Circular Economy and Resource Efficiency

Angul District, Odisha

TARA

UN environment programme

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Abbreviations

CBA	Cost Benefit Analysis
CFCs	Chlorofluorocarbons
CSOs	Civil Society Organizations
CSR	Corporate Social Responsibility
DIC	District Industries Centre
DMF	District Mineral Foundations
EIA	Environment Impact Assessment
ESP	Electrostatic Precipitator
EU	European Union
GHG	Green House Gas
GIZ	The Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
LCA	Life Cycle Analysis
LCA	Life Cycle Assessment
MCL	Mahanadi Coalfields Limited
MOSPI	Ministry of Statistics and Programme Implementation
MSME	Micro, Small & Medium Enterprises
NALCO	National Aluminium Company Limited
NGOs	Non-Government Organizations
NITI Ayog	National Institution for Transforming India
NSDC	National Skill Development Corporation
SDGs	Sustainable Development Goals
SMEs	Small and Medium-Sized Enterprises
SPCB	State Pollution Control Board

Introduction

Circular Economy is a sustainable economy model where majority of the material for a new product comes from the older product. Based on the concept of Reduce, Reuse, Repair and Recycle, it is considered to be one of the solutions to handle the climate change crisis. Circular Economy removes the pressure from natural resources by encouraging the use of old and waste material for production rather than using virgin materials promoting the efficient use of resources.

Odisha's Angul district has witnessed a steep rise in economy in the last few years. Various public sector undertakings like National Aluminium Company Limited (NALCO), Mahanadi Coal Fields Limited (MCL), National Thermal Power Corporation (NTPC) and Talcher Thermal Power Station (TTPS) have been set up in this natural-resource rich district. Besides, several private sectors have also been established in the area which have contributed to its industrialization.

To ensure all-round development of this mineral rich region, the District Administration launched an ambitious 'Vision-2023' plan earlier this year. The objective is to be one of the country's best models of mining area development in a challenging environment with its sustainability embedded in ecological protection, cultural heritage and human development. In alignment with Angul's 'Vision 2023' plan and national priorities for green economic growth, a two-day Stakeholder Orientation Workshop was organized by the Angul District Administration in partnership with the United Nations Environment Programme (UNEP) on 24th and 25th of June, 2021. This was followed by a one-day Virtual Stakeholder Consultation & Prioritization Workshop held on 1st July, 2021.

The workshop aimed at orienting the audience on the concept and need of Circular Economy and how it can be integrated into different sectors. A week after the two-day workshop, a one-day workshop was conducted in which the line departments and five major industries of the district shared their experiences, successful intervention, challenges, gaps and way forward towards Circular Economy.

INAUGURAL SESSION:

Role of Circular Economy & Resource Efficiency in Sustainable Socio-economic Development

> ***Welcome Remarks:*** Shri Dilip Kumar Sahoo, Project Director, District Rural Development Agency, Angul, Odisha in his welcome address highlighted the importance of 'Identifying and prioritizing the effective interventions'.

Shri Dilip Kumar Sahoo in his welcome address highlighted the importance of protecting the ecosystem for the benefit of humans and environment. He emphasized on the need of efficiently utilizing our resources for sustainable consumption and production to restore the ecosystem. For this, he said, participation and consultation of different stakeholders – public institutions, private companies, CSOs, NGOs and others is crucial.

Virtual Stakeholder Orientation Workshop was organised by District Administration, Angul in collaboration with United Nations Environment Programme (UNEP). The workshop aimed at:

- Identifying and prioritizingthe effective interventions
- Documenting the existing interventions and best practices of sustainable consumption and production
- Identification of capacities for mainstreaming principles of inclusive, circular, and green economic growth across social economic sectors
- Developing the roadmap for sustainable socio-economic development

Angul District Vision 2023:

Shri Siddharth Shankar Swain, IAS, District Magistrate, Angul

Talking about Angul District Vision 2023, Shri Siddharth Shankar Swain, IAS, looked at the need of going beyond and establishing a 'long term vision' for humanity. He acknowledged the need of circular economy to grow sustainably through judicious use of resources and optimising and reusing resources. He explained how this workshop aimed at creating a roadmap for Angul district to achieve circular economy. The district can actually benefit from a practical vision that can be implemented as there is a lot of scope for circular economy and several industries in the district follows the practice. Angul has a scope for MSMEs – the

learnings of circular economy can transform the district into a hub for repair, refurbish industry and even for recycling e-waste and other components. For him, building a circular economy can lead to mitigation of several hazards that exist due to presence of industries. He ended his address by emphasising on the need of a futuristic approach and expanding circular economy practices into other sectors such as MSMEs, food, textiles, electronics etc.

Setting of Context:

Mr Atul Bagai, Country Head, UNEP

While setting the context, Mr Atul Bagai highlighted the role of new generation in dealing with the current challenges of climate change and pollution contributed by various sources in the past when these issues were considered myth. In 40 years, so much damage has happened that the challenges have increased manyfold. This webinar can set a long-term engagement for sustainable development with contribution from academicians and practitioners. Although a two-day event, he believed that this webinar can lead towards developing clear thoughts and have a deep interaction with stakeholders at district level to come up with an action plan that will be the first of its kind in India and can show path to other districts to deal with the challenges of climate change.

Keynote Address:

Mr Satya S Tripathi, Chancellor, Kalinga Institute of Social Sciences

In his keynote address, Mr Satya S Tripathi highlighted three cautionary points to the audience:

i. Interventions, conversations around sustainable development start at a positive note but along the way, people start losing interest. There is a tendency to invest in easier things – machines, equipment or infrastructure and not in critical things like maintenance of these interventions which leads to the failure of such interventions.

ii. These are unprecedented times. Humans are at a place in time where irreparable damages have been done to our environment and its consequences will be faced by everyone. A state like Odisha which has a huge coastline will suffer immensely. In fact, no state or district will be exempted.This initiative is exponential in terms of possibilities as worldwide a lot of supply side conversations are happening – responsible banking, insurance, investment, net zero asset owners alliance. These things are created to keep advocacy and outreach alive. But with nothing happening on the demand side, these initiatives die out.

iii. There is not a single jurisdictional district of Angul's size and complexities that is on track to discuss something meaningful and have an action plan to deal with such challenges. As this is a unique initiative, not everything will be good - there will be failures as well. The whole activity, however, will act as a vital lesson for our society preparing us for the future. This webinar is a courageous step to start something new where people have come together to deliberate, discuss and find solutions that will hold tremendous and meaningful lessons for the rest of the state, country and planet. If this can be done in Angul, it can be done anywhere else.

Special Remarks: National Priorities on Circular Economy & Resource Efficiency

Dr Ashok Khosla, Founder and Chairman, Development Alternatives

In his address, Dr Ashok Khosla discussed the need to look for efficiency in production and delivery systems to reduce the pressure on natural resources by identifying and filling the gaps. Along with efficiency, he introduced the concept of 'Sufficiency'. He explained how 70% of people in India do not have a decent life while the remaining and among them – the affluent ones, consume and over-consume. Sufficiency means not to have more than what one needs and to have enough to live a decent life is adequacy.

He proposed that the main aim of this initiative should not just be efficient and circular economy but to ensure that people in the district live decent lives. In his presentation, he mentioned the difference between vicious circular economy and a virtuous circular economy. Future has to be a virtuous cycle - the secondary economy that needs to be discussed. He shared two key hypothesis:

- First, decoupling strategies can be designed to dissociate the amount of resources that we use from the economic well-being that we produce - reducing consumption and enhancing access to resources, particularly by the poor.
- The second key hypothesis is resource governance - the markets, the finance, the trading knowledge and technology systems can be redesigned.

