMS implementation and operation

### 7.1. Structure and responsibilities

[36] The example is preferred to the tabular representation of objectives and targets, because the format conforms to the format of ISO 24510, 24511 and 24512. More importantly, it includes the use of performance indicators to facilitate the assessment of progress. The format also fits with the concept of continuous improvement better than the more common ISO 14001 table does.

In order to facilitate OEMS implementation, it is important to define, document and communicate not only the roles, responsibilities and authorities of personnel who manage, perform and verify activities that have an effect on operations quality, but also the environmental risks and impacts of an organization's activities, facilities and processes. This expands on the Section 5 description of main organizational entities and their general responsibilities to include specific responsibilities for implementing objectives and targets defined in the OEMS. Other specific responsibilities include:

- Providing resources;
- Initiating action;
- Identifying problems;
- Recommending solutions;
- Verifying implementation of solutions;
- Controlling further activities; and
- Acting in emergencies.

The section should also reference related procedural documents, to include:

- ✓ Organizational Chart
- ✓ Applicable Developed Procedures/Plans

### 7.2. Training, awareness, and competence

The utility should determine required competence levels for staff members whose work pertains to product requirements, as well as for all staff and site contractors whose work may contribute to significant environmental impacts. At a minimum, environment training must be provided to the following individuals:

- Company managers involved in policy formulation and resource allocation;
- Auditors/monitors;
- Specialists; and
- EHS managers.

Awareness training should also be provided for all employees and contractors.

Training curricula for all personnel should be standardized and documented for each subject and level of responsibility. The environmental training program should specify the type, scope, duration and frequency of required training and include:

- Implementation triggers and protocols;
- Responsibilities for implementation; and
- Effective measures for documenting and tracking training activities.

The environmental training should address all areas of competency as applicable to employees, contractors and guests.

### 7.3. Contractors and vendors

This section establishes the principles and objectives for managing contractors and vendors in order to ensure compliance with applicable provisions of the OEMS.

This OEMS section should reference any related procedural documents, to potentially include:

- ✓ Procedure for Control of Contractors and Vendors

### 7.4. Consultation and communication

For the purposes of product quality, top management should ensure that responsibilities and authorities are defined and communicated within the organization.

Internal communication procedures regarding environmental issues may address such topics as environmental protection, policies, objectives and targets, management programs and other environmental issues.

External communication procedures will address authorities and protocols for receiving, documenting and responding to communication to and from external parties. These include customers, suppliers, agencies, media and the public. It may incorporate or contain references to any developed Consultation and Community Relations Plan as applicable.

### 7.5. Recordkeeping, documentation and document control

Documents will be created in the implementation of an OEMS. It is important to develop a procedure for controlling all documents, records and data created or required by the management system. It is not necessary that the document control system conform to any particular format; it may instead follow a utility's existing document management procedures.

Environmental documents, procedures and policies may be linked. A complete matrix of linkages may be impossible to develop, but readily apparent connections should be recognized and reflected in any document management procedures.[37] Within the context of continuous improvement, this section should further address the manner in which relevant documents are periodically reviewed and revised as necessary. The way in which obsolete documents are managed should also be addressed.

Thus, this section should address the establishment and maintenance of OEMS information, which should be recorded either in hard copy or electronically. This section should include a description of the areas of responsibility for managing documentation and recordkeeping.

This OEMS section should reference any related procedural documents, to potentially include:

- ✓ Procedure for Records and Documentation Control
- ✓ Record Retention Policy

[37] The document links do not have to be established in a separate report or document, which may find little use and would thus be a waste of resources to develop. The recognition of links may be best resolved in the design of a record-filing system.

### 7.6. Operational control

This section provides the general protocol for control of operations whose absence could result in significant impacts or risks, including non-compliance with regulatory or other applicable standards. The utility must plan the conduct of these operations in order to ensure that they are carried out in a manner that protects the environment.

Operational controls should be communicated to employees who have specific roles or responsibilities outlined within those controls. Control documents must be made available at points of use in relevant areas, and the relevant departments must develop them. The controls should cover at a minimum:

- Process operations and criteria (process flow diagrams can be developed to illustrate operating processes and to communicate criteria for operational control, in order to minimize environmental effects);
- Review process for operational controls when there is a change in process, facility or equipment;
- Control of vendors and contractors;
- Methods of chemical storage, handling, and transfer;
- Spill response;
- Waste disposal;
- Potential hazards;
- Maintenance of equipment and/or systems; and
- Safety requirements.

