STRATEGIC BUSINESS PLAN
ISO/TC 282

EXECUTIVE SUMMARY

Committee's Environment

There is a rapidly growing market on a global scale for water reuse that needs standards that are applicable world-wide. Today, water shortages are faced in many regions in the world, and the feasibility of water reuse provides options to meet these needs. Meanwhile, the possibility of water reuse raises concerns over human health, environmental and societal implications of water reuse around the world. This has led to the increasing needs to specify various aspects of water reuse projects defined by appropriate parameters. Consequently, for reuse projects, there are growing needs for the international standards from supplier, user and regulators. Unless these needs are met by the activities of ISO, a great deal of opportunities for the sustainable development based on water reuse will be lost.

Benefits

ISO/TC 282 standards will help:
• Facilitate the dialogue among stakeholders, including consumers, providers, public authorities, industries, research departments, laboratories;
• Ensure consistency within a sector engaged in water reuse
• Provide guidelines for a healthy, hydrological, environmental and economically conscious design, operation, monitoring and maintenance for water reuse systems and applications of different kinds including irrigation, urban, environmental and industrial uses.
• Provide methods and tools to evaluate the risk and performance of water reuse systems from multifaceted aspects including human health, economics, environment and society.
• Implement the management system standards such as ISO 9000 and 14000 series for an organization engaged in water reuse to achieve its objectives.
• Regulatory bodies to prepare rules and regulations of their own circumstances on water reuse

Main Objectives and Priorities in the Work of the Committee

ISO/TC 282 standards deal with:
• The definition of a terminology common to the different stakeholders;
• Specification of the elements to be considered for planning, designing, operation, monitoring and maintenance of water reuse including for various fields including irrigation, urban, environmental and industrial uses.
• Methods and indicators for risk and performance evaluation of water reuse system.

Water reuse comprises a sequence of the stages and operations involved in uptaking, conveyance, processing, storage, distribution, consumption, drainage and other handling of wastewater, including water that is reused in repeated, cascaded and recycled ways.
The standards and other deliverables to be developed in TC 282, in principle, are intended to cover both centralized and decentralized or on-site water reclamation, and direct and indirect reuse applications, taking into consideration the potential for unintentional exposure or ingestion, irrespective of whether the relevant organization is public or private.

1. INTRODUCTION

1.1 ISO Technical Committees and Business Planning

The extension of formal business planning to ISO Technical Committees (ISO/TCs) is an important measure which forms part of a major review of business. The aim is to align the ISO work programme with expressed business environment needs and trends and to allow ISO/TCs to prioritize among different projects, to identify the benefits expected from the availability of International Standards, and to ensure adequate resources for projects throughout their development.

1.2 International Standardization and the Role of ISO

The foremost aim of international standardization is to facilitate the exchange of goods and services through the elimination of technical barriers to trade.

Three bodies are responsible for the planning, development and adoption of International Standards: ISO (International Organization for Standardization) is responsible for all sectors excluding Electrotechnical, which is the responsibility of IEC (International Electrotechnical Committee), and most of the Telecommunications Technologies, which are largely the responsibility of ITU (International Telecommunication Union).

ISO is a legal association, the members of which are the National Standards Bodies (NSBs) of some 140 countries (organizations representing social and economic interests at the international level), supported by a Central Secretariat based in Geneva, Switzerland.

The principal deliverable of ISO is the International Standard.

An International Standard embodies the essential principles of global openness and transparency, consensus and technical coherence. These are safeguarded through its development in an ISO Technical Committee (ISO/TC), representative of all interested parties, supported by a public comment phase (the ISO Technical Enquiry). ISO and its Technical Committees are also able to offer the ISO Technical Specification (ISO/TS), the ISO Public Available Specification (ISO/PAS) and the ISO Technical Report (ISO/TR) as solutions to market needs. These ISO products represent lower levels of consensus and have therefore not the same status as an International Standard.

ISO offers also the International Workshop Agreement (IWA) as a deliverable which aims to bridge the gap between the activities of consortia and the formal process of standardization represented by ISO and its national members. An important distinction is that the IWA is developed by ISO workshops and fora, comprising only participants with direct interest, and so it is not accorded the status of an International Standard.

2. BUSINESS ENVIRONMENT OF THE ISO/TC

2.1 Description of the Business Environment

The following political, economic, technical, regulatory, legal and social dynamics describe the business environment of the industry sector, products, materials, disciplines or practices related to the scope of this ISO/TC, and they may significantly influence how the relevant standards development processes are conducted and the content of the resulting standards:

2.1.1 Non-conventional Water Resources for "The Future We Want"

Resolution "The future we want" which was adopted by the General Assembly of United Nations in the 123rd plenary meeting on 27 July 2012 involves the following statements;

123. We underline the need to adopt measures to address floods, droughts and water scarcity, addressing the balance between water supply and demand, including, where appropriate, non-conventional water resources, and to mobilize financial resources and investment in infrastructure for water and sanitation services, in accordance with national priorities.
124. We stress the need to adopt measures to significantly reduce water pollution and increase water quality, significantly improve wastewater treatment and water efficiency and reduce water losses. In order to achieve this end we stress the need for international assistance and cooperation.

The water produced by water reclamation is recognized as a promising non-conventional water resource and a wide range of projects for water reuse are planned or in progress in the world. Improving wastewater treatment sometimes highlightes the potential of treated wastewater use and promotes exploiting the non-conventional water resources.

2.1.2 Water Supply Crisis – One of the Major World Risks

World Water Crisis is ranked as within the top five risks by likelihood and impact in the report "World Economic Forum's Global Risks 2013", which was developed from an annual survey of over 1,000 experts from industry, government, academia and civil society who were asked to review a landscape of 50 global risks over the next 10 years. Water shortage is now recognized as one of the major threats which are likely to cause significant impacts on the global society and should be addressed very urgently.

