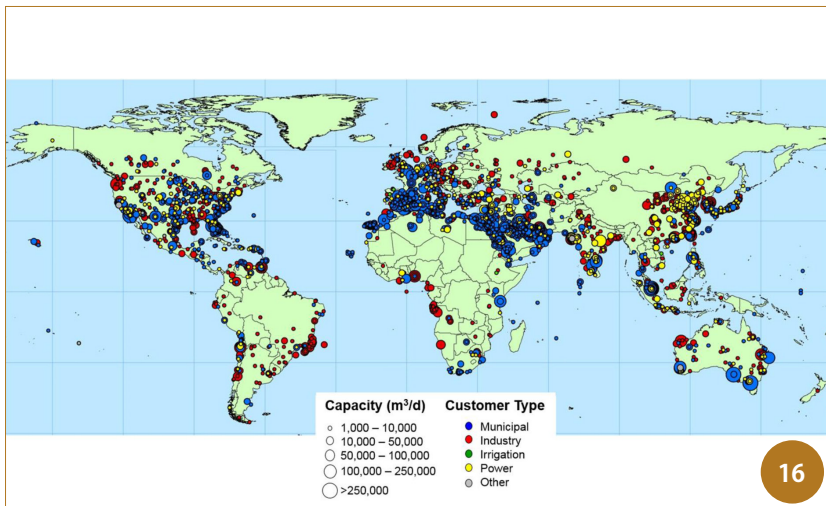


CIDCO @SMART Newsletter

JULY - AUGUST 2019 | VOLUME 5 ISSUE 3

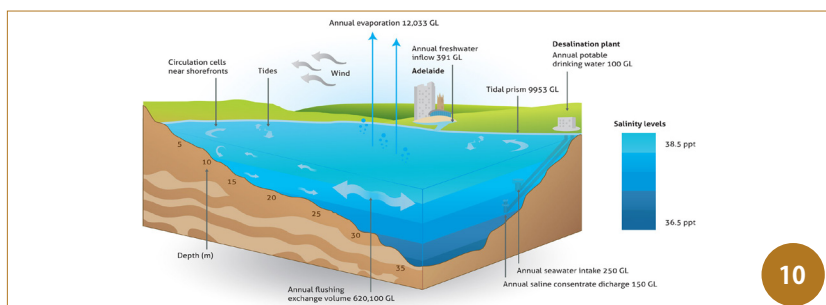


16



02

09



10



06

CONTENTS

INTERVIEWS AND FEEDBACK2

■ Interviews of Training Attendees

Ms. Deepa Prakash Kamble – Assistant Social Service officer- Social Service

Mr. Rajaram Shivanna Nayak – Superintendent Engineer- Engineering

NEWS UPDATES.....3

FEATURED COURSES ON UJJWAL3

DATA SHEET 4

Case-Studies Covered
by CIDCO@Smart –2015 to 2019..... 4

SMART CITIES CORNER 6

■ Emerging Ideas

Solid waste management –
Segregating Solid Waste at Source 6

Environment Impact Assessment –
Water Desalination Plants 10

Recreating Organizational Learning –
Learning Through Technology 16

BIBLIOGRAPHY.....18



16

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Interviews of Training Attendees

Ms. Deepa Prakash Kamble – Assistant Social Service officer

Leadership Development

Indian Institute of Management, Lucknow

Date - 1st –3rd July 2019



You have recently attended a course on Leadership Development. How was your experience?

This was the first time I went for a training through Ujjwal. Earlier, I had attended a customized training arranged by Ujjwal. I had a great experience during this residential training. IIM Lucknow has really good faculty and has a huge campus. I gained a lot of knowledge during the entire training programme. Accommodation was also very good.

Do you think this course helped you in your current role and how do you relate this course to your day to day life personally as well as professionally?


Since the time of selecting the course, I was very clear that I wanted to go for a leadership training and therefore, I froze my preferences in the portal accordingly. I am really thankful to the Ujjwal team for responding as per my preferences and giving me an opportunity to attend a training in IIM Lucknow. The training was really intense but also in-depth. Whatever I learnt in the training, I am trying to incorporate it in my professional life. I have started implementing few of the learnings I took from the training, but since I have attended this training recently it's a bit early to notice the transformation. However, I have certainly sure that my confidence has increased a lot after attending this training.

Mr. Rajaram Shivanna Nayak– Superintendent Engineer- Engineering

Infrastructure Development, PPPs and Regulation

Indian Institute of Management Bangalore

26th – 39th August 2019



You have recently attended a course on Infrastructure Development, PPPs and Regulation. How was your experience?

The training I attended was in IIM Bangalore. Going to an IIM was always a dream, finally making it at this age makes me really happy. The course was very good and the faculties were excellent, this was evident from the high level of participants present in the training program. The course was quite rigorous. It also brought us many memories of our college days.

Do you think this course helped you in your current role and how do you relate this course to your day to day life personally as well as professionally?

The course covered a wide range of topics like PPP, the risks and various financial analysis. One of the

the capability to be able to judge myself on what kind of leader I am or I want to be. It was really interesting.

How do you think if other CIDCO employees go for similar course would be benefitted?

Definitively, I would suggest this course to all CIDCO employees, especially the middle level leaders. This is a very good programme offered by one of the most renowned institutes in India. In my opinion, CIDCO employee should attend at least one training offered by IIM Lucknow.

What are your views about implementation of Ujjwal in CIDCO?

With time, Ujjwal has proved-out to be a major support to CIDCO in terms of capacity building. I am working with CIDCO since last eleven years and with the same department. I strongly believe that it is very important to upgrade our knowledge through training and refresher courses. Ujjwal is definitely doing a great job and the way the team is supporting CIDCO is commendable.

Using this technique and some case studies, the concept was made clear to us. Other than that, case-studies of Delhi and Mumbai Airports, and their various complications and experiences before finalizing the award was explained in detail. I believe, this case study will help us in dealing with similar situation in CIDCO's other projects. Also, classes on the metro projects, particularly case-studies of PPP will help us in planning future metro projects through this route as an additional option. Besides this, some important sessions related to ports and shipping along with some legal aspects were also taught. Many legal terms and concepts were made clear during the training programme.

Apart from all this, I personally gained a lot of confidence. Sometimes when you are aware of the scenario but hesitant to take decisions or sometimes

when you may not be completely aware of a subject, such situations were handled very well here.

Who were your fellow participants and how was your interaction with other participants?

Participants were of senior level position from different organizations and interacting with them was a great experience. Participants came from DFCC, IFCI, Bangalore Metro, Railways, port-organisation, etc. Many concepts discussed made us aware about practices and affairs happening outside CIDCO.

What was the best part of this training? If you want to highlight anything in particular.

All the aspects of the training were really good, be it the faculty, food, campus, case-studies, topics or

the participants. Especially the case studies of Delhi and Mumbai Airport that I mentioned earlier was explained in great detail to us. We face something similar type of issues here in various projects, but after going through those case studies, it gave me a lot of clarity and confidence.


How do you think if other CIDCO employees go for similar course would be benefitted?

Definitely this course is very helpful for CIDCO and I don't mind even if some junior level employees attend this training. However, they should be really interested in doing this course. Mr. Kale, one of my colleague and a fellow participant in this training was little reluctant to attend this course because of his work pressure, but was very happy after coming back and repeatedly thanked me for bringing him along.

What are your views about implementation of Ujjwal in CIDCO?

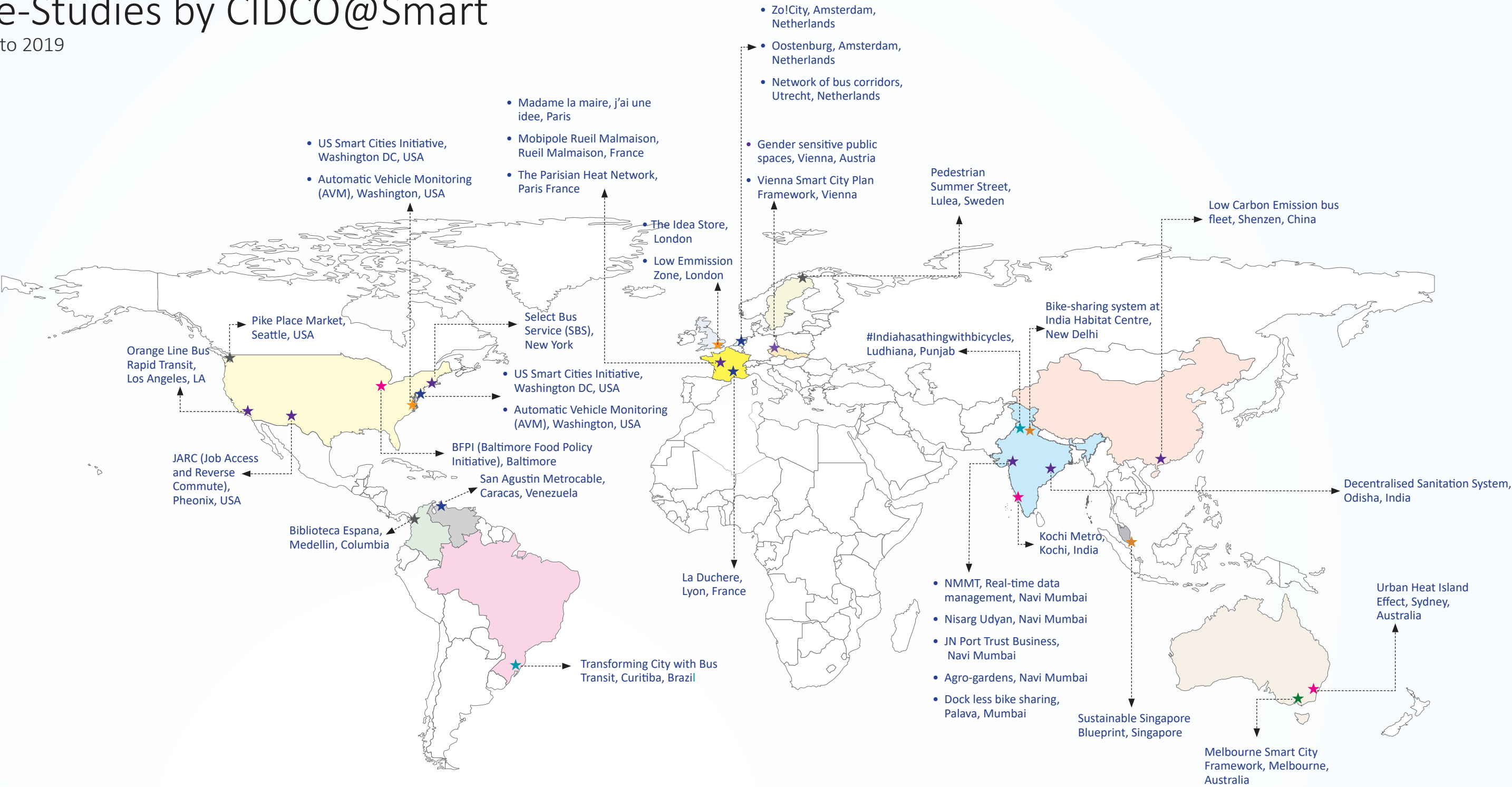
Ujjwal is a very good concept because earlier we used to have trainings but it wasn't structured properly, it used to be an on and off. No proper record about the employees attending the trainings was maintained. Ujjwal has made it compulsory in its protocol. Also, the online management system is very user-friendly and gives us lots of data too. Besides, it is also helping us in achieving ISO standards. For ISO certifications, training is a mandatory requirement and whenever needed we can readily give them the training data documented through Ujjwal.