### 7.7. Emergency preparedness and response

Plans and procedures must be developed and maintained for identifying the potential for, and responses to, incidents and emergency situations. Further plans and procedures should be

developed to address preventing and mitigating the environmental impact that may be associated with such occurrences. These procedures should be reviewed and tested periodically, as well as whenever an incident occurs. Operational risks for individual sites must be actively assessed to ensure that emergency response procedures prepare the sites to effectively respond to emergency situations. The assessment process should test planned responses and evaluate how effectively they deal with the consequences of an unplanned event. It is also vital to develop a properly trained emergency response team staffed by operating personnel and led by a trained emergency response coordinator drawn from management-level personnel. Proper emergency equipment must be identified and a program for practice drills must be developed to ensure response measures are effective and understood.

This OEMS section should reference any related procedural documents, to potentially include:

- ✓ A Contingency Plan
- ✓ Reporting Investigations of Incidents and Accidents

### 7.8. Program implementation documentation

#### *7.8.1. Monitoring and measurement*

The utility should determine, collect and analyze appropriate data to demonstrate the suitability and effectiveness of environmental quality management and regulatory compliance, as well as opportunities to improve the effectiveness of the OEMS. These records should include data generated as a result of internal monitoring and measurement together with data from other relevant sources, such as government drinking water surveys or wastewater discharge sampling.

It is important to provide a description of the program for monitoring and measuring activities with significant environmental impacts. These documents will address parameters, methods and criteria for monitoring and measuring activities and/or conditions, in order to ensure conformance with established objectives and targets, as well as compliance with legal requirements commitments.

This section should reference related procedural and supporting documents and plans, to include:

- ✓ Environmental and Monitoring Program
- ✓ Quality Manual

### *7.8.2. Accidents, incidents, nonconformities and corrective action*

Procedures should be developed to define responsibility and authority for the handling and investigation of accidents, incidents and nonconformities[38], as well as the consequences thereof. Additionally, the causes of accidents, incidents and nonconformities should be evaluated, after which the need for action and the specifics of any action required should be determined. Any action subsequently taken should be recorded, and the results evaluated. There should be clear procedures that detail how accidents are to be reported and investigated. This process will allow the organization to collect proactive data that can be used to further improve quality and environmental performance. Accident analysis will seek the root cause of an incident, which is typically an underlying failure to conform.

### *7.8.3. Performance evaluations and auditing*

Procedures should be established and maintained for monitoring, measuring and documenting OEMS performance on a regular basis. This section establishes the principles and objectives for performance evaluations and audits. These evaluations and audits are intended to determine the overall effectiveness of the OEMS and to report findings to management for review. Auditing and inspections are also needed when a system is in place and working properly, in order to determine that:

[38] That is, something that is outside of normal operations.

- Quality and environmental management activities conform to the program; and
- The system is effective.

The process should address methods, procedure type (internal vs. external), scope, frequency, reporting methods and corrective action protocols. It typically includes one or more of the following:

- Audit Schedule;
- Audit Procedures;
- Checklists;
- Audit Reports; and
- Follow-up and Corrective Action.

Measurements will include both proactive and reactive measures. Proactive measures include establishing checks and balances prior to an incident or accident. These may include inspections, equipment testing, instrument calibration, training and discussions of near-miss occurrences, among other elements. Reactive monitoring practices include accident investigation and analysis of historical accident data.

This section should reference any related procedural and supporting documents and plans, to include:

- ✓ Internal Audit Program
- ✓ External Audit Program
- ✓ Inspection Program
- ✓ Nonconformance and Corrective Action Program

### 7.9. Records and record management

A system is recommended to confirm that the OEMS works and that compliance can be demonstrated. Procedures must be developed to identify, maintain and dispose of program records

and other related documents. These records include required regulatory components and documentation demonstrating that the OEMS operates effectively.

This section should reference any related procedural and supporting documents and plans, to include:

- ✓ Records and Documentation Control Procedure
- ✓ Record Retention Policy

### 7.10. Management review

Periodic upper management review of the OEMS must be performed. Review of the management system provides an avenue for management to ensure that the system remains suitable for achieving the organization's quality and environmental goals and objectives.

This section should reference any related procedural and supporting documents and plans, to potentially include:

- ✓ Management Review Program, Template or Schedule

## Annex A. Indicative list of OEMS programs, plans and procedures

Presented below is an indicative list of documents, programs, plans, and procedures that might be developed for an OEMS. These documents would be applicable to each phase of a project. Some of these are required elements for an OEMS. These are identified with an asterisk. Others are only sometimes required, based on the size or complexity of a project, or to address specific identified significant impacts.