2.1.3 Global Climate Change

Summary for Policy Makers of the Working Group I (WGI-12), contribution to the IPCC (Intergovernmental Panel on Climate Change) Fifth Assessment Report (WGI AR5) "Climate Change 2013" describes the following result of long-term climate model simulation.
Changes in the global water cycle in response to the warming over the 21st century will not be uniform. The contrast in precipitation between wet and dry regions and between wet and dry seasons will increase, although there may be regional exceptions.
Mean precipitation will likely decrease in many midlatitude and subtropical dry regions, while in many midlatitude wet regions, mean precipitation will likely increase by the end of this century. This means that the present water-stressed regions are likely to suffer from severer water shortage in the future.
International Standards play a crucial role in underpinning the global action to address the climate change.The London Declaration, signed in September 2021, defines ISO's commitment in supporting the climate agenda. The Declaration promises to embed key climate considerations into every new standard that is created. It will also retrospectively add these requirements to all existing standards as they are revised, a change on an unparalleled scale.

2.1.4 Green Technology for Green Economy

"The United Nations World Water Development Report 4 – Managing Water under uncertainty and Risk" discusses the role of water in greening economies and growth. Water is an essential resource required for

sustaining life and livelihoods: safe water is required for drinking, hygiene and providing food; and adequate water to produce energy and support economic activities such as industry and transportation. Recognizing the centrality of water for sustainable development is crucial in the development of a green economy. New approaches, such as planning for adaptation to uncertain futures, the adoption of green technologies, improving the efficiency of water provision, and developing alternative water sources and forms of management will play an essential role in enabling a cross-sectoral transition to a green economy. In this context, water reuse and recycling, and rainwater harvesting are recognized as some promising green technologies for greening economies and growth.

2.1.5 Water reuse for circular economy

The core principle of circular economy is to employ reuse, sharing, repair, refurbishment, remanufacturing and recycling to create a closed-loop system, minimising the use of resource inputs and the creation of waste, pollution and carbon emissions. Moving towards a more circular economy could deliver benefits such as reducing pressure on the environment, improving the security of the supply of raw materials, increasing competitiveness, stimulating innovation, boosting economic growth and creating jobs. As such, governments at all levels are increasingly considering the circular economy as a new socio-economic paradigm aiming to foster efficient use of resources by minimising waste. Water reuse offers the potential to transform the water resoursce management from linear (abstract, treat, distribute, consume, collect, treat and dispose) towards circular models by closing the loop between water supply and sanitation. In addition, as an essential component of a circular economy, resource recovery from wastewater can generate new business opportunities whilst simultaneously improving water supply and sanitation services. From perspective of circular economy, water reuse recognizes and captures the full value of water – as a service, an input to processes, a source of energy and a carrier of nutrients and other materials. Water reuse is one of the most important practices for circular economy approach and offer a strategy to improve water supply by managing wastewater better.

2.1.6 Sustainable Development Goals- 2030 Agenda

The Sustainable Development Goals (SDGs) are a universal call to action to end poverty, protect the planet and improve the lives and prospects of everyone, everywhere. The SDGs were established in 2015 by the United Nations and intended to be achieved by the year 2030, called Agenda 2030. Among them, Goal 6 “Ensure availability and sustainable management of water and sanitation for all” is recognized as cornerstone to achieve all the SDGs. Access to safe and afordable water and sanitation is a fundmental human right. Water is essential not only to health, but also to poverty reduction, food security, peace and human rights, ecosystems and education. The demand for water has outpaced population growth, and nearly half the world’s population is already experiencing severe water scarcity at least one month a year and this could increase to up to 5.7 billion in 2050 (UN). In addressing this global chanllenge, water reuse can provide safe, reliable, and efficient water supplies to enhance water security, sustainability, and resilience.

2.1.7 Recommendations from ISO/TMB

Final ITFWA (Implementation Task Force on Water) report to the ISO/TMB recommended that ISO/PC 253 Treated wastewater reuse for irrigation be transformed into a technical committee "Water reuse" with an enlarged scope to include other kinds of reuse of treated wastewater. ISO/TMB in its resolution 19/2013 (quoted below), noting this recommendation, approved, in principle, the creation of a new TC to address water reuse, which would also be responsible for : 1) the ISO 16075 series currently under development, and 2) the contents of TS/P 232. This Strategic Business Plan addresses the resolutions of ISO/TMB.

TECHNICAL MANAGEMENT BOARD RESOLUTION 19/2013

Final report of the Implementation Task Force on Water (ITFWA) – Idea 2

The Technical Management Board,

Noting "Idea 2: Reuse for all kinds of uses: develop a coherent approach" in the ITFWA final report recommending that:
- ISO/PC 253 Treated wastewater reuse for irrigation be transformed into a technical committee entitled "Water

reuse" with an enlarged scope to include other kinds of reuse of treated wastewater,
- this new technical committee could have several subcommittees dealing with specific kinds of reuse of treated wastewater, which could include the proposal from SAC (China) TS/P 232 on Treated wastewater reuse in urban areas and noting the JISC proposal (Risk and performance evaluation of water reuse system).

Approves, in principle, the creation of a new TC to address water reuse which would also be responsible for: 1) the ISO 16075 series currently under development, and 2) the contents of TS/P 232,

Requests SII (Israel), SAC (China) and JISC (Japan) to work with ISO/CS (by end of February 2013) to prepare a draft TS/P to address water reuse, and

Instructs ISO/CS to circulate the above TS/P to ISO members with a communication explaining that it cancels and replaces TS/P 232 currently under ballot, further to the recommendations of the ITFWA.

In the ISO International Workshop on Water held on 25/26 July 2012 in Kobe, "Standard for the reuse of water" was ranked as the second priority.