I thank CIDCO management for introducing Ujjwal, through which I could attend this course.

NEWS UPDATES	
Date – 19th July 2019	
The training cell conducted 9 th session of Vimarsh with the training attendees from April 19 to June 19. The participants shared their training experiences with the training cell.	
	30th August 2019 CIDCO Smart City Lab released a series of 2 video interviews conducted with CIDCO employees to know their experience with CIDCO's training management system – Ujjwal.
FEATURED COURSES ON UJJWAL	
10th-11th Oct, 2019 Technologies for Reducing PM, Nox, SOx and CO2 in Cement Industry	
14th-16th Oct 2019 Performance Evaluation of Sewage Treatment Plants-Practical Aspects and Field Visits Aspects and Field Visits	
14th-16th Oct, 2019 A Leadership Challenge of the Decade Managing Organizational Culture to face VUCA challenges	
14th-18th Oct 2019 Leading with Emotional Intelligence	
14th-18th Oct 2019 Sustainable Cities	
21st-23rd Oct 2019 Current Requirements in Environmental Impact Assessment (EIA) Process and Procedures (as per MoEF & CC Guidelines)	
21st-25th Oct 2019 Effective Land Acquisition, Resettlement & Rehabilitation (LARR)	
21st-25th Oct 2019 Quality Assurance and Quality Control in Civil Engineering Construction Projects	
04th-07th Nov 2019 Demystifying Strategic Decision Making through Strategy Simulation	
12th-15th Nov 2019 Water Woes: Understanding Urban Water Management and Sustainability	
19th-22nd Nov 2019 Good Maintenance Practices for Durability of Structures	
18th-22nd nov 2019 Design of Bridges including Computer applications	
18th-20th Nov 2019 Environmental Impact Assessments for Ports and Harbours	
26th-29th Nov 2019 Mainstreaming Energy Efficiency in Water Management: Water- Energy nexus	
02nd-06th Dec 2019 Pavement Evaluation Techniques and their applications for Maintenance and Rehabilitation	
02-06 dec 2019 Waste Water Treatment Technologies	
09th-11th Dec 2019 Strategic Financial Analysis to Make Value-Creating Decisions	

Case-Studies by CIDCO@Smart

2015 to 2019



Over the past 4 years, CIDCO Smart City Lab has covered many concpets and practices through various case-studies across the globe. These articles discuss different emerging ideas, best-practices and innovative ideas used to deal with current urban challenges. This datasheet showcases the geographical footprint covered by CIDCO@Smart through its articles in different issues over the past few years.

Legend			
★	Vol. 2, Issue 2 & 3	★	Vol. 3, Issue 1
★	Vol. 1, Issue 3& 4	★	Vol. 4, Issue 1
★	Vol. 2, Issue 1	★	Vol. 4, Issue 2
★	Vol. 3, Issue 3 & 4	★	Vol. 4, Issue 3 & 4
		★	Vol. 5, Issue 1 & 2

Solid Waste Management

Segregating Solid Waste at Source

Introduction

Human interventions are a key element in the waste cycle. The complex process of producing useful products from different raw materials generates a large amount of solid waste. Improper disposal of this solid waste and its management is one of the main causes of environmental degradation. It is a major contributor to all types of pollution and outbreak of diseases in many parts of the world (A.K, 2017). Solid Waste can be classified into four groups (Asmawati Desa, n.d.):

- Municipal Solid Waste or common garbage
- Hazardous or industrial waste
- Construction or demolition waste
- Biological or medical waste
- Nuclear or radioactive waste

Due to inefficient disposal mechanisms in place, many of this waste goes to landfills. There are many landfill sites operating in India without having sufficient efficiency to reduce the emitting pollution (Bakshi, Bose, Nandan, Yadav, 2017). Solid waste management controls the amount of waste sent to the landfills. It involves collection, transportation, disposal and treatment of waste materials (Paghasian, 2017). SWM follows a three-tier approach (3Rs), each of these steps are important to reduce the amount of waste left for final disposal (Paghasian, 2017), the 3Rs are:

- **Reduction:** bringing down the amount of garbage disposed, also by avoiding items that generate a lot of trash.
- **Recycling:** saving resources used to manufacture

the products and reducing the impact on landfills

- **Reusing:** Recovering materials intended for the same or different purpose without the alteration of its physical and chemical characteristics. The energy and resources used to make a new product is saved by reusing and results in fewer by-products ending up in a landfill.

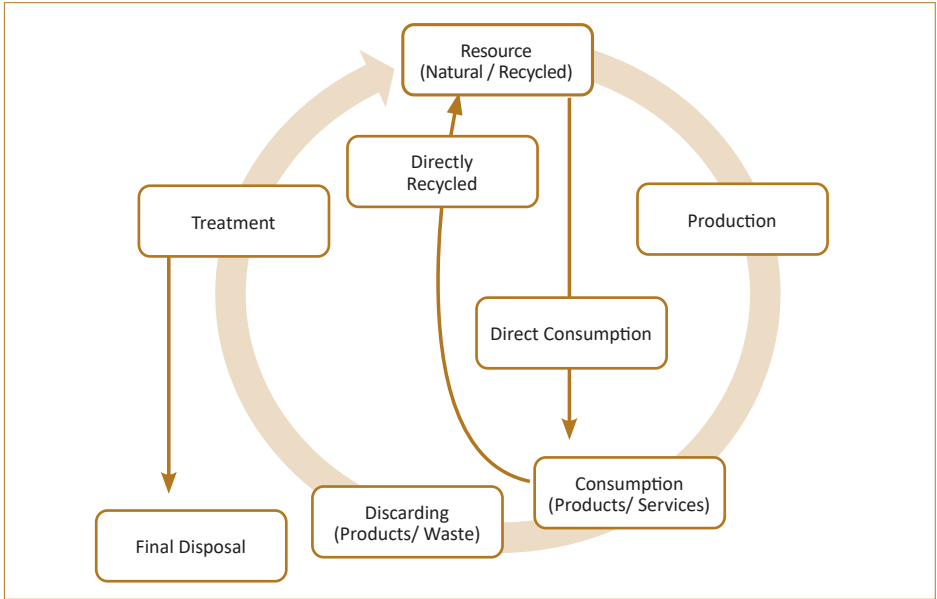
This article discusses the solid waste management by focusing on the importance of segregation at source, different initiatives necessary to make it possible and takes the case-study of waste management strategy in Helsinki, Finland to further understand the initiatives taken by its local municipal body.

Segregation at Source

When none of the 3Rs are applicable, a responsible waste disposal strategy is required. A generalised sequence of activities in solid waste management includes: Source > Separation/Sorting > Collection > Transportation > Processing / Recycling > Residual disposal (Hassan, 2004). Generally, a lot of emphasis is put on recycling the waste material. However, it is important to note that segregating at source is also one of the more crucial step for an effective waste management strategy. In India, identifying the need for better waste segregation was solidified only after the release of 2018 Swacchta Sarvekshan (Agarwal, 2018).

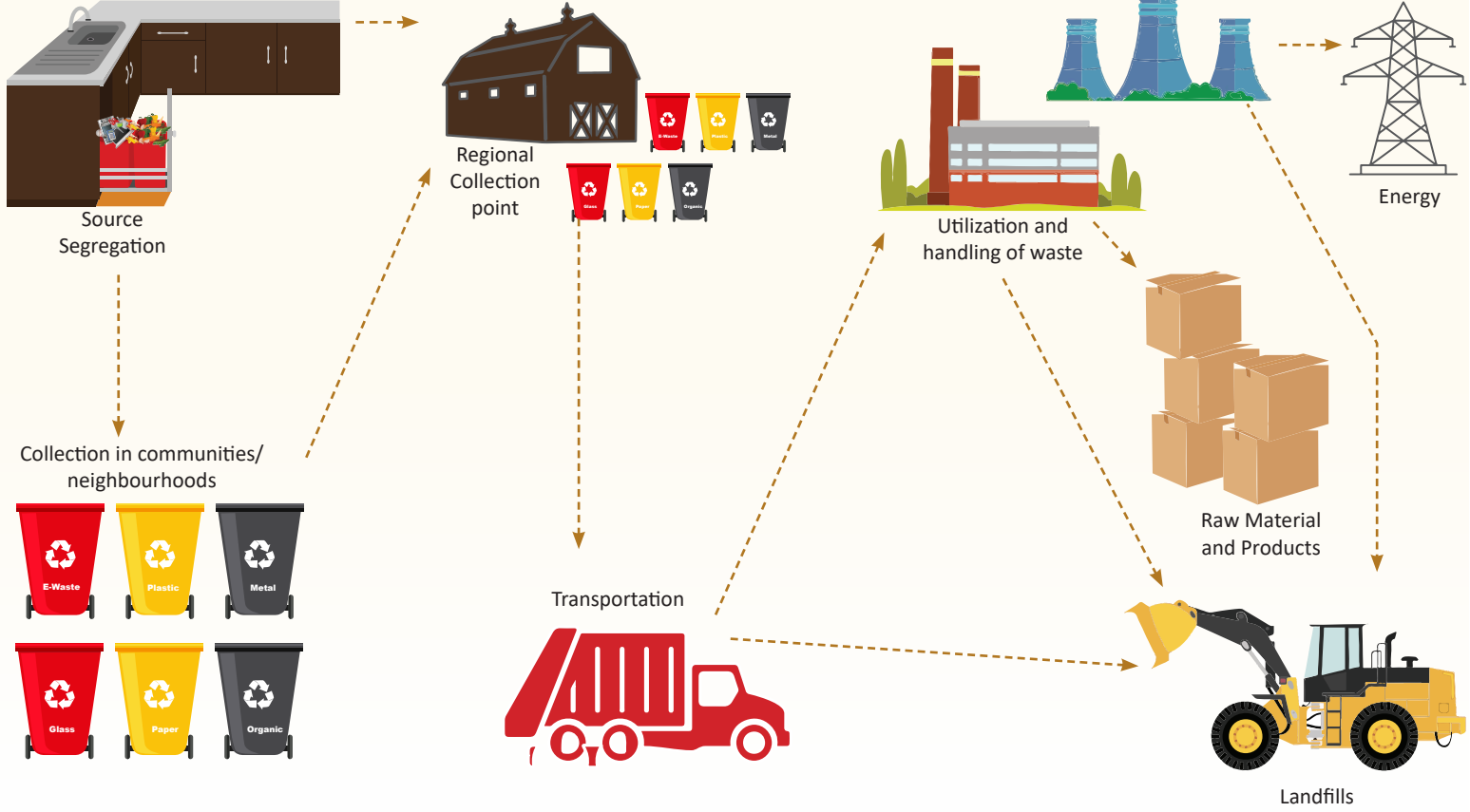
Separating the solid waste at the point of origin in order to recycle and reuse the resources reduces the cumulative volume of waste for collection and makes waste management a lot more efficient

Fig 1 – Ideal life-Cycle of Solid Waste and its Management



Source – UNEP, nd

Fig 2 - Typical cycle of solid waste segregation, collection and processing



(Paghasian, 2017). Segregation at source leads to easier processing of waste and resource recovery, it also improves the collection efficiency. Most cities are now realising the importance of segregation of waste at source and are slowly taking initiatives to implement it. However, the efficiency of any waste segregation strategy varies as per the attitude and awareness of the persons involved. A marked difference between the approach of an informed and environmentally aware individual and an uninformed individual clearly exists. For an effective implementation, there are many ways any municipal bodies can incentivise the waste segregation process, some of them have been discussed below.