**OEMS Development Documents**

- Sustainability Policy Statement*
- Description of the Company or Project's Activities and Organization*
- Environmental Structure and Areas of Responsibility*
    - Organizational Chart
- Procedure for Review of Legal and Other Applicable Requirements (e.g., LEED criteria compliance)*
    - Legal Register*
- Register of Environmental Aspects and Impacts*
- Environmental Significance Determination Criteria
- Consultation and Communications Plan*
- Records and Document Control Plan*
    - Records Retention Procedure
- Operational Control Procedures (only for operations identified as having significant impacts or risks and that could be significantly impacted by the absence of control procedures)
- Emergency Preparedness and Response Plan and Procedures*
    - Contingency Plan*
    - Management and Investigation Report of Incidents and Accidents*

- Performance Evaluation and Auditing*
    - Management Review Procedure/Template
    - Internal Audit Procedure
    - External Audit Procedure
    - Internal Inspection Program
    - Non-Conformance and Corrective Action Program*

## Annex B. Example policy

We recognize that safe drinking water, sanitary wastewater conveyance and effective wastewater treatment have an important role to play in protecting and enhancing the environment, health, safety and welfare of current and future generations, and in helping to secure the long-term sustainability of our community.

To this end name of utility is committed to taking action:

- ✓ To achieve sound environmental, health and safety practices across our entire operation.
- ✓ To comply fully with all legislation.
- ✓ To minimize our use of energy, water and materials.
- ✓ To minimize our waste and to reduce, reuse and recycle the resources consumed by our business wherever practical.
- ✓ To reduce our pollution to a minimum.
- ✓ To invite our customers, suppliers and contractors to participate in our efforts to protect the environment
- ✓ To clearly state our commitment to the safety, health and welfare of our employees and the surrounding community.
- ✓ To work where we can with other public agencies and the community in order to achieve wider environmental, socioeconomic and health and safety goals.
- ✓ To provide all employees with the training and resources required to meet our objectives.
- ✓ To openly communicate our policies and practices to the public and other interested parties.
- ✓ To monitor and record our impacts on a regular basis and compare our performance with our policies, objectives and targets, with a view to continuous improvement over time.

## Annex C. Example significance frameworks

**Significance = (Severity of Impact) x (Probability of Occurrence)**

# I. Assess the severity of the impact according to the following scale:

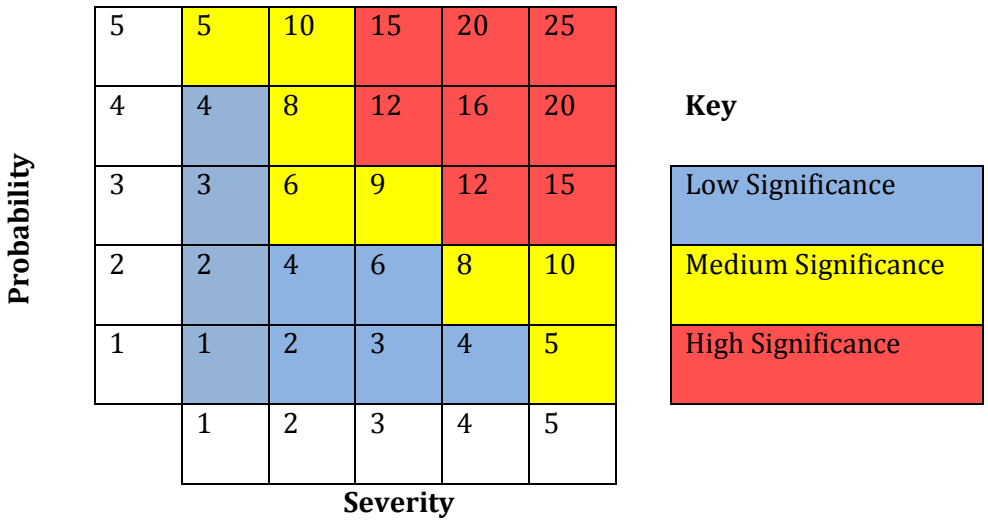
1. **Negligible/Minor**
   - Negligible potential to result in excursions from legislative limits; small contribution to local/regional environmental; no stakeholder interest; insignificant resources required to correct impact.
2. **Moderate/Serious**
   - Temporary excursion outside of legislative limits; small contribution to local/regional environment; re-established within one year; low potential for complaints; moderate resources required to correct impact.
3. **Serious**
   - Short-term non-compliance with legislation; contribution to local/regional/global environment; recovery within one to two years; issue of concern to stakeholders; major resources required to correct impact.
4. **Major**
   - Medium-term non-compliance with legislation; major contribution to local/regional/global environment; recovery takes two to five years; issue of concern to stakeholders; major resources required to correct impact.
5. **Catastrophic**
   - Long-term non-compliance with legislation; long-term contribution to local/regional/global environment; recovery takes more than five years; issue of concern to stakeholders; critical resources required to correct impact.

# II. Assess the probability of the impact according to the following scale:

1. **Improbable**
   - Has not happened before but theoretically possible
2. **Low probability**
   - Occurs five to ten times yearly

3. **Probable**
    - Occurs yearly
4. **Highly probable**
    - Occurs monthly
5. **Definite**
    - Occurs daily to weekly

This method results in the following scoring matrix:




This methodology gives a maximum score of 25 points. Significant aspects are defined as those whose impact has a score of 12 points or more.