There are a lot of ISO deliverable applicable to water reuse, including ISO 9000, ISO 14000 and ISO 31000 series. But water reuse, to which most people have not been accustomed, involves many specific aspects to consider. The international standardisation of water reuse is needed also to facilitate the application of existing ISO deliverables as appropriate to the field of water reuse.

TECHNICAL MANAGEMENT BOARD RESOLUTION 108/2013

The Technical Management Board,

Noting the recommendations provided in the ITFWA analysis on "Idea 6: Water inside buildings: A need for an analysis of existing work at ISO level" and the latest update on the ITFWA Synthesis of all comments received from ITFWA members " Propositions for future work" (TMB WD 90/2013 Annex 4)

Further noting the update provided by committees on the implementation of TMB Resolutions 19 to 23,

Requests that the topics outlined in the analysis on Idea 6 be treated as follows:
· Priority 1: Topic 4 – Rainwater management (harvesting, green roofs) on buildings and properties to be considered by ISO/TC 282 Water reuse

WG 2 Terminology was created and a definition will be determined for the Term “Rainwater” (TBD) at WG 2 level and TC 282.

TECHNICAL MANAGEMENT BOARD RESOLUTION 88/2019

Adopted by correspondence on 2019-10-25

Re-allocation of the secretariat of ISO/TC 282 Water re-use

The Technical Management Board,

Noting that when ISO/TC 282 was established with TMB Resolution 72/2013, the secretariat was allocated to JISC (Japan) with SAC (China) as the twinned secretariat.

Further noting the committee resolution 01/2019 from ISO/TC 282 to re-allocate the secretariat from JISC to SAC,

Approves the re-allocation of the secretariat to SAC (China).

According to the revised requirements and process for Twinning 2018, SAC and JISC are not able to continue to co-undertake the secretariat of TC 282. JISC decides to relinquish the secretariat of TC 282 and endorses

that SAC takes full responsibility of the secretariat of TC 282. ISO/TBM approved the reallocate the secretariat of TC 282 to SAC in October 2019.

2.2 Quantitative Indicators of the Business Environment

The following list of quantitative indicators describes the business environment in order to provide adequate information to support actions of the ISO/TC:

2.2.1 Treated Wastewater: A Resource to Use

Treated Wastewater (TWW) is already being reused in many nations worldwide. Figure 1 shows wastewater production per capita ($m^3\,yr^{-1}$ per capita) and wastewater production, collection, treatment and reuse ($109\,m^3\,yr^{-1}$), aggregated from the country data (reported + simulated) at the global scale and by region and level of economic development (L Jones, et al., 2021).
Worldwide, agriculture accounts for 70% of all water consumption. Farmers in peri-urban areas use streams for agriculture and aquaculture as in the past, but now increasingly also use TWW and the nutrients in it. TWW flows are typically more reliable than freshwater sources and are rich in nutrients for the cultivation of high-value crops.

