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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 so fast in 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.

Who all were the participants and how was your interaction with other participants?

Most of the participants attending the training work in the private sector. The mode of training was more inclined towards private sector. During the course of the training, we were trying to figure out if we as a public body can implement the same methodologies in our daily work or not. Much of the learning was through interactive games, they helped us in understanding the content and allowed us to interact with the other participants.

What was the best part of this training?

If you want to highlight anything in particular. One of the lecture by Pandey sir was very motivating. I feel I will never forget his teachings ever. In this particular session, they compared different types of leaders with different animals to understand the leaders’ behaviour. This was very innovative and it helped me in giving me the capability to be able to judge myself on what kind of leader am I or want to be. It was really interesting.

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

Definitely, 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 employees 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.

What do you think if other CIDCO employees get trained in such a course?

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 similar type of issues in various projects and 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 beneficial?

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. Rajaram Shivanna Nayak – Superintendent Engineer - Engineering Infrastructure Development, PPPs and Regulation

Indian Institute of Management Bangalore

Date – 1st –3rd July 2019

CIDCO@Smart Vol 5, Issue 3, 2019

CIDCO@Smart Vol 5, Issue 3, 2019
Over the past 4 years, CIDCO Smart City Lab has covered many concepts 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.

Datasheet

Case-Studies by CIDCO@Smart

- 2015 to 2019
**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, Yadev, 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 disposal and treatment of waste materials (Asmawati Desa, n.d.). It has turned out to be effective in reducing the cumulative volume of waste for collection and managing the waste material. It is important to note that segregating at source is also one of the more crucial steps for an effective waste management strategy. In India, identifying the need for better waste segregation was solidified only after the release of 2018 Swachhata Sarvekshan (Agarwal, 2018).

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 steps for an effective waste management strategy. In India, identifying the need for better waste segregation was solidified only after the release of 2018 Swachhata 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.

**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 container.

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

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

Fig 3 – Comparing effectiveness of different waste reduction options

**Table 1:** Comparing effectiveness of different waste reduction options

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>-45%</td>
</tr>
<tr>
<td>Paper</td>
<td>-40%</td>
</tr>
<tr>
<td>Metal</td>
<td>-30%</td>
</tr>
<tr>
<td>Hazardous or industrial waste</td>
<td>-20%</td>
</tr>
<tr>
<td>Construction or demolition waste</td>
<td>-15%</td>
</tr>
<tr>
<td>Biological or medical waste</td>
<td>-10%</td>
</tr>
<tr>
<td>Nuclear or radioactive waste</td>
<td>-5%</td>
</tr>
</tbody>
</table>

Source:
- Recycling Carts: Massachusetts Department of Environmental Protection Solid Waste Data, 2011
- Deferred Mandatory Recycling: "Massachusetts Department of Environmental Protection Solid Waste Data, 2011 and 2012"
management 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 (Paghaisan, 2017). Motivation for self-awareness and different forms of public participation leads to behavioral change at the community level. Swatch Bharat Mission also emphasises on Behavioral 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 54% 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 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 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 segregationists. 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 limitations
- 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 4 - Typical waste bringing for collection points in Helsinki, Finland.

![Fig 4](Image 215x547 to 794x811)

Fig 5 - Automatic Solid Waste Collection System segregating & collecting waste and sending it to the waste transfer terminal through pipes

![Fig 5](Image 625x65 to 1161x340)

Table 1 - Bio-waste collection in Helsinki

<table>
<thead>
<tr>
<th>Year</th>
<th>Door to door</th>
<th>Paper and Cardboard</th>
<th>Glass</th>
<th>Metal</th>
<th>Bio-waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>97%</td>
<td>66%</td>
<td>20%</td>
<td>84%</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>98%</td>
<td>67%</td>
<td>19%</td>
<td>82%</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>97%</td>
<td>66%</td>
<td>20%</td>
<td>84%</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>98%</td>
<td>67%</td>
<td>19%</td>
<td>82%</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>97%</td>
<td>66%</td>
<td>20%</td>
<td>84%</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>98%</td>
<td>67%</td>
<td>19%</td>
<td>82%</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>97%</td>
<td>66%</td>
<td>20%</td>
<td>84%</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>98%</td>
<td>67%</td>
<td>19%</td>
<td>82%</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>97%</td>
<td>66%</td>
<td>20%</td>
<td>84%</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>98%</td>
<td>67%</td>
<td>19%</td>
<td>82%</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>97%</td>
<td>66%</td>
<td>20%</td>
<td>84%</td>
<td></td>
</tr>
</tbody>
</table>

Source: HSY, 2014

Table 1 - Bio-waste collection in Helsinki

![Table 1](Image 254x274 to 394x518)

Source: BiPRO, 2015

Fig 4 - Typical waste bringing for collection points in Helsinki, Finland.

Source: Metrolaifun.com, 2014

Fig 5 - Automatic Solid Waste Collection System segregating & collecting waste and sending it to the waste transfer terminal through pipes

Source: Metrolaifun.com, 2014

Source: HSY, 2014

![Table 1](Image 254x274 to 394x518)
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, Shue, & 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, & Semiat, 2014). India is first in line in this crisis. While representing 17.74% of the world’s population, India 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 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 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.