Initiatives for Waste Segregation PAYT (Pay As You Throw)

Municipal bodies always have a variety of options for better waste management; its expense and the effectiveness vary greatly. For example, the traditional approaches of managing the cost of disposing the waste are flat-rate system or through municipal taxes. In both cases, the users pay a flat amount irrespective of the amount of waste generated. Moreover, there are no incentives to encourage the users to reduce the amount of waste generated.

PAYT (Pay As You Throw) over the years in many countries, has turned out to be a highly effective waste management strategy (pay-as-you-throw.org, n.d.). It has turned out to be effective in reducing the amount of waste generated and managing the

cost involved. PAYT, also known as trash metering or unit pricing, is a user-pricing model for disposing municipal solid waste. Users are charged a rate based on the amount and type of the waste they give for the collection by municipality. There are 3 variants of PAYT:

- Full-unit pricing – Users pay for all the garbage in advance by purchasing a garbage bag, tag or a

container.

- Partial-unit pricing – The municipality decides the maximum number of bags used by a household and the average amount is included in the taxes.
- Variable-rate pricing – Users choose to rent a container with the price corresponding to the waste generated.

It is important to note that before implementing PAYT, the municipalities should first understand the municipality's position in terms of Municipal Solid Waste (MSW) disposal and management. For this, the municipality is expected to gather data on:

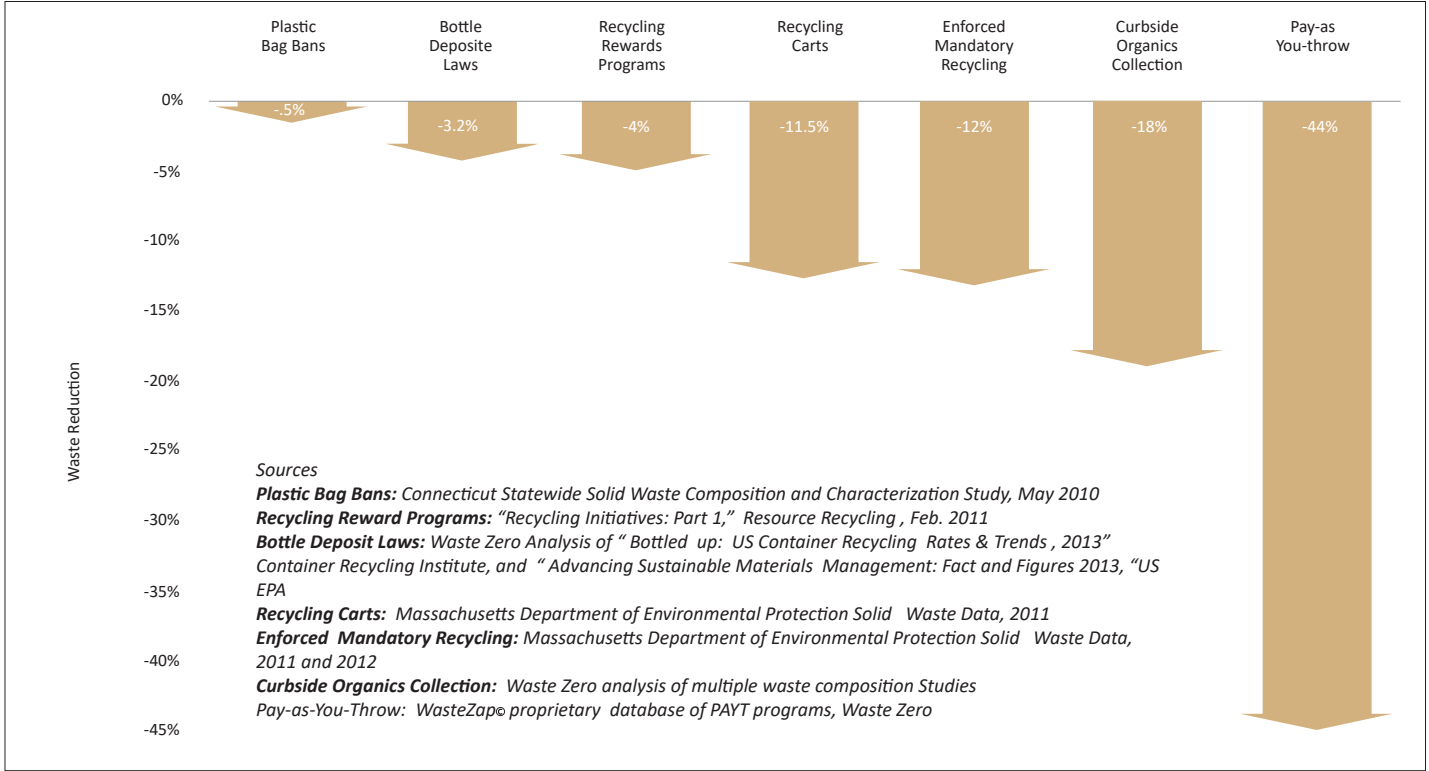
- MSW tonnage – Amount of waste generated
- Hauler relationship – How the waste and the recycled material is transported
- Recycling – History on community's recycling habits and capabilities
- Fees structure – Current solid waste budget and funding structure, user's capability of paying recurrent fees and possibility of future hikes
- Other miscellaneous costs – transportation, yard management and operations, etc.

Municipalities opting for PAYT can choose any of the variants depending on the local context and analysis. However, any PAYT program must make sure that the program is (pay-as-you-throw.org, 2013):

- Fair and easy to understand
- Convenient, user-friendly and designed to incentivise the right behaviour
- Financially viable
- Meeting the community's environmental objectives
- Capable of earning resident's satisfaction
- Requiring minimal commitment for additional resources

Public Participation and Awareness
In addition to an appropriate legislation, technical support and adequate funding, public awareness and participation plays a critical component in source segregation and any waste

Fig 3 – Comparing effectiveness of different waste reduction options



management method in general. Having a proper understanding of any issue related to waste management is vital for the success of even the best conceived waste management plans. This brings an urgency of public participation and awareness in any waste prevention and waste management methods implemented. Awareness accompanied by participation should be involved in waste management program where effective and sustainable implementation of the proper waste management practices could be achieved (Paghasian, 2017). Motivation for self-awareness and different forms of public participation leads to behavioural change at the community level. Swachh Bharat Mission also emphasises on Behavioural Change Communication (BCC) for the implementation of an effective waste management strategy.

This can be achieved by awareness drives at different levels of the society. For eg., education in schools and colleges increases the students’ awareness about environmental problems and solutions. At the same time, motivating them to take part in environmental protection activities and plans helps in generating new ideas for better waste management. When the students share these experiences with friends and families, it brings positive implications on solid waste management practices (Asmawati Desa, n.d.).

Case Study - Helsinki, Finland

In Finland, the solid waste is segregated into four categories: paper, glass, metal and bio-waste. Paper and bio-waste make up to 94% of the total waste collected from door to door collection, bringing to collection points and civic amenities (BiPRO, 2015). Out of which, the majority of the collection is through door-to-door collection. Collection of bio-waste from households and public administration is the responsibility of its municipal authority Helsinki Region Environmental Services (HSY). HSY



Fig 4 - Typical waste bringing for collection points in Helsinki, Finland. Source: Metrotaifun.com, 2014

is responsible for collecting the remaining mixed and hazardous waste and also responsible for processing the separately collected bio-waste by anaerobic digestion and composting.

Bio-waste collection has increased relatively smoothly since 2004. Separate collection of bio-waste started in 1993 due to the changes made in the law for waste. The changes include the

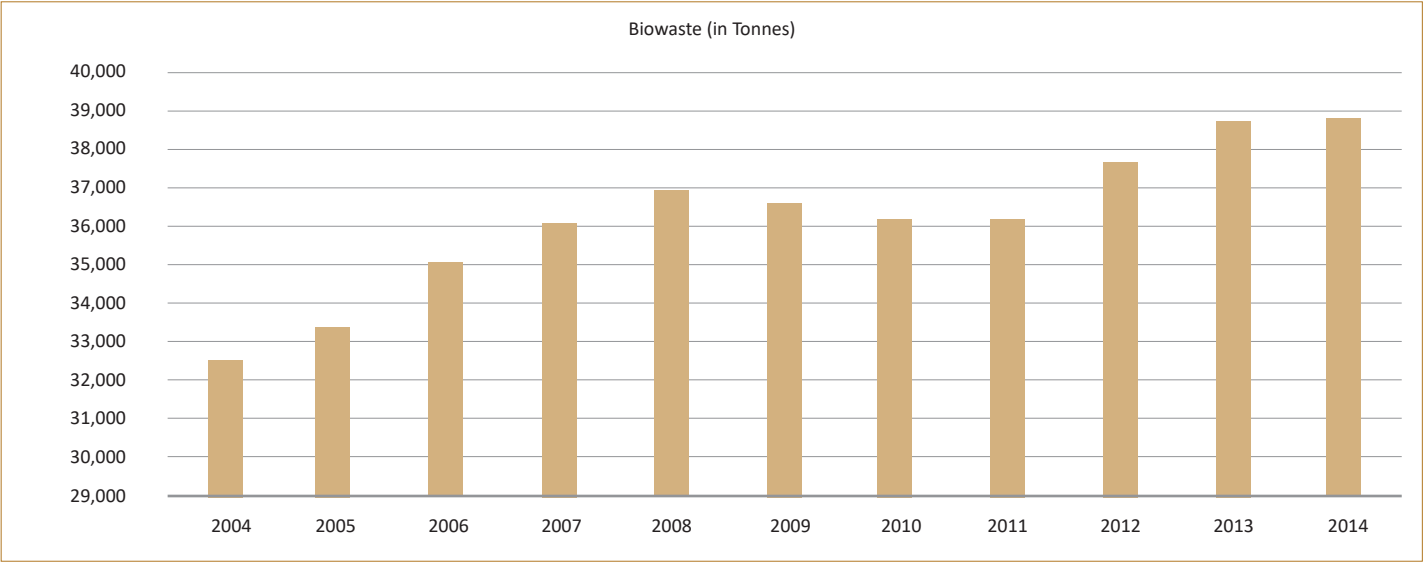
implementation of waste hierarchy and giving the responsibility to the municipalities to organize the transportation of household and household-like waste. According to the changes in the waste law, municipalities now have to organize the recovery and disposal of household and other non-hazardous waste. They also have the right to decide the charges for waste collection. These charges cover the cost of investment in treatment

Fig- Summary of Helsinki’s collected waste

Collected Waste	Paper and Carboard	Glass	Metal	Bio-waste
Door to door	97%	66%	20%	84%
Brings Points	3%	34%	7%	
Civic amenities	1%	-	73%	16%
Total	100%	97%	100%	100%

Source: BiPRO, 2015

Table 1 - Bio-waste collection in Helsinki



Source: HSY, 2014

plants and their operations. These charges, simultaneously, encourage the people to reduce the production of waste and to recycle the waste.