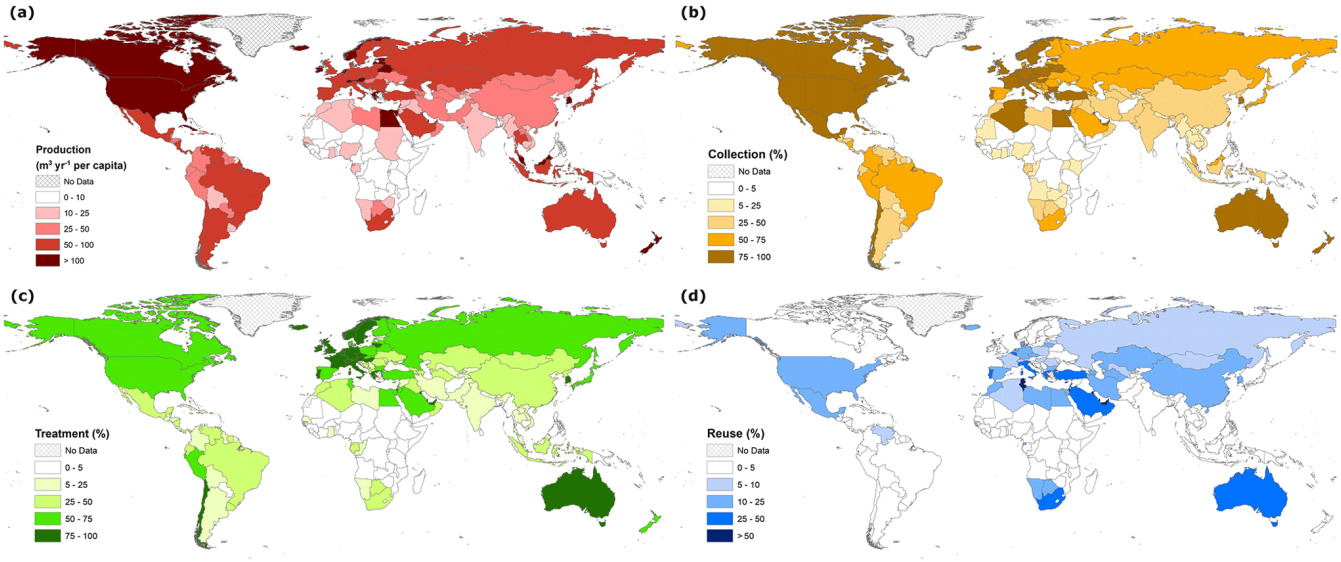


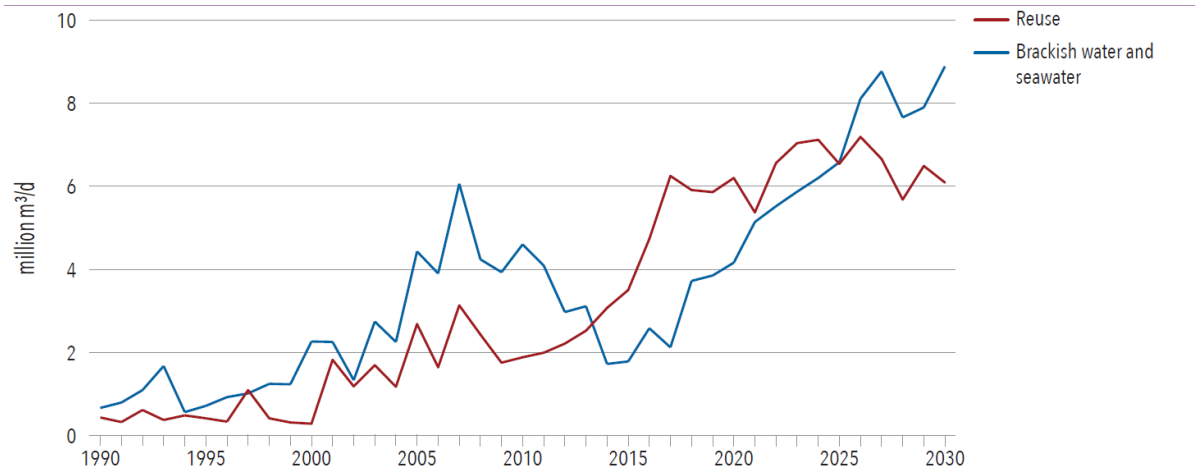
Figure 1. Wastewater production (m^3yr^{-1} per capita), collection (%), treatment (%) and reuse (%) at the country scale

Water pollution by industrial wastewaters is expected to increase in emerging market economies with economic and industrial development. In the early years following the widespread introduction of environmental regulations in developed countries, firms tended to invest in industrial wastewater treatment and recycling which reduced industrial water consumption, energy consumption and effluent drastically. Treated wastewater from industries should be recognized as promising water resource from perspectives of both conservation of water resources and mitigation of water pollution.
By the growth in water reuse for wide range of applications, more freshwater can be allocated for uses that require higher quality, such as for drinking, thereby contributing to more sustainable resource utilization.

2.2.2 Growing Global Market of Water Reuse

Figure 2 shows the new contracted capacity of municipal water reuse vs brackish/seawater desalination and

Figure 3 shows that the biological wastewater treatment market size is estimated to be USD 8.7 billion in 2020 and is projected to reach USD 11.1 billion by 2025.



Note: Due to the difficulty in distinguishing spending on reuse from spending on wastewater treatment, it is not possible to realistically estimate spending on reuse in monetary terms. Instead, we have estimated the market by contracted capacity.

Source: GWI

Figure 2. New Contracted Capacity of Municipal Water Reuse vs Brackish/Seawater Desalination, 1990-2030 (Source: Municipal Water Reuse Markets 2017)

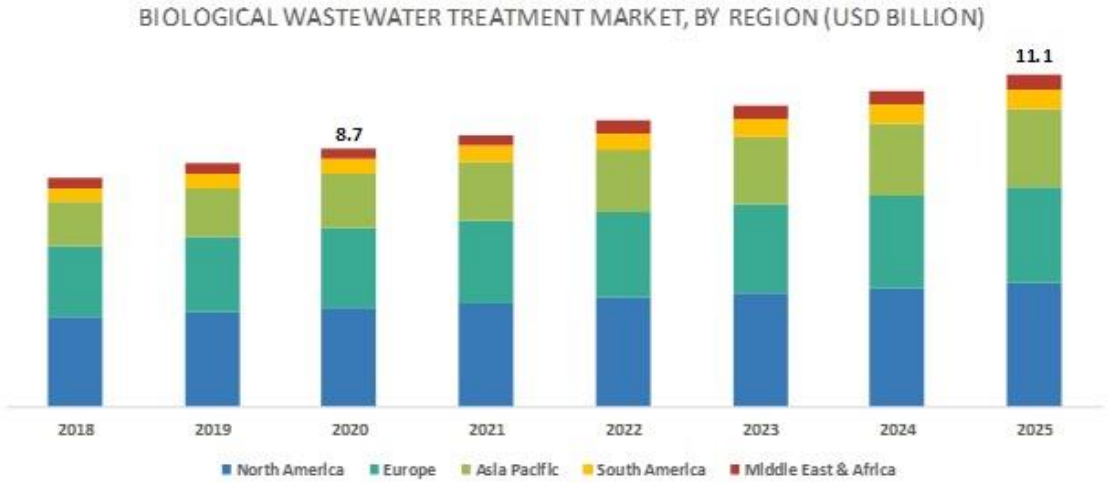


Figure 3. Biological wastewater treatment market, by region
(Source: Biological Wastewater Treatment Market 2022)

Pursuant to the report of Municipal Water Reuse Markets 2017, the market for water reuse is on the verge of major expansion.In the 2000s, growth in this sector has been overshadowed by the accelerated growth of the desalination industry. Over the last decade, however, the rate of growth in the water reuse sector has outpaced desalination. Since the outbreak of COVID-19 in 2020, the padeimic is adversely affecting the global water recycle and reuse market through changing the consumer behavior and demand, purchasing patterns, re-routing of the supply chain, dynamics of current market forces, and the significant interventions of governments. According to the report of *Rearch and Market*, the global market for water recycle and reuse technologies is estimated to grow from $21.3 billion in 2021 to reach $40.5 billion by 2026, at a compound annual growth rate (CAGR) of 13.8% during the forecast period of 2021-2026 (Fig.4).