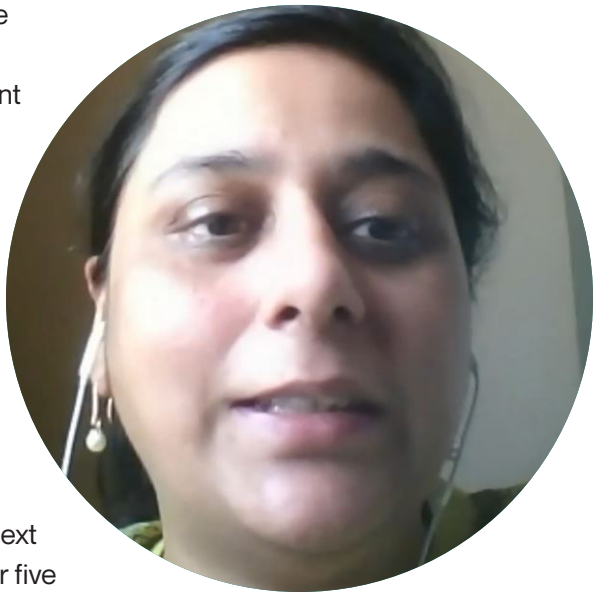
To make society efficient and sufficient, strategies should be adopted that are desirable to the market and are acceptable by the financial institutions. This will require building skills and utilisation of local resources to create local jobs and local consumption patterns. Quoting Mahatma Gandhi, he emphasised how, instead of globalised economies, local initiatives help achieving efficiency. In cost benefit analysis at district level, environment and social costs should be considered. In the process of creating sustainable livelihoods, not only the interests of the planet, environmental quality, and economy should be considered but the interests of the people and principles of social equity, fairness and justice should be given priority. The need of the hour is to shift from a linear economy to a circular economy to achieve sustainability.

VOTE OF THANKS

Shri Siddharth Shankar Swain, IAS, expressed his gratitude to Mr Atul Bagai, Shri Satya S Sahoo and Mr Ashok Khosla for providing guiding principles that will be followed by the district to ensure an inclusive development. He also extended his heartfelt appreciation to all the panellists and participants for attending the workshop.

Briefing on Structure of the Workshop

Ms Manisha Chaudhary, National Coordinator, Partnership for Action on Green Economy with the UNEP, India Office



Ms Manisha Chaudhary set the agenda for the two days. She informed participants that the workshop will have presentations from different stakeholders over the 10 thematic sessions. Each session will be followed by a Q & A round and at the end of the two-day session, participants will be provided with a worksheet in which they can provide inputs, help identify gaps and share best practices. She informed that a meeting will be held on July 1, 2021 to discuss the worksheet. It will be the prioritization workshop where all the stakeholders will discuss the priority areas for action over the next five years. This will help develop a roadmap for five years that will be implemented in Angul district.

PROCEEDINGS

THEMATIC SESSION:

Ecological and Economic Situational Analysis of Angul district

Mr Chandra Bhushan, President and CEO, iForest

In his presentation, Mr Chandra Bhushan shared his thoughts on the institutionalisation of District Mineral Foundation (DMF) project. He started by mentioning that government alone should not be responsible for the development of the society and for implementing initiatives like circular economy and at the same time deal with global challenges like climate change. Calling them the three pillars of any developing country, he highlighted the need of partnership between government, market and civil society.

While sharing his experience while working on the DMF project, he discussed the role of community participation in finding gaps and then prioritise the interventions. Instead of having an input-output framework, he focused on the need of having an output-outcome framework that considers the wholesome result of an initiative.