Collection of paper from HSY and its handling is done by several private actors. The market of paper recycling is heterogeneous and unorganised, and the statistics of the performance and its collection is not good as a whole (BiPRO, 2015). The paper and cardboard collected is used by the paper industry as a raw material.

Fee/ Charging System

The municipal waste management fee covers the door to door collection operations of bio-waste.

The fee varies according to the type of waste, size of the container and the frequency of pick-up. For paper’s door to door collection, the households are asked to buy or rent a bin while the charges of collection are free. Once a paper is left in the bin, it becomes a property of HSY. The sales price of the recovered paper normally covers the collection and other incurred costs; hence it is not forwarded to the consumers. Garden waste, mixed waste and other types incurs a fee on the consumers. Recycling the waste is encouraged through the fee system. For example, residual waste collected costs more than the collected bio-waste. Paper collection is free, except the cost of the bins.

Conclusion

There are many benefits of segregating the waste at source. These benefits can be broadly divided into 3 categories:

- Economic – The economic benefits are two-fold: On the users’ end, the fees paid under PAYT provides subsidies on other property and maintenance charges. In general, PAYT makes the waste similar to other commodities like electricity or water, where the user pays the fees according to the units generated. The municipality, on the other hand, is able to generate some jobs and gets more independence in the finances and the management of the residential waste system. The revenue generated after recovering the operations’ cost is put into service improvement and infrastructural development.
- Environmental – PAYT and public participation schemes are an effective tool in encouraging the users to separate the waste, reduce the amount of waste generated and increase the chances to recover the materials. This eventually helps in

reducing the load on landfills and also reduces the amount of pollution generated through incinerators.

- Social – Paying for the waste generated makes the user more responsible and aware while disposing off his/her share of the waste. The awareness of the users reduces the workload on the waste collectors and segregators. Free-riders are unable to take benefits of the subsidies provided.

However, raising awareness about the benefits of proper solid waste management and waste management activities in a city has many limitations too. These are (coalition, n.d):

- Practices, beliefs and behavioural norms that are already embedded and hard to break
- Lack of familiarity with the economic opportunities related with waste management
- Waste management agency’s capacity limitation
- Lack of funds and capacity
- Unsupportive legal and regulatory framework
- Key stakeholder’s lack of interest and time

Models like PAYT should only be implemented on the basis of the data gathered, as per the readiness of the community and the municipality. At the same time, it is also important to take strong steps to stop illegal or irresponsible dumping of garbage, those activities can be avoided by:

- Awareness campaigns and cleanliness drives
- Effective and convenient waste collection system
- Implicating fines on illegal dumping and incinerations
- Refusing to collect or accept incorrect sorted garbage



Fig 5 - Automatic Solid Waste Collection System segregating & collecting waste and sending it to the waste transfer terminal through pipes Source: Metrotaifun.com, 2014

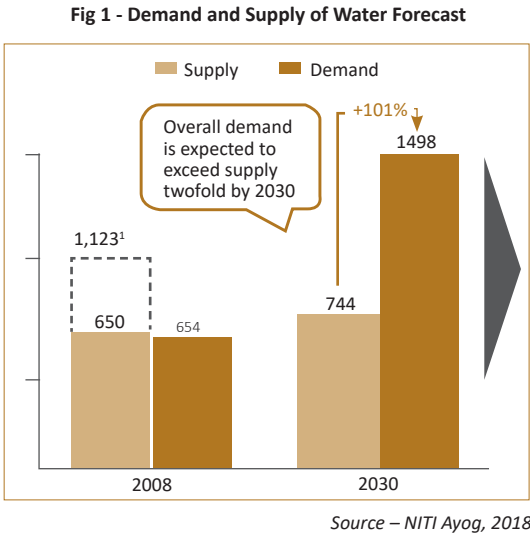
Environment Impact Assessment:

Water Desalination Plants

Introduction

Water is one of human’s vital needs, however, less than 2.5% of the total volume on earth is available for all the living beings (Population Action International, 2012). Today, a third of the world’s population is affected by lack of water supply, due to spatial or temporal uniformity and the increasing human population (Fuentes-Bargues, 2014; Liu, Sheu, & Tseng, 2013). In 2035, 3.6 billion people will live in an area concerned by water stress or scarcity (Population Action International, 2012). Moreover, as the urban population grows, it puts more pressure on the available water sources because of the increase in demand without any substantial improvements in supply (Population Action International, 2012). This scarcity is also due to an increase in standards of living since the second half of the 20th century resulting in an increase in per capita consumption (Miller, Shemer, & Semiati, 2014).

India is first in line in this crisis. While representing 17.74% of the world’s population, India only has access to 4.5% of the entire freshwater resource (Water Aid India, 2018). In addition to the scarcity, most of the water available is highly polluted. In 2015, the Central Pollution Control Board reported that more than 60% rivers of the 445 monitored were polluted (Water Aid India, 2018). Not only the surface water but groundwater is also affected. One of the many reasons is due to excessive use of pesticides in agricultural practices causing arsenic and fluoride contamination (Water Aid India, 2018). All these global issues draw an alarming picture of the future of drinkable water supply in India and the world.



Water Sources and Technologies

Sufficing the drinking water supply involve different sources of water and the way we utilise them. The various sources can be listed as following:

- Surface water
- Ground water
- Rainwater harvesting
- Wastewater treatment
- Desalination
- Conservation and water saving

Desalination process

Facing the growing demand and the shrinking resources, societies over the years have developed various technologies to use the available water sources, desalination is one of them. A focus on desalination systems shows that they are used in

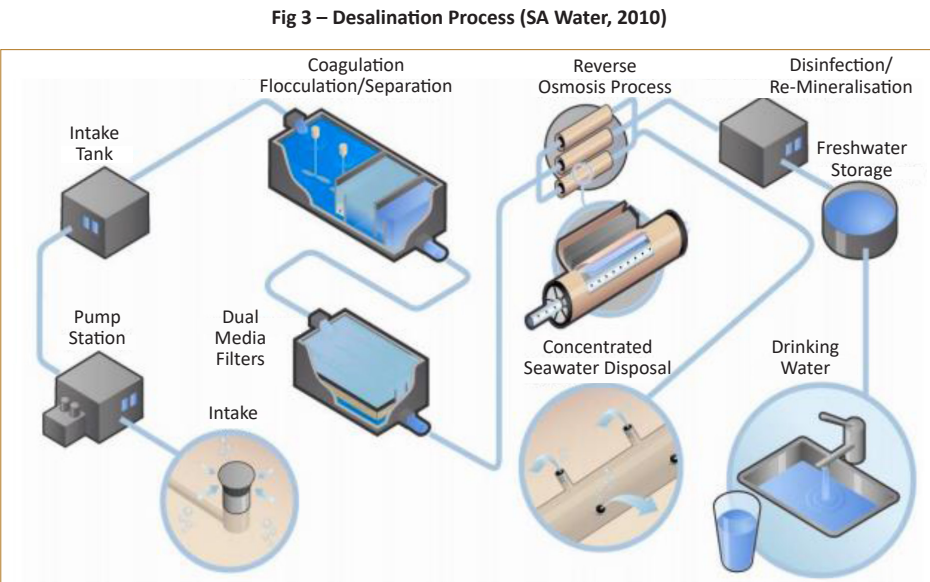


Table 1 - Different technologies and geographical requirements for different sources of water

Sources of water	Geographical requirements	Technology required
Surface water	River, lake, stream, creek or reservoir	Bacterial decontamination technology (Johnston, Heijnen, & Wurzel, 2001)
Ground water	Water table	Wells, drills, pipes and pumps (UNEP, n.d.)
Rainwater harvesting	Ample rainfall	Storage systems and proper drainage to the
Wastewater treatment	No	Decentralised Sanitation systems and proper sewerage network
Desalination	Coastal areas. Can also be used for water reuse (Miller, Shemer, & Semiati, 2014)	Thermal or membrane technology as reverse osmosis.
Conservation and water saving	No	No