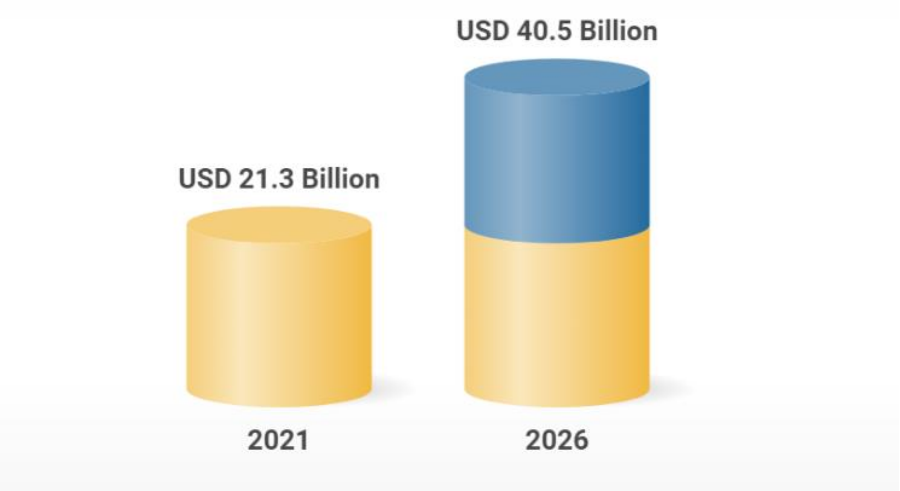


Figure 4.Global market and technologies for water recycling and reuse
(Source: Global Markets and Technologies for Water Recycling and Reuse 2021-2026)

Figure 5 shows memberane market growth by region, 2017-2024. The membranes market size is projected to grow from USD 5.4 billion in 2019 to USD 8.3 billion by 2024, at a CAGR of 9.0%. The major drivers for the membranes market include increasing population, rising awareness about wastewater reuse, and rapid industrialization. Shift from chemical treatment of water to physical treatment of water, strict regulations regarding water treatment, and water discharge, and changing climate dynamics in terms of amount of precipitation are also expected to drive the membranes market. These technologies are keys to the water reuse market. Indeed the GWI 2017 report clearly stated that the market would start to grow considerably from 2018 as the desalination market picks up and membranes become an increasingly cost-competitive and viable option. Continued development of those key technologies is expected to contribute to the steady growth in water reuse market.

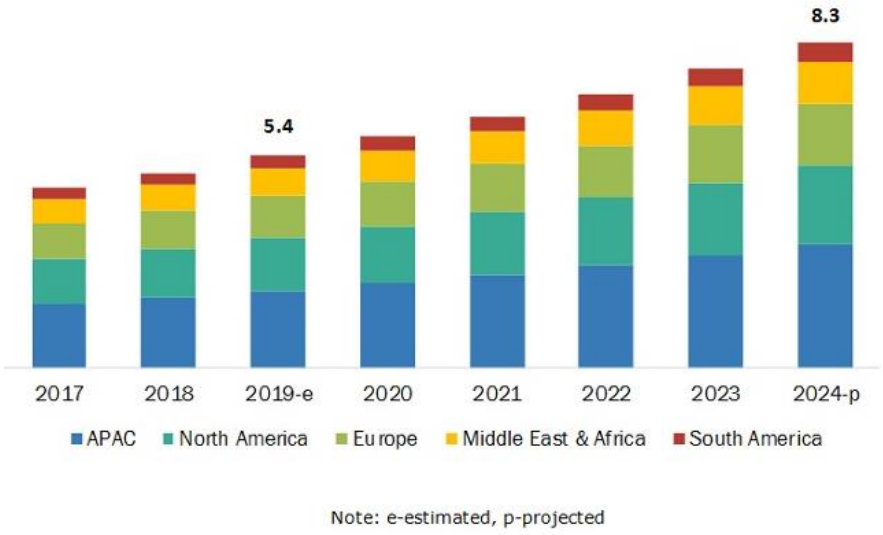


Figure 5. Memberane market by region 2017-2024
(Source: Membranes Market Global Forecast to 2024)

3. BENEFITS EXPECTED FROM THE WORK OF THE ISO/TC

ISO/TC 282 standards will help bring the following benefits to the stakeholders:

Since the water reuse including rainwater management (harvesting, green roofs) on buildings and properties is a newly emerging area, there can be many confusions or misunderstandings among stakeholders. Some may be afraid of using water reclaimed from wastewater in spite of its safety assured scientifically, while others may be too optimistic about using it thoughtlessly. Generally speaking, three parties are involved in the water reuse project; users of the reclaimed water, suppliers of water reuse services and the relevant public authority. Also industries, research departments, laboratories are included in relevant interested parties. ISO/TC 282 standards will provide the common language to facilitate the dialogue and mutual understanding among stakeholders and encourage and guide water reuse projects undertaken by service suppliers under appropriate regulation by public authority as well as the utilization of the reclaimed water by users in a proper manner.

Common perspectives and knowledge are needed within a sector involved in the water reuse project. For example, the staff members of designing, manufacturing, procurement, operation and maintenance, monitoring and even sales in a service providing company should have the common perspectives and basic knowledge to be required for securing consistency in the water reuse project. The community of users of reclaimed water can have more difficulties to argue whether to accept the reclaimed water or not. Some members may have the feeling that the community is handicapped by the water reuse project. Common perspectives and basic knowledge on water reuse can create the consistency and facilitate the consultation within the community. ISO/TC 282 standards will provide such common perspectives and knowledge to secure consistency within a sector.

The issues to be considered in a water reuse project vary mainly with the purpose and the source (waste) water. Responding to the growing market for water reuse, rapidly emerging is the social needs for the guidelines on a healthy, hydrological, environmental and economic conscious design, operation, monitoring and maintenance for water reuse project for major purposes and technologies by means of typical source water, one of which is municipal waste water. There are already such guidelines issued by governmental agencies or international organizations. But most guidelines are specific to the country or too specialized in one aspect of the reuse to be accepted by the communities. ISO/TC 282 standards are expected to guide more practically the stakeholders toward the most appropriate solutions of water reuse in water scarce communities and help wiser water reuse to be established in the society, possibly in conjunction with the application of other International Standards or certification system.