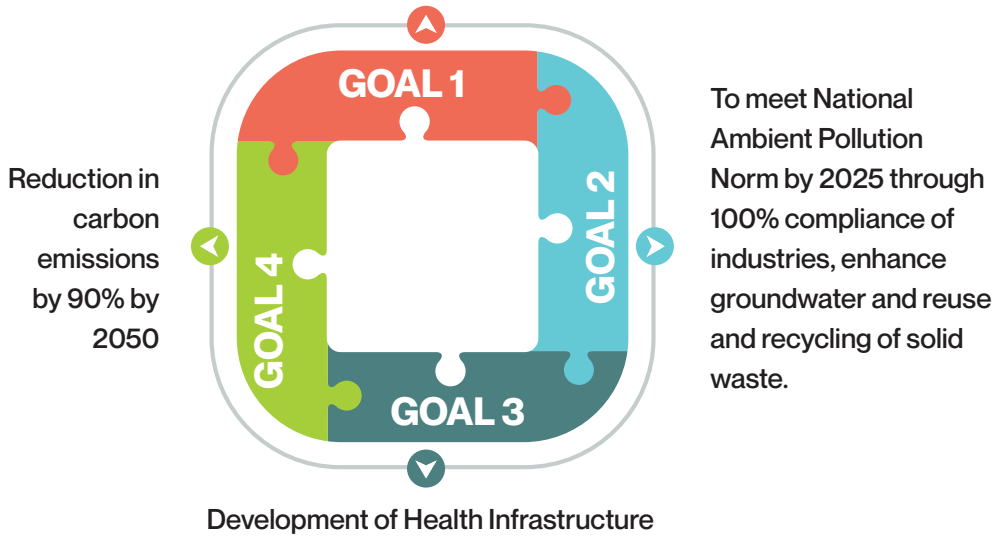
Angul in a highly industrialised district that provides 15% of India's coal and 5% of India's steel in addition to a 5000MW powerplant. The entire existence of Angul district is based on fossil fuel so if India wants to implement climate change mitigation, then districts like Angul should be at the forefront.

Besides, Angul is a highly forested district which makes it a resource-rich district. 42% land in the district is under forest and 30% is under agriculture. Even then, it is a poor district with 22% population living below poverty line making it a classic case of rich land-poor people situation. He talked about the need for sustainable economic development to make Angul a rich land-rich people district.

Angul has been classified as a critically polluted area by the Central Pollution Control Board. The PM 2.5 level is three times the normal value. The ground water quality and quantity isn't good. Brahamani River – the major river that passes through the district, is also quite polluted as it receives discharge from several industries located in the region. Human Development Parameters indicate poor WASH conditions, prevalence of water borne diseases, tuberculosis and disability. The infant mortality rate is 50% while under 5 mortality rate is 62. 37% of children between the age of six months and five-year and 50% of pregnant women are anaemic. Angul has a good education level till primary level but the secondary education and graduation levels are quite poor.

This situation needs to be changed to provide skilled jobs to the people. There is also a high rate of unemployment. As per the 2011 Census, 59% population is unemployed of which majority are in the age group of 15-59. He noted that, at present, there are not sufficient employment avenues in the district.

In his final remarks, he mentioned that Angul district has low human development and is a hotbed for climate change. The good part is that being an industrial district and the government does not lack funds. The discussion should be around the effective utilisation of these funds. Through the output-outcome frameworks, 4 goals can be set for an inclusive development:



The first question was asked by Mr Subbu Prasad: The landholding of farmers in Angul is quite small and extracting the groundwater is a hurdle. Is it important then to prevent surface water flow and construct dug wells and other water storage projects for provision of drinking water? Farmers are also opting to grow vegetables to improve their financial health. How can it be helpful?

Mr Bhushan replied by mentioning that majority farmers across nation have small landholdings and larger land holdings are part of mechanised culture. Tubewell water is a problem as ground water is heavily polluted. Dug wells are important in that case but it should be coupled with water harvesting. Secondly, growing vegetables is a very good idea but it also requires lot of market support- from cold storage to marketing to sales. There is also scope of non-timber forest products which can be tapped.

Prof Rajiv Sinha from IIT Kanpur flagged the issue that there is a need of integrated surface water and ground water management systems and they both should not be looked at differently. Focus should be to take stock of natural resources and take measures for their maintenance rather than building new infrastructures. Mr Bhushan agreed with Professor Rajiv and mentioned that the already existing water bodies and resources should be maintained.