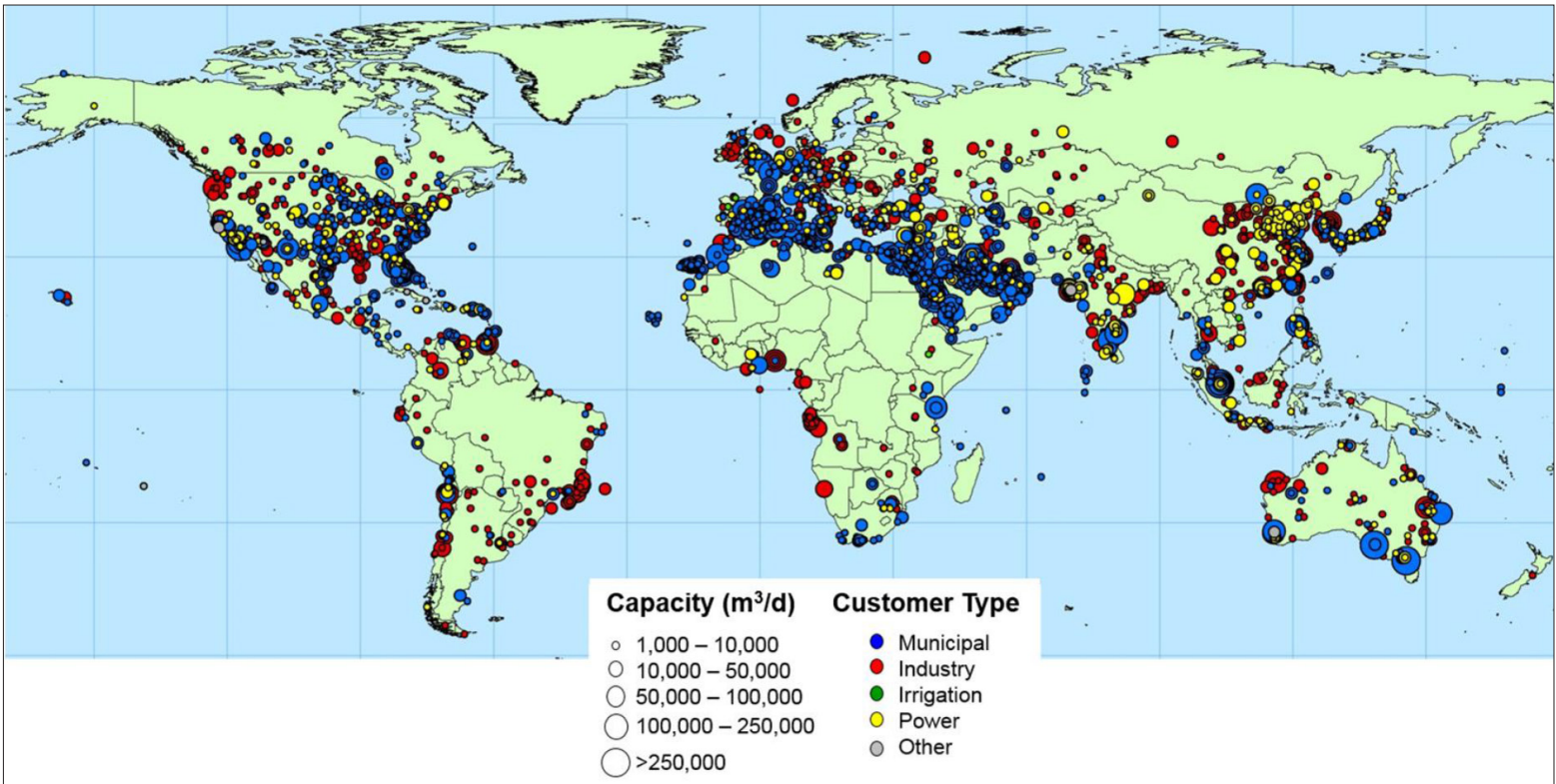


Fig 2 - Global distribution of operational desalination facilities and capacities (N1000 m3/day) by sector user of produced water.

Source: Jones, Qadir, van Vliet, Smakhtin, & Kang, 2019

many water-stressed areas. In 2013, desalination plants produced 80.9 million m3/day of freshwater globally and this volume has been rising since then. (Miller et al., 2014). The technology is popular in Arabic gulf countries. Saudi Arabia, UAE, Kuwait and Qatar produce 32% of the total desalinated water (Jones, Qadir, van Vliet, Smakhtin, & Kang, 2019). These nations predominantly use thermal technologies, adapted to their oil-rich situation, and heritage of the earliest desalination plants

However, the practice of desalination has been highly criticised due to the involved energy consumption and environmental issues. The energy consumption of the different desalinating technologies lead to prices varying from 0.46 to 3.71 US\$/m3 (Pinto & Marques, 2017). Desalination plant rejects brine during the process, leading to the formation of 'Brine underflows' and forming a layer of hypersaline water with reduced oxygen levels,

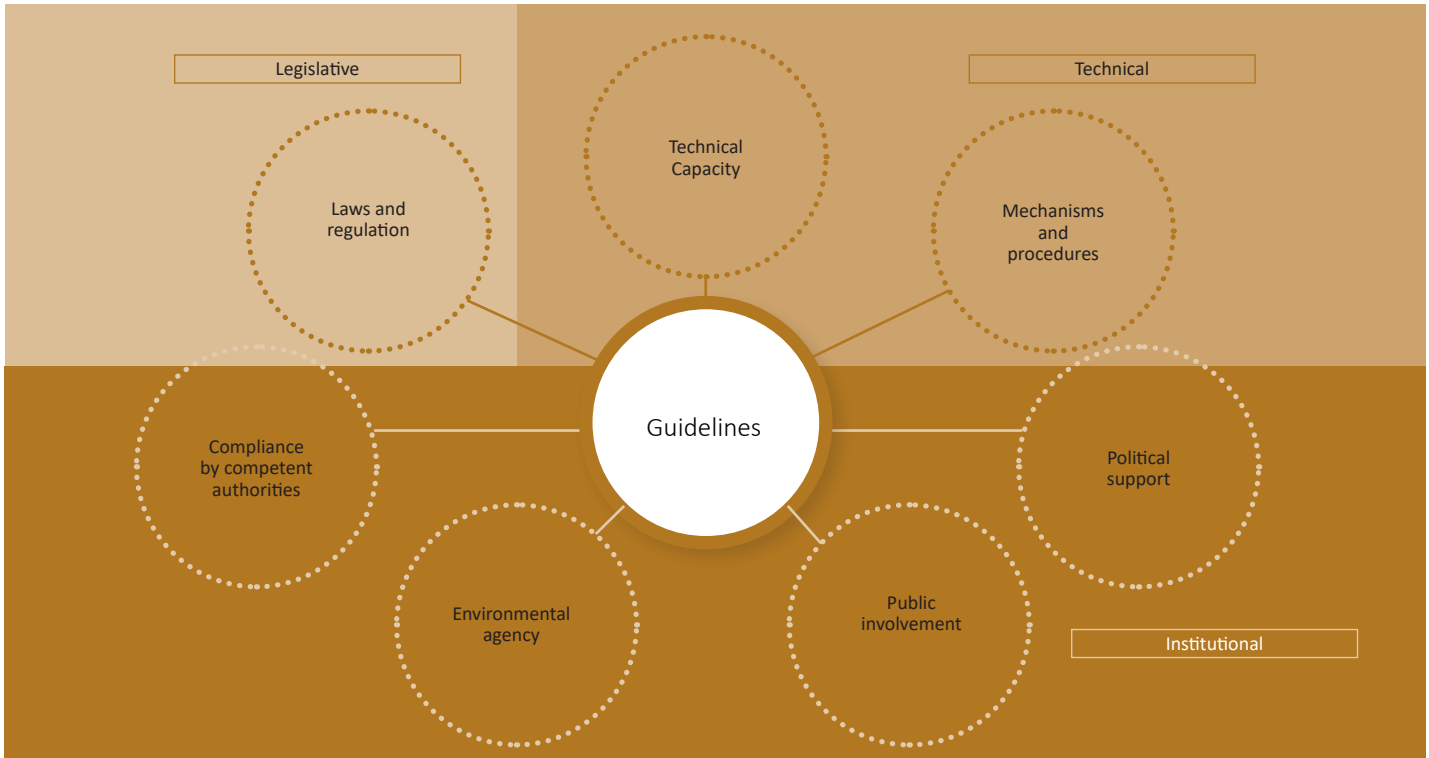
spreading along the seafloor (Kämpf & Clarke, 2013). Salinity rates and the environmental impacts pose harm to the marine and terrestrial ecosystems, arising the need to control the energy consumption and the release of by-products into the sea

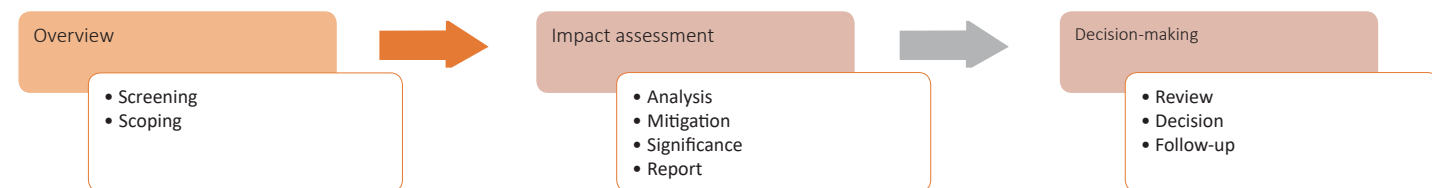
To avoid such a situation, any project before reaching to the implementation phase must conduct an Environmental Impact Assessment (EIA) to allow the decision-makers to find out which technology is the most relevant as per the local environmental context and has least negative impacts. Desalination plants must also conduct an EIA before any implementation. This article explains the global framework for an EIA and takes a case study of a desalination plant in Adelaide, Australia who conducted an EIA to take necessary precautionary measures to further understand the process.

Framework for an Environmental Impact Assessment

The United Nations Environment Program provides guidelines to carry out an EIA process. This guidelines for an EIA can be extended to a general framework for any project’s impact assessment. They are broadly divided into 3 areas: Technical, Legislative and Institutional. The main guidelines within these 3 areas are (Abaza, Bisset, & Sadler, 2004):

- Level of political support and commitment
- Legal basis with accompanying regulations and guidelines
- Provision for public involvement- This step takes place before the decision-making process and influences it. In France, the duration of the public inquiry must exceed 30 days (demeulenaere, versmisse, maubant, & alligand, 2019). Moreover,





the impact assessment report must include a non-technical summary to enable the citizens to understand the environmental issues involved.

- Coverage of proposed actions likely to have significant environmental effects- The environment has to be seen in its entirety: population and human health, biodiversity, ground, water, air, climate, material goods, cultural heritage and landscape, as well as the interactions between these elements (MTES, 2019).
- Designated process and procedures, including mechanisms to review the quality of EIA reports - In the french EIA process, an environmental authority is always required to give opinion on the way the environment is taken into account.
- Measures to ensure compliance and accountability by competent authorities and decision-making body
- Appropriate role for environmental agency in eia process administration and decision-making
- Technical and professional capacity to carry out EIA

EIA Process

On reaching the criterias mentioned above setups the base for an EIA to commence. The main aspects and parameters required for an EIA process to take place are (Fuentes-Bargues, 2014):

- Basic Data about the project (Project description, location, environmental agency, etc.)
- Identification of interested agencies as per their scope (local, regional or national), the type of ownership and the number of consultations made between them and the environmental organisations
- Number of consultations responses received by the environmental agencies
- Description and number of proposals/options considered
- Methodology for identification and assessment of environmental impacts
- Environmental impacts identified in the construction and operations process
- Classification of impacts according to the physical, biological, perpetual, socio-economic and cultural heritage
- Proposed corrective measures
- Number of responses received during public consultations
- Developing a monitoring project and its instructions (Environment monitoring plan and the people involved)
- Records of Decisions (RODs) (positive, negative or positive but with conditions)

All the data acquired from the parameters mentioned above is used in EIA's framework. Many

global organisations, like UNEP, ADB, the world bank provide their own EIA guidelines and framework. Out of these, operating principles described by the International Association for Impact Assessment can be parted in 3 phases mentioned below (Sénécal, Goldsmith, Conover, Sadler, & Brown, 2012):