Intensive research and development activities are in progress and the scientific knowledge is accumulated in industries as well as public research laboratories/institutes. Thus the information asymmetry in communications between service suppliers and users has been a deep-rooted problem. Universal and objective evaluation of risk and performance related to water reuse system is the fundamental key to the problem. What should be shared is not the technical expertise but the system for securing the reliability of risk and performance evaluation. To this end, ISO/TC 282 standards will provide methods and tools to evaluate the risk and performance of water reuse systems from the aspects including human health, economics, environment and society. Community survey and consultation methods are also included to evaluate the potential impact of water reuse project on the community.

ISO/TC 282 standards will promote the international trade, facilitating the fair competition among suppliers by providing common methods and indicators for performance evaluation of the facility system and its service. It will be advisable to implement the management system standards such as ISO 9000, 14000 and 22300 series for the assurance of the service quality or reliability. ISO/TC 282 standards will help the organizations engaged in water reuse implement those management system standards and get third party certification, which can result in promoting the international fair trading.

4. REPRESENTATION AND PARTICIPATION IN THE ISO/TC

Countries/ISO member bodies that are P and O members of the ISO committee

4.1 Analysis of the Participation (data as of November 2018)

ISO/TC 282 currently has 25 P-members: Austria (ASI), Bahrain (BTMD), Bolivia, Plurinational State of (IBNORCA), Canada (SCC), China (SAC), Costa Rica (INTECO), Egypt (EOS), Ethiopia (IES), France (AFNOR), India (BIS), Iran, Islamic Republic of (INSO), Ireland (NSAI), Israel (SII), Japan (JISC), Kenya (KEBS), Korea, Republic of (KATS), Mongolia (MASM), Netherlands (NEN), Portugal (IPQ), Rwanda (RSB), Spain (UNE), Sudan (SSMO), Sweden (SIS) United States (ANSI), Viet Nam (STAMEQ), and 24 O-members: Argentina (IRAM), Armenia (SARM), Burundi (BBN), Colombia (ICONTEC), Croatia (HZN), Czech Republic (UNMZ), Finland (SFS), Germany (DIN), Hungary (MSZT), Italy (UNI), Lithuania (LST), Malaysia (DSM), New Zealand (NZSO), Peru (INACAL), Philippines (BPS), Poland (PKN), Saint Lucia (SLBS), Serbia (ISS), Singapore (SSC), Slovakia (UNMS SR), Sri Lanka (SLSI), Switzerland (SNV), Thailand (TISI), United Kingdom (BSI).

Thus, most industrialised nations and a significant number of developing countries are represented in ISO/TC 282 from the beginning stage of the TC. More members from water-stressed countries are expected to participate actively when the standardization activities are initiated and some outcomes are presented in the future.

Liaison Committees to ISO/TC 282
The committes below can acess the documents of ISO/TC 282:
ISO/TC82/SC7, Mine closure and reclamation management
ISO/TC147/SC1, Water Quality- Terminology
ISO/TC147/SC6, Water Quality- Sampling (general methods)
ISO/TC275, Sludge recovery, recycling, treatment and disposal

Liaison Committees from ISO/TC 282
ISO/TC 282 can access the documents of the committees below:
ISO/TC 82/SC 7, Mine closure and reclamation management
ISO/TC147, Water Quality
ISO/TC190, Soil Quality
ISO/TC224, Service activities relating to drinking water supply wastewater and stormwater systems
ISO/TC275, Sludge recovery, recycling, treatment and disposal

Additionally, potential liaisons can be as follows:
ISO/IEC JTC 1 Information technology
ISO/TC 8/SC 13 Marine technology
ISO/TC 23/SC 18 Irrigation and drainage equipment and systems
ISO/TC 113 Hydrometry
ISO/TC 207 Environmental management
ISO/TC 268 Sustainable cities and communities
ISO/TC 331 Biodiversity
ISO/PC 316 Water efficient products - Rating

5. OBJECTIVES OF THE ISO/TC AND STRATEGIES FOR THEIR ACHIEVEMENT

5.1 Defined Objectives of the ISO/TC

The ISO/TC 282 will develop a package of International Standards in the field of water reuse.

Specific

Water reuse to be dealt with under ISO/TC 282 comprises a sequence of the stages and operations involved in uptaking, conveyance, processing, storage, distribution, consumption, drainage and other handling of wastewater, including water that is reused in repeated, cascaded and recycled ways. It covers both centralised and decentralised or on-site water reuse, direct and indirect ones, taking into consideration the potential for unintentional exposure or ingestion. It includes technical, economic, environmental and societal aspects of water reuse. Water reuse also includes rainwater management (harvesting, green roofs) on buildings and properties.
The following items are excluded from this TC:

- the limit of allowable water quality in water rreuse, which should be determined by the governments, WHO and other relevant competent organizations.
- the aspects which are not specific to water reuse, such as:
  - management of drinking water,wastewater and stormwater utilities, which is covered by TC 224,
  - methods for the measurement of water quality, which are covered by TC 147.