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 water sources, 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 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 (demesmesan, verinson, maubant, & aligand, 2019). Moreover, guidelines for an EIA could be elaborated to further understand the EIA process.

Fig 1 - Demand and Supply of Water Forecast

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

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

Fig 2 - Global distribution of operational desalination facilities and capacities (N<1000 m³/day) by sector user of produced water.

Fig 3 – Desalination Process (SA Water, 2010)

Fig 4: Guidelines for a Project’s Impact Assessment

Source: Jones, Qadir, van Vliet, Smakhtin, & Kang, 2019
the impact assessment report must include a non-technical summary to enable the citizens to understand the environmental issues involved. The 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 (MTEES, 2019).

- Designated process and procedures, including mechanisms to review the quality of EA 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 an EA process administration and decision-making.
- Technical and professional capacity to carry out EIA.

**EIA Process**

On reaching the criterias mentioned above setups required for a preliminary identification of the project that could not be avoided or sufficiently reduced

1. **Project Overview**
   1. **Screening**
      1. **Project**
         1. **Identified**
            1. **Access**
               1. **Limit**
                  1. **Impact**
                     1. **Impact**
                       1. **Impact**
                          1. **Impact**
                             1. **Impact**
                                1. **Impact**

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 the ecosystem is drawn. It identifies a clear identification of every natural ecosystem in interaction with the project. The typologies of the impacts considered are:
      - 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. 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. E.g. a new road built for a project can lead to the further creation of roads around it.

3. **Decision-Making Process**

   In the first stage of the decision-making process, the project is conducted to check if the proposed mitigation can be monitored and controlled. If the project meets the specific requirements, only then is it 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 compliance with the restrictions approved and monitoring the effects on the environment over a longer term.

![Figure 5: Typical zones in a coastal area](image)

**Table 2: Mitigation impact on environmental quality**

<table>
<thead>
<tr>
<th>Environmental Quality</th>
<th>Non-avoidable impacts</th>
<th>Residual impacts</th>
<th>Residual impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain</td>
<td>Compensation</td>
<td>Avoid</td>
<td>Reduce</td>
</tr>
</tbody>
</table>
| Loss                  | Application of mitigation measures | Application of reduction measures | Avoid: an avoidance measure modifies a project to remove a non-avoidable impact and identifies that the project engendered

- **Compensate:** Positive actions to counter all the residual negative impacts
- **Reduce:** A reduction measure aims to reduce the duration, intensity and/or extent of project impacts that cannot be avoided as much as possible.

- **Avoid:** Suppress the negative impact by modifying the project

**Applying EIA on Desalination Plants**

While conducting an EIA for desalination plants, while capturing the screening and coping 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, are ecologically sensitive or not.
- Entrainment 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
- Territorial 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 pathogen 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...
Objectives

- Limiting infrastructure footprints within the site and away from the coastal zone,
- Monitoring: annual and quarterly reports are needed (Lord et al., 2009).
- Implementing 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 covers half of Adelaide’s water needs (SA Water, 2010).

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, Walks, & Kumar, 2009; SA Water, 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 (EM, 2012). The aim is to dilute the brine in the ambient seawater.
- Restrictions in chemicals: nature of chemicals, storages and discharge are controlled.
- Sea water intake: the velocity must not exceed 0.25m/s (SA Water, 2009). The aim is to avoid harming marine species.
- Monitoring: annual and quarterly reports are requested, particularly concerning salinity

Environmental Issues

- Geology
- Sediments and erosion
- Terrestrial flora and fauna
- Ground and surface water
- Resource efficiency
- Waste and hazardous materials
- Stormwater management
- Air quality and greenhouse gases

Environmental Measures

- Limiting infrastructure footprints within the site and away from the coastal zone, identifying ‘no go’ zones to preserve ecologically sensitive areas.
- 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 landslips, limiting the flow of dust and mud to the infrastructure and ecologically sensitive areas.
- Avoid removal of native vegetation, incorporate habitat restoration and rehabilitation by incorporating effective construction techniques, implementing an EMM and Land Management Plan, comply to local vegetation conservation policies (if any), ensure stormwater management.
- The EMM must include measures to protect the ground and surface water, to ensure that the foundations or any construction is leak-proof and does not affect the ground and surface water during drilling or tunneling, adopt water-sensitive design for effective water management, compliance to relevant environment protection policies.
- Incorporate reusing and recycling of materials as much as possible, minimal reliance on any ground or surface water during construction and operations.
- Waste disposal and generation should be minimal, the waste generated should be segregated, on-site storage of hazardous materials 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 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.
- 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, avoiding using 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 EMM must constantly monitor the water quality and the marine flora and fauna.
- Land Management plan should incorporate opportunities to conserve the local biodiversity and habitat, regular rehabilitation within the site, undertake revegetation at the site.

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 (UNE-F. n.d.). In the light of the above, cities under water stress can make a choice for the future of the water supply on their territory. This 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

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 predict its knowledge and skill requirement. However, the current learning trends focus 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 organizational 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.

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 (LEP). Technology based learning through LMS and LEP 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:

- Tele-immersion - A technology in virtual reality that allows 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 equipment are used to create a holographic training room.
- Virtual retinal display - A technology that projects images directly on eye’s retina. It allows real-time, on-site performance support.
- 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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