1. Project Overview

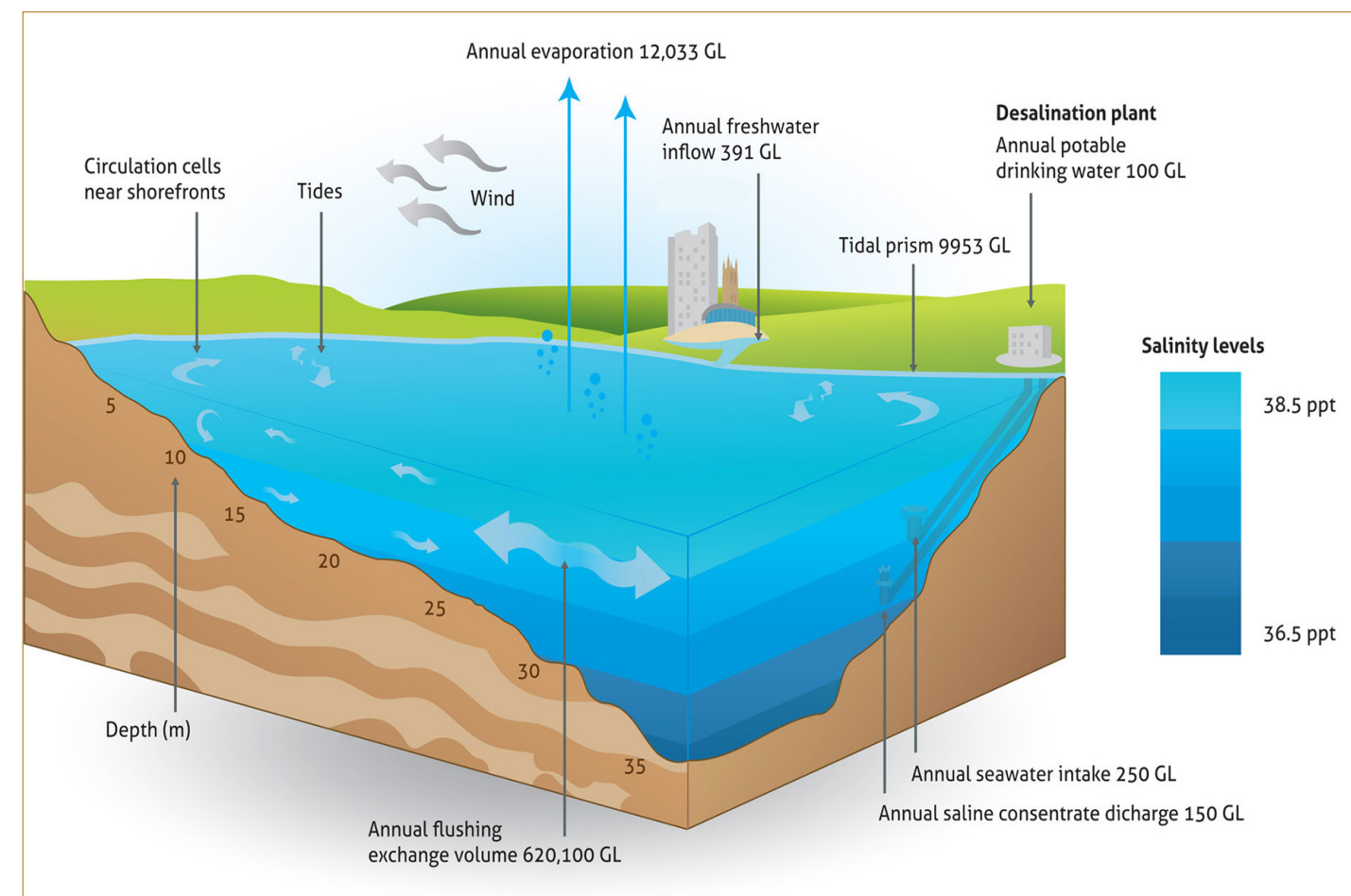
- 1. Screening** a project leads to determining if an EIA is needed and to which level of detail. It classifies projects in 3 categories (Mareddy, 2017):
 - Project clearly requiring an EIA
 - Project not requiring an EIA
 - Project for which the need of application of an EIA is not clear
- This is required for a preliminary identification of the potential impacts of the project and their intensity.

2. Impact Assessment

Several steps are essential in this process:

- 1. Impact analysis:** From the list of all the actions undertaken by the project both during construction and operation phases, a list of their impacts on ecosystems is drawn. It identifies a

Figure 5: Typical zones in an coastal area



Source: SA Water, 2010

clear identification of every natural ecosystem in interaction with the project. The typologies of impact is diverse:

- Direct: occurring from an interaction with the ecosystem.
- Indirect: of secondary or third level, they are not directly due to the project. They can result from a complex impact pathway. Ex: emissions of greenhouse gases have their own impacts but can also transform into other chemical components with harmful consequences.
- Cumulative: these are the combined impacts caused by the combined impact of past, present and future activities.
- Induced: an impact can imply new changes which have their own impact. Ex: a new road built for a project can lead to the further creation of roads around it.

- 2. Mitigation:** A component of the project can be eliminated through this process if its impacts are too severe. The impacts are carefully analysed and chosen using the process: Avoid-Reduce-Compensate (details in table 2), (Demeulenaere, Muller, Legendre, Lemaître, & Darses, 2017) where:

- Avoid: Suppress the negative impact by modifying the project
- Reduce: If avoiding the impact is impossible, then its duration, intensity and/or spatial extent should be reduced

- Compensate: Positive actions to counter all the residual negative impacts

- 3. Significance:** Both before and after the mitigation process, it is necessary to assess the scale of each impact. The aim is to prioritise the associated risks and help the decision-making process.
- 4. Report:** Also known as the Environmental Impact Statement (EIS) (Sénécal et al., 2012), summarises the whole impact assessment process and helps in decision-making. In this report, the concerns of the interested public and communities affected by the project must also be considered. It aligns with the idea of public involvement advocated by the UNEP.

3. Decision-Making Process

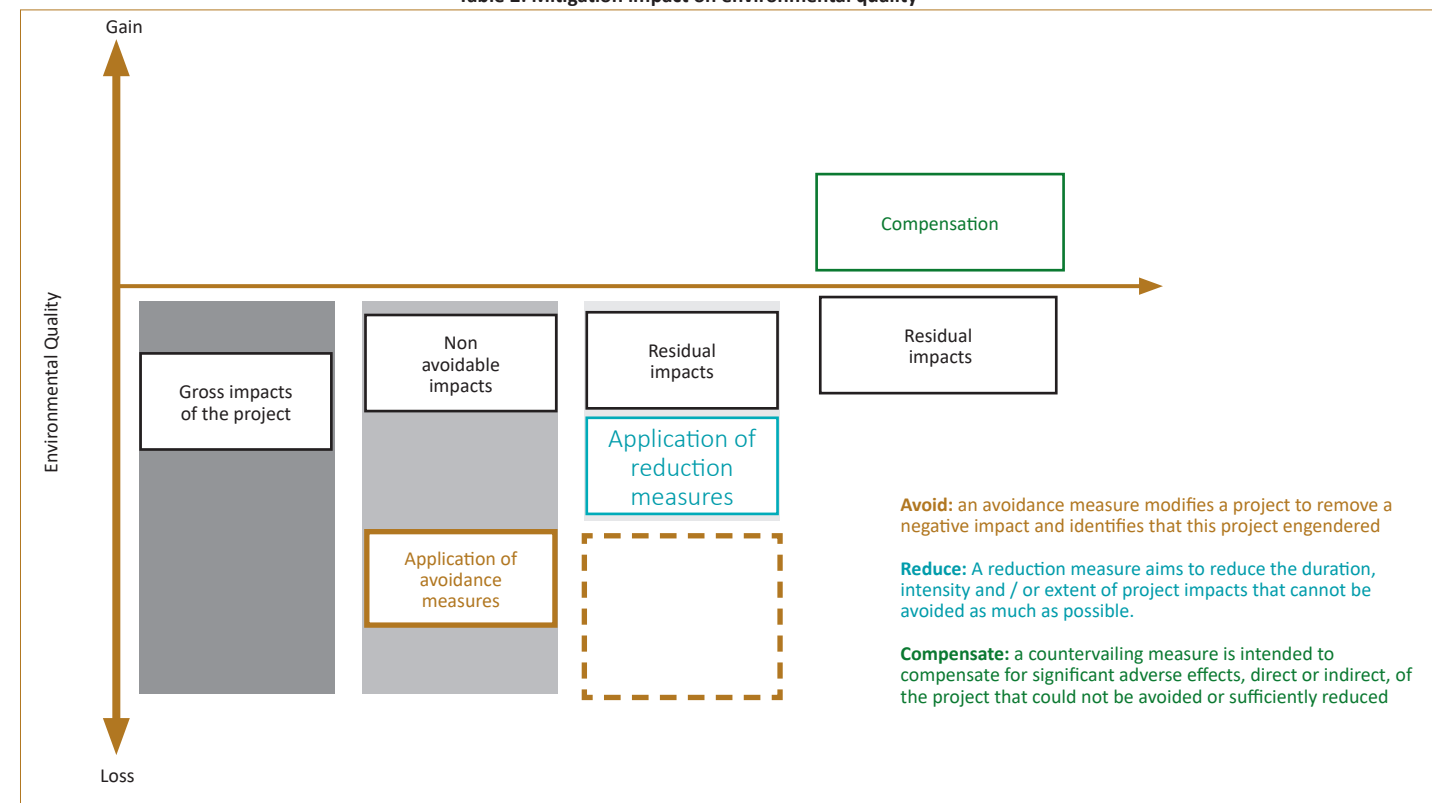
In the first stage of the decision making process, a **review** of the EIA is conducted to check if the proposed mitigation can be monitored and controlled. If the projects meets the specific requirements, only then it is considered as a support for **decision-making**. Accordingly, modifications of the initial project along with implementation of mitigation actions are made. A regular **follow up** of the implementation is required to ensure compliances with the restrictions approved and monitoring the effects on the environment over a longer-term.

Applying EIA on Desalination Plants

While conducting an EIA for desalination plants, while capturing the screeing and scoping in the project overview, the following environmental issues should be noted

- Marine environment
 - If the habitats in the coastal zone, like the intertidal reef, subtidal reef and the cliff, is ecologically sensitive or not.
 - Entrapment and entrainment of marine species during the intake of sea water
 - The current salinity levels of the water and the expected change after the outfall
 - The by-products produced during the desalination process
- Terrestrial environment
 - Type of land on and around the site
 - Potential impacts on the existing flora and fauna
 - Inclusion of site rehabilitation in a land management plan to reduce the impact on the existing habitat
 - Possible erosion and sediment movement
 - Measures taken during construction and operational phases through an Environmental Management and Monitoring Plan (EMMP) to avoid soil pathogens and growth of weed
 - Affected air quality due to dust emissions during the construction and the odour produced during the desalination process
 - Potential noises and vibrations on land during

Table 2: Mitigation impact on environmental quality



the construction

- Energy and climate
 - Anticipated rise in sea levels over a course of time
 - Capability of operations during high and low tide, and during a storm surge
 - Ways of producing electricity
 - Measures taken during the construction process to minimise impact on the local environment

On moving towards the second phase, the EIA works on the impact analysis of different mitigation proposals to reduce the impact on the environment. The different mitigations can work around the following objectives (SA Water, 2010):

On noting down the objectives, the assigned environmental agencies should then focus on minimising the impacts of the construction and operations of the plant and should work towards finding different methods to do so. The list below notes down some requirements and environmental measures, a desalination plant managing can take (SA Water, 2010):

EIA For Adelaide Desalination Plant

The Adelaide desalination plant opened in 2011 at the Gulf Saint Vincent. With a capacity of producing 100 GigaLiters per year, it is covering half of Adelaide’s water needs (SAWater, 2019). This plant uses reverse osmosis technology to filter seawater and rejects brine twice as salted as the water drawn from the sea along with some other chemical by-products during the process (Kämpf & Clarke, 2013).