Measureable

Targets of standardization will involve the development of International Standards in the following 4 categories:
(1) Treated wastewater use for irrigation
(2) Water reuse in urban areas in urban area
(3) Risk and performance evaluation of water reuse systems
(4) Industrial water reuse

Achievable

There are sufficient amounts of informative materials including guidelines and technical reports which the standardization work should make reference to. Representative guidelines are as follows:

- ISO/IWA 6:2008, Guidelines for the management of drinking water utilities under crisis conditions
- WHO: Guidelines for the Safe Use of Wastewater, Excreta and Greywater (2006)
- AQUAREC: Guideline for quality standards for water reuse in Europe, EVK1-CT-2002-00130, Work package , Deliverable D15 (2006)
- USEPA: Guidelines for Water Reuse (2012)
- WERF: Pathogen Risk Indicators for Wastewater and Biosolids (2009)
- Australian Guidelines for Water Recycling：Managing Health and Environmental Risks (2006)
- National Institute for Land and Infrastructure Management, Government of Japan: Report of the Microbial Water Quality Project on Treated Sewage and Reclaimed Wastewater (2008)
- Harold L. Leverenz, Takashi Asano: WATER REUSE- Issues, Technologies, and Applications, Metcalf & Eddy (2006)
- EU Minimum Requirements for Water Reuse (2020)
- WHO Potable Reuse Guidance for Producing Safe Drinking-Water, 2017
- The UN World Water Development Reports 2019-2021

Results-oriented

In the program of work, standardisation for specific types of wastewater treatment and supply system for popular water reuse may be prioritised, when it is preferred by the international communities.
Ex) standardisation of the methods to evaluate human health related risk reduction in some particular process(es) for water reuse and the methods to comprehensively assess typical water reuse systems

involving them.
Since the global market for water reuse is exploding and the active research and development on water reuse technologies are in progress world-wide, this kind of standardization will be very likely to be proposed and successfully implemented.

Time-bound

Since the first plenary meeting of TC 282 in Tokyo, Japan, on January 23rd and 24th, 2014, a number of projects have been proposed to TC or SCs, all of which being developed in appropriate timeframe agreed by members. In each stage of these developments, every progress have been achieved by consensus based balloting or meetings.

5.2 Identified Strategies to Achieve the ISO/TC's Defined Objectives

Current programme of works are as follows:

(1) SC 1: Treated wastewater reuse for irrigation

a) The second edition of ISO 16075 series, titled "Guidelines for treated wastewater use for irrigation projects" have been developed by TC 282/SC 1 (formaly known as PC 253). Parts 1 to 2 were published in 2020 and Part 3 to 5 in 2021.
b) ISO 20419, Treated wastewater reuse for irrigation -- Guidelines for the adaptation of irrigation systems and practices to treated wastewater, was published in 2018.
c) ISO 16075-6, Guidelines for treated water use for irrigation projects — Part 6: Fertilization

(2) SC2: Water reuse in urban areas

a) ISO 20760 series, titled "Water reuse in urban areas -- Guidelines for centralized water reuse system", Part 1: Design principle of a centralized water reuse system, and Part 2: Management of a centralized water reuse system. Part 1 and 2 were published in 2017 and 2018.
b) ISO 20761, Water reuse in urban areas -- Guidelines for water reuse safety evaluation: assessment parameters and methods, was published in 2018.
c) ISO 23056, Water reuse in urban areas -- Guidelines for decentralized/onsite water reuse system: Design principle of a decentralized/onsite system, was published in 2020.
d) ISO 23070, Water Reuse in Urban Areas -- Guidelines for reclaimed water treatment: Design principle of a RO desalination system of municipal wastewater, was published in 2020.
e) ISO 24297, Guidelines for treatment and reuse of leachate from municipal solid waste (MSW) incineration plants, was published in 2022.
f) ISO 24416, Water reuse in urban areas — Guidelines for water reuse safety evaluation: Stability evaluation of reclaimed water, was published in 2022.
g) ISO 24575, Guidelines for cost analysis in planning of decentralized wastewater treatment and/or reuse, has been under development in the Joint ISO/TC 282/SC 2 - ISO/TC 224 WG.
h) ISO 9111,Water reuse in urban areas — Guideline for benefit evaluation of reclaimed water use
i) ISO 9784, Guidelines for deep purification of secondary effluent for non-potable reuse using biological filtration systems

(3) SC3: Risk and performance evaluation of water reuse system

a) ISO 20468 series, titled "Guidelines for performance evaluation of treatment technologies for water reuse systems", Part 1: General, published in 2018, Part 2: Methodology to evaluate environmental performance of treatment systems on the basis of greenhouse gas emissions, published in 2019, Part 3: Ozone treatment technology published in 2020, Part 4: UV Disinfection, Part 5: Membrane filtration, Part 6: Ion exchange technology, Part 7: Advanced oxidation processes pubulisehd in 2021 and Part 8: Evaluation of treatment systems based on life cycle cost published in 2022.
b) ISO 20426, Guidelines for health risk assessment and management for non-potable water reuse, was published in 2018.
c) ISO 20469, Guidelines for water quality grade classification for water reuse, was published in 2018.
d) ISO 20468-9, Guidelines for performance evaluation of treatment technologies for water reuse systems

— Part 9: Part 9: Electro-chlorination

(4) SC4: Industrial water reuse

a) ISO 23043, Evaluation method of industrial wastewater treatment and reuse technology, was published in 2021.
b) ISO 23044, Guidelines for softening and desalination of industrial wastewater reuse, was published in 2020.
c) ISO 22447, Industrial wastewater classification, was published in 2019.
d) ISO 22524, Pilot plan for industrial wastewater treatment facilities in the objective of reuse, was published in 2020.
e) ISO 22449 series, titled “Industrial cooling water reuse”, Part 1: Technical guidelines and Part 2: Guidelines for cost analysis, were published in 2020.
f) ISO 21939-1, A calculation method and expression for industrial wastewater treatment energy consumption for the purpose of reuse -- Part 1: Biological processes, was published in 2019.
g) ISO 4789, Guidelines for wastewater treatment and reuse in thermal power plants
h) ISO 21939-2, A method to calculate and express energy consumption of industrial wastewater treatment for the purpose of water reuse — Part 2: Accounting for energy recovery
i) ISO 12370 Guidelines for treatment and reuse of fermentation-based pharmaceutical wastewater

In addition to the above subjects, the following projects are under development in TC 282/WG 2 “Terminology” and WG 3 “Water systems for biopharma industries**”**
a) The first edition of ISO 20670, Water reuse – Vocabulary, was published in 2018. The revision of ISO 20670 was initiated in 2020.
b) The first edition of ISO 22519, Purified water and water for injection pretreatment and production systems, was published in 2019. The revision of ISO 20670 was initiated in 2020.