The location of the plant raises one major issue concerning this discharge: the Gulf St Vincent present slow flushing (exchanges with the ocean) and tides (Kämpf & Clarke, 2013). It results in a lower mixing of the brine discharged. Moreover, the gulf is home of a rich and unique marine biodiversity. All the construction and operation processes avoid spots of sensitive habitats (Lord, Fairweather, Wallis, & Kumar, 2009; SAWater, 2009).

- After carrying an EIA, the Environmental Protection Agency made recommendations to counter these issues and minimise the environmental impact:
- Discharge limit: it consists in a concentration limit at a certain distance from discharge, combined with a period discharge limit (EPA, 2012). The aim is to dilute the brine in the ambient seawater.
 - Restrictions in chemicals: nature of chemicals, storage and discharge are controlled
 - Sea water intake: the velocity must not exceed 0,15m/s (SAWater, 2009). The aim is to avoid harming marine species.
 - Monitoring: annual and quarterly reports are requested, particularly concerning salinity

Environmental Issues	Objectives
Geology	Protecting the coastal zone from any type of coastal instability and erosion. The site perimeter must be away from the coastal edge.
Sediments and erosion	Measures must be taken to minimise the erosion and sediments’ movement during the construction and operations of the plant.
Terrestrial flora and fauna	Biodiversity values must be protected and impacts on native vegetation or fauna must be avoided.
Ground and surface water	The quality and quantity of both ground and surface water must be protected as per the regional water policies.
Resource efficiency	Efficient use of resources through minimal consumption and efficient recycling must be done.
Waste and hazardous materials	Waste production and disposal must be minimised. The sea and the surrounding areas must be protected from any hazardous material produced during the process.
Stormwater management	Waste production and disposal must be minimised. The sea and the surrounding areas must be protected from any hazardous material produced during the process.
Air quality and greenhouse gases	The impact on air quality during the design, construction and operations must be minimal. Emission of greenhouse gases must be controlled.
Marine and coastal integrity	Ecological integrity and values of the marine environment must be protected. This includes protection of existing coastal processes, protection of marine flora and fauna, avoiding introduction and spreading of marine pests and maintaining minimal impacts to marine recreational activities (if any).
Site rehabilitation and land management	Protecting the environment and human health and enhance site’s environmental values through management of any contamination

Environmental Issues	Measures / Requirements
Geology	Limiting infrastructure footprints within the site and away from the coastal zone, identifying ‘no go’ zones to preserve ecologically sensitive areas. .
Sediments and erosion	Implementation of a Soil Erosion and Drainage Management Plan to minimise the areas disturbed, use and maintenance of erosion control devices, management of excavated areas and landfills, limiting the flow of dust and mud to the infrastructure and ecologically sensitive areas.
Terrestrial flora and fauna	Avoid removal of native vegetation, incorporate habitat restoration and rehabilitation by incorporating efficient construction techniques, implementing an EMMP and Land Management Plan, comply to local vegetation conservation policies (if any), ensure stormwater management.
Ground and surface water	The EMMP must include measures to protect the ground and surface water, to ensure that the foundations or any construction is leak-proof and does not effect the ground and surface water during drilling or tunneling, adopt water-sensitive design for effective water management, compliance to relevant environment protection policies
Resource efficiency	Incorporate reusing and recycling of materials as much as possible, minimal reliance on any ground or surface water during construction and operations
Waste and hazardous materials	Waste disposal and generation should be minimal, the waste generated should be segregated, on-site storage of hazardous material must be avoided, hazardous materials (if any) must be stored within a bunded area and should ensure any non-spillage especially to stormwater management system, emergency response plan must be in place
Stormwater management	Stormwater management system should ensure measures to ensure operations of the plant during a storm, containment and reuse of stormwater, avoid soil erosion, bunding of hazardous materials to avoid any spillage
Air quality and greenhouse gases	Minimise disturbed areas and emission of dust, all construction and loading vehicles must be covered to avoid loss of load, ensuring that the disturbed areas are rehabilitated, ensure minimal odour by ensuring regular disposal of waste, incorporate energy efficient and efficient energy recovery practices
Marine and coastal integrity	Measures should be taken to minimise impacts to the marine ecology during the construction and operations by avoiding any infrastructure footprint on the coastal zone, avoid placing the intake pump in the intertidal zone only, avoid any processes that impacts the sediment movement, underwater noise and vibration must be limited and should not take place in the coastal or intertidal zone, the EMMP must constantly monitor the water quality and the marine flora and fauna
Site rehabi litation and land management	Land Management plan should incorporate opportunities to conserve the local biodiversity and habitat, regular rehabilitation within the site, undertake revegetation at the site

Figure 6: Major Desalination Plants in Australia

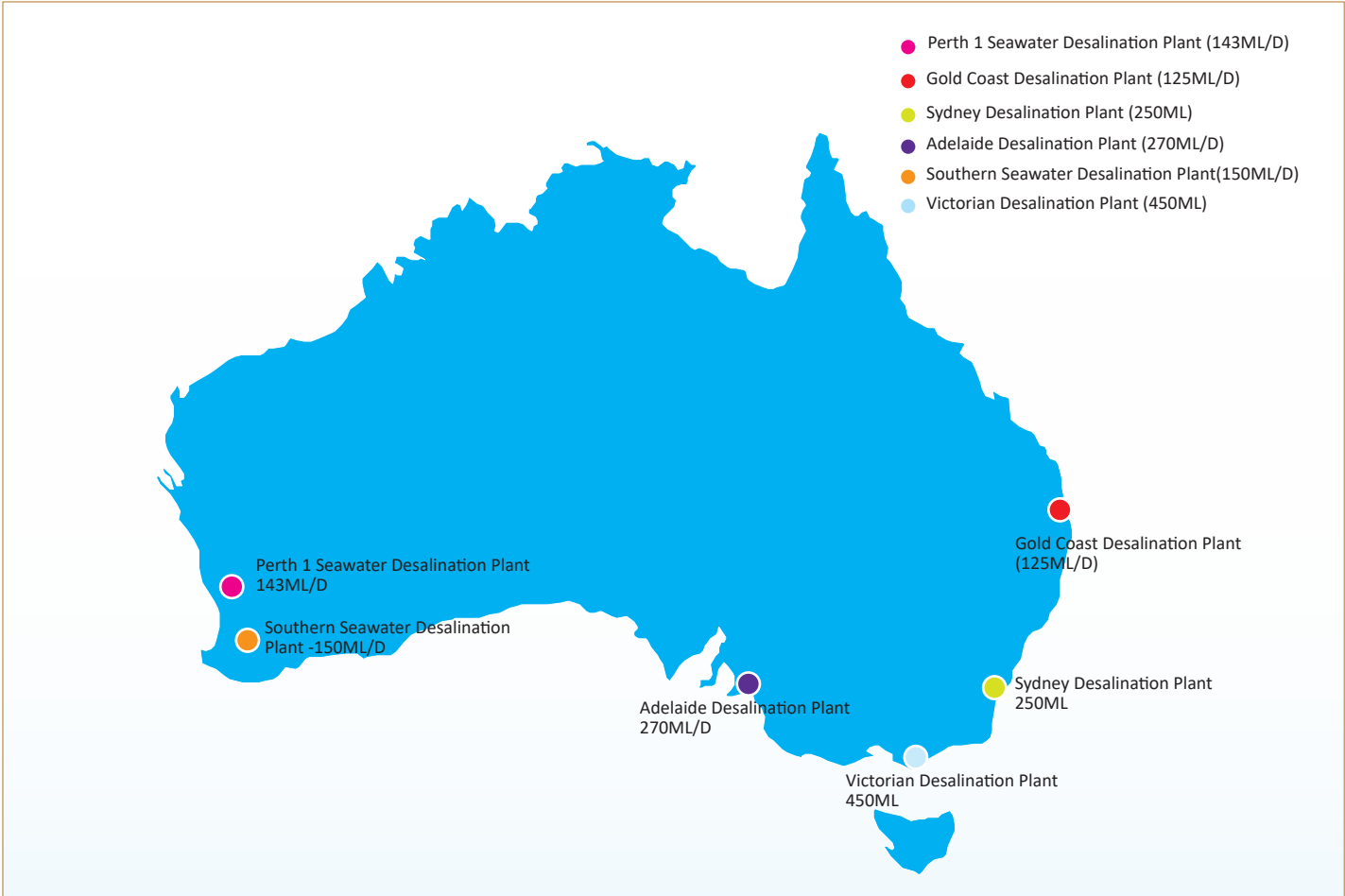
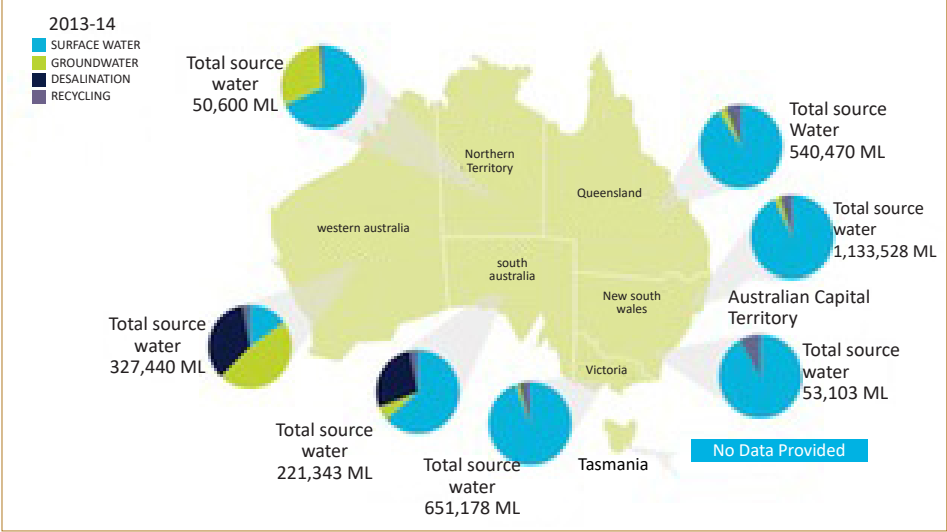


Figure 7: Total water requirement (2013-14) and distribution among various sources



(EPA,2012). They also monitor currents and ecotoxicological studies. They can lead to a modification of the dilution factor minimum, if needed (Lord et al., 2009).