Since its creation in 2013, subcommittees for above items (1), (2), and (3) have been established and the activities of those subcommittees as well as working groups were incorporated into the immediate plan. Also, a Chairman’s Advisory Group (CAG) has been created under TC 282 to secure the coherence including common terminologies within the TC, taking into consideration the suggestion to “develop a coherent approach” in idea 2 “Reuse for all kinds of uses” in the Final ITFWA report to the ISO/TMB. Then, (4) and Communications Task Group (CTG) were established in 2016, WG 3 followed in 2017.
Subcommittee secretaries for items (1), (2), (3) and (4) are undertaken by Israel (SII), China (SAC), Japan (JISC), and China (SAC) respectively.

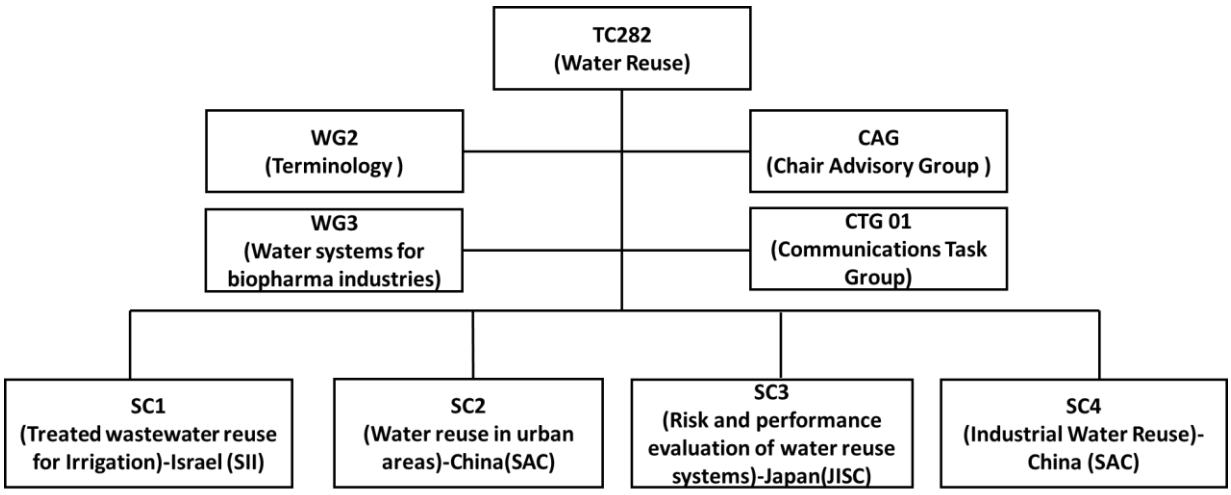


Figure 6 Structure of TC 282

6. FACTORS AFFECTING COMPLETION AND IMPLEMENTATION OF THE ISO/TC WORK PROGRAMME

Stakeholders of water reuse comprise the academic researchers, practitioners from industries, officials from public authorities, users of the reclaimed water and so on. Those stakeholders are often divided into some groups specific to the industries where water is reused. Appropriate mixture of those stakeholders will be the top key priority to the success in good work of standardisation.

The second key priority is the participation of the experts from water scarce areas in the world. Especially participation from developing areas is desirable to develop more universal International Standards.

Since water reuse sometimes requires specific technical expertise for safe and sustainable water reuse, the discussion tends to be industry-oriented. However, the International Standards can be successfully implemented with support from users. The third key priority is the user-oriented approach in developing standards.

Special attention should be paid to the above factors in the management of the ISO/TC 282.

7. STRUCTURE, CURRENT PROJECTS AND PUBLICATIONS OF THE ISO/TC

This section gives an overview of the ISO/TC's structure, scope, projects and publications. All of this information is updated regularly and is available on ISO's website, ISO Online.

Scope of ISO/TC 282

Standardization of water reuse of any kind and for any purpose. It covers both centralized and decentralized or on-site water reclamation, and direct and indirect reuse applications, taking into consideration the potential for unintentional exposure or ingestion. It includes technical, economic, environmental and societal aspects of water reuse. Water reuse comprises a sequence of the stages and operations involved in collection, conveyance, processing, storage, distribution, consumption, drainage and other handling of wasterwater and treated effluent, including water that is reused in repeated, cascaded and recycled ways. The scope of ISO/PC 253 (Treated wastewater reuse for irrigation) is merged therein.

Excluded:

- the limits of allowable water quality in water re-use, which should be determined by the governments, WHO and other relevant competent organizations.
- standardization in drinking water, wastewater and stormwater systems and services as within the scope of ISO/TC 224)
- methods for the measurement of water quality, which are covered by ISO/TC 147.

The link below is to the TC's page on ISO's website:
ISO TC 282 on ISO Online

Click on the tabs and links on this page to find the following information:

- About (Secretariat, Secretary, Chair, Date of creation, Scope, etc.)
- Contact details
- Structure (Subcommittees and working groups)
- Liaisons
- Meetings
- Tools
- Work programme (published standards and standards under development)

You could also find ISO/TC 282's original website, where we provide further information:
ISO TC 282 Website

Reference information

- Glossary of terms and abbreviations used in ISO/TC Business Plans

- General information on the principles of ISO's technical work