The implementation of the plant was possible only under the strict respect of these conditions. The example underlines the major importance of an efficient EIA process for the preservation of ecosystems.

Desalination Plants In Tamil Nadu

Chennai requires about 1200 MLD but only receives 985 MLD from different water sources. In 2031, this

Source: Ozewex.org, 2015; Ausrtalian Bureau of Meteorology demand is expected to rise to 2700 MLD. Minjur desalination plant produces about 100 MLD of freshwater from around 275 MLD of sea water. It was followed by another desalination plant of equal capacity in Nemmeli. The plant in Nemmeli has further plans to expand the operations and double the freshwater production (Water Technology, 2009). However, a comprehensive EIA before the implementation of these projects or the details about the project seems unavailable.

Conclusion

Even though desalination plants are increasingly popular around the world, their implementation

should only be considered as the appropriate choice after a proper EIA. Every possibility should be analysed to choose an appropriate solution, specific to the local context (localisation, demand, financial means, etc.). The geographical requirements should be considered through the constraint of the costs of setting up the infrastructure and the water transportation. This price varies with altitude and distance and is closely linked to the context of any project, however, a global estimation comes out to be around 100 MCM (million cubic meters) cost \$0.05–0.06/ m3 for 100m of transport (vertical and horizontal transport) (Zhou & Tol, 2005).

For efficient water management and conservation, UNEP advocates a focus on rainwater harvesting, wastewater treatment and water conservation (UNEP, n.d.). In the light of the above, cities under water stress can make a choice for the future of water supply on their territory. The issue is to provide a reliable source of water at minimum economic costs and minimal impact on the natural environment. The three pillars of sustainable development should therefore be accommodated and the solution should be linked to the geographical context. This underlines the importance of the Environmental Impact Assessment to lead any decision-making process.

Recreating Organizational Learning

■ Learning Through Technology

Organizational Learning

Organizational learning talks about the developing the capability of thoughts and productivity. Through commitment to which, continuous improvement in the organization is obtained (Marquardt, 2002). As we are advancing to the new realms of corporate structures, learning is considered as an effective way to address the business needs. It is one of the several possible solutions to improve an organization's performance. Traditionally, learning in an organization referred to emphasizing at the basic and advance skills of its employees. While today, as we move ahead of the baby boomers, the definition and understanding of organizational learning has moved to the next level. With the new terms of organizational learning, employees are now required to learn, understand and adopt the service and product development systems. Now, the learning further is to be rightly applied and creatively used to:

- Modify an existing product
- Innovate based on customer demands
- Compete with the existing technology

The traditional approach to learning assumed that business conditions are predictable and can be controlled by company. Accordingly, organizations used to control and predict its knowledge and skill requirement. However, the current learning trends focuses on addressing an organization's business needs, behavior change and improving performance and creativity time to time. With the evolution of training in today's time, the HR professionals, trainers and managers have started

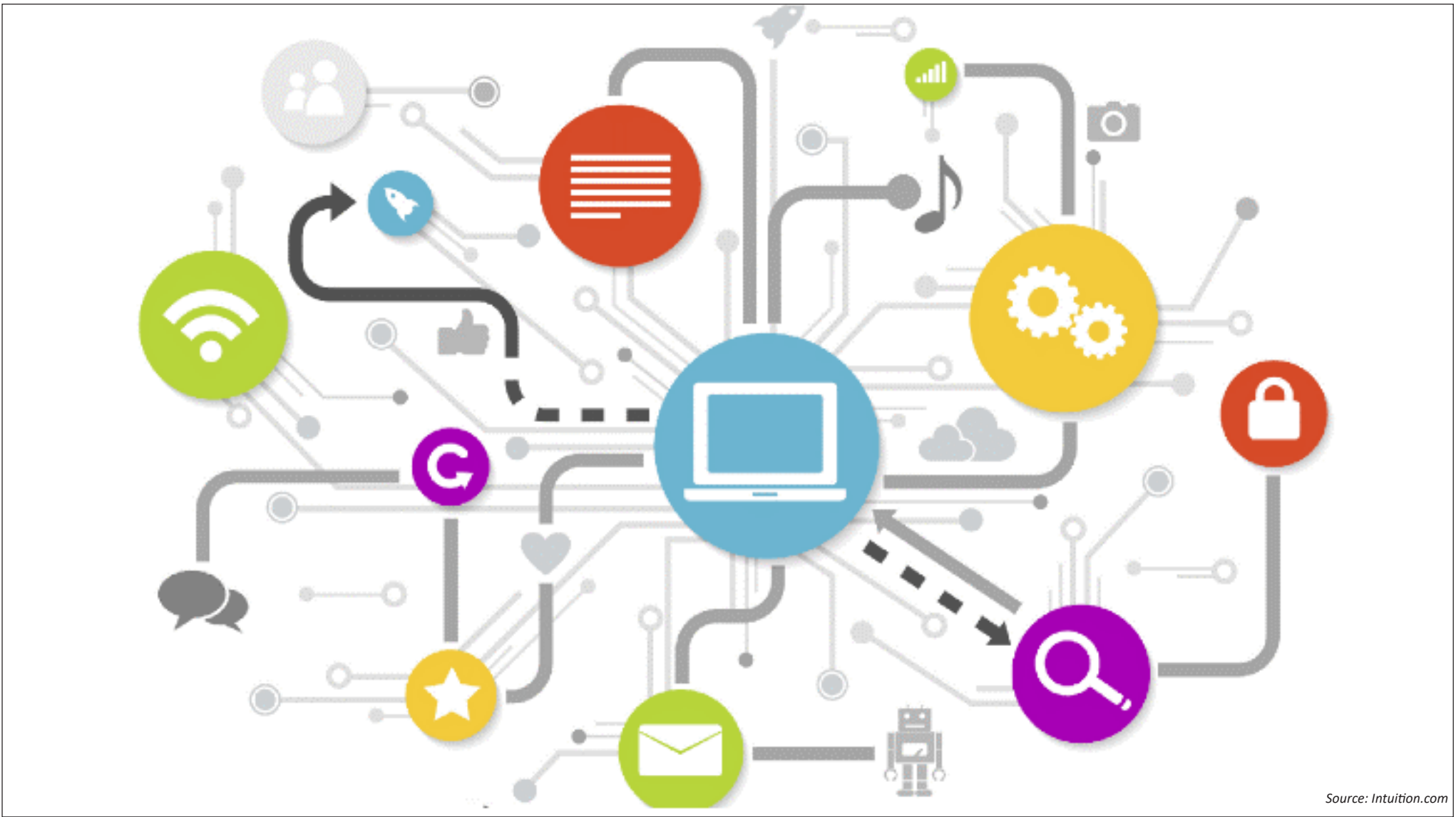
aligning learning with the organizations' business goals and providing competitive advantage. Such practices of learning, wherein the focus is not only on Tacit knowledge but also on explicit knowledge, helps employees understand the business needs, financial statements and strategy to put forward opportunities for cross-functional businesses.

As quoted by American Society of Training and Development, "Organizations can't innovate unless their employees have the knowledge and skills necessary to make it possible". Knowledge and necessary skills also help in understanding customers and their needs for a collaborative development of individuals and the organization. Organizations have now started aligning their business vision with the training goals, so as to create a culture of learning and knowledge transfer. With the continuous change in the processes, technologies, techniques, methods and customer demands, organizations have started investing on learning initiatives that are strategically linked with the organizational, departmental as well as the employees' needs. Organizational leaders from top to bottom are focusing on building a culture of learning and creating an atmosphere conducive to 'grow as you learn'. Based on a LinkedIn research in the year 2018, manager's involvement is a critical ingredient to increase employee engagement with learning. 56% of research respondents feel that getting managers to support employee learning is the only way to see increased learner engagement.



E Learning Virtual Reality

Source: Blog.commlabindia.com



Source: Intuition.com

Learning Through Technology

With a vision of an enhanced emphasis on performance analysis and learning for business improvement, more organizations are now adapting new technologies for training delivery. The use of online Learning Management System (LMS) that has been helping trainers and training partners to continuously monitor learning has already gained wide acceptance. While with changes in technology and easier access to internet, various organizations are also moving to Learning Experience Platform(LXP). Technology based learning through LMS and LXP helps in the process of maintaining a learning ecosystem in the organization, wherein employees learn at their own desired pace based on their work demands. This helps in building 'integrated development practices' to learning and development.

Learning through technology gives flexibility in learning and helps in designing and monitoring practice test, feedbacks, and reinforce the learning by continuous evaluation. The learning technologies help combine computer science, instructional design, and graphic interfaces eventually enabling better potential for learning.

Gamifying Learning solutions is another approach to new age learning that has helped boost the e-learning functionality. It also helps people compete with other teammates, see how they score, earn rewards, collaborate and feel a sense of accomplishment. "With Augmented Reality and Virtual Reality, you have technologies that have been shown to increase engagement and improve results", reports the Association for Talent Development. Various new technologies introduced in the technology based learning environment in the recent times are-

- a) **Tele-immersion** - A technology in virtual reality that allow users in different geographic places to come together in a simulated environment to interact. This technology uses a 'Tele-cubicle' equipped with large screens, scanners, sensors and cameras. These equipments are used to create a holographic training room.
- b) **Virtual Retinal display** - A technology that projects images directly on eye's retina. It allows real-time, on-site performance support.
- c) **Digital Avatar** - This is an animated virtual teacher that gives online instructions

Many corporates are also adapting to 'Micro-

Learning Modules' that helps in learning in the shortest possible time. Such modules are designed based on lot of researches. Here, the required attention time span is lesser and learners wants to learn on-the-spot, considering the solution that perfectly fits to the busy work schedules. Micro learning modules are bite-sized segments of learning contents. These standalone information nuggets address one learning objective at a time. These modules have helped in:

- Having more engaged learners
- Reducing the cognitive load

Joint Responsibility

Learning and development is a joint responsibility between the organizations and its employees. Organizations need to understand and accept that the investment in learning and development helps in long-term sustainability of its employees, thereby increasing the employees' motivation. It not only helps in the professional development of its employees but also helps in building an organizational culture, which supports creativity and innovation. Building a collaborative, organization-wide culture around high quality modules of learning helps in designing exactly what is desired by the learners and what can actually

help in the long-term vision of the organization. Learning can be more effective if:

- Organizations create training systems and processes that support learning interventions
- Individual learn and integrate learnings to day-to-day workflow operations.

In the last few years, many business organizations have made remarkable progress in terms of their training initiatives and have engaged lot of business leaders in designing training centers and mentoring their people. In a recent global survey of 2019 by Deloitte, 84% of its respondents believe that they were increasing their investment in reskilling programs, with 53% saying that they would increase this budget by 6% or more. While, 77% of organizations are increasing their learning team's head count, elevating learning to the second-fastest-growing role in HR. This is a positive indicator highlighting a growth in Training and Development initiatives and seriousness towards building a learning organization. The learning industry still needs to go a long way in building more agile and focused learning systems to instill a culture of learning that helps individuals grow not only in the corporate ladder but also as mature human beings.

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