Ms Zeenat Niazi then also mentioned the need for water utilities like integrated pipelines along with integrated water management systems to supply drinking water to villagers.

THEMATIC SESSION:

Principles and Concepts (Inclusive Green Economy & Life Cycle Assessment)

Introduction to Principles of Circular Economy

Ms Archana Datta, SWITCH-Asia RPAC- National Coordinator for India, UNEP

Through her presentation, Ms Archana Datta introduced the concept of Circular Economy. For conceptual clarity, she started by explaining Linear Economy where the natural resources are utilised to produce a product which is thrown away when it becomes unusable. She explained how this unsustainable production and consumption practice is leading to climate change and why Circular Economy is required to deal with this situation.

Circular Economy means designing waste out of the system. It focuses on rethinking the business model, so that the resources are circulated within a closed loop.

- Circular Economy requires a fundamental shift in the way resources, energy and information flows in our economy.
- The key characteristic of this framework is that the products and their components remain at their highest levels for integrity and performance, which means waste of any kind is eliminated-the wasted resources, the wasted capacities, the wasted life cycles, as well as wasted embedded values. There are five broad principles of Circular Economy:
    i. Circular design where products are designed in a way that they are long lasting, easily repaired and can be dismantled so that the material used in manufacturing can be recovered and reused.
    ii. Usage of clean resources i.e., renewable resources, local resources and ethical resources which are made of non-virgin material.

iii. The most important principle is resource efficiency in the way the products are made - use of most efficient processes, energy efficiency and minimizing wastage during production process

iv. Exploring new business models

v. To efficiently recover the products so the resources can be used again.

- Based on the principles, business models can be further classified into 5 broad categories:

  i. Circular supply chain

  ii. Recovery and Recycling

  iii. Product life extension

  iv. Sharing Platforms

  v. Offering service as a product

- Providing a good practice for circular economy. This was explained using the example of Nike grind wherein they collected used and old Nike shoes and reused them in manufacturing sports equipment.

- This was followed by a video shared on Philips circular lighting and a video on Interface carpets.

- Ms Datta also shared some circular economy examples from India- Reliance Industries, Geetanjali Woollens, Amazon and Mahindra Trringo. Packaging and plastics, agriculture, food, clean energy, mining, manufacturing textiles construction and demolition are some major sectors where circularity is being explored across the globe.

- Circularity can be scaled by leveraging the combined strengths and weaknesses of different organizations.

- Along with investments, disruptive technologies and the right policy landscape will help enable create the right ecosystem and mainstream circular economy agenda.

Resource Efficiency and Circular Economy

State Level Experience

Dr Rachna Arora, Team Leader, Team Leader & Coordinator, European Union - Resource Efficiency Initiative, India - GIZ

Dr Arora, in her presentation, discussed the project GIZ is running for circular economy in India. She highlighted several issues in circular planning that require partnership and networking among departments and industries. There is a partnership between India and EU on 4 different aspects which largely focussed on implementation of policies on circular economy and working with the state governments and the ministries to identify a business innovation so that innovative products are available for consumers. Currently, 8 ministries of India are jointly working on the project with GIZ. The key points of her presentation were:

- Criticality framework of resources and material availability
- Local municipalities as key asset
- Capacity of recycling units
- Designing new products that can be made from recycled material

Bringing the project to state level and implementing the interventions is now the objective of the organisation in partnership with various stakeholders like TERI, CII etc. The policy document which Dr Arora was talking about was released in 2017 and will be a substantial asset for planners to implement circular economy practices in the district.

She gave example of project from Goa that included series of consultations with local populations including fisher communities, documentation of local best practices and identification of the sector where the project can be implemented. Awareness and capacity building of different stakeholders is one of the key instruments to initiate a process on strategic action plan. She advocated for stakeholder consultation as an important aspect for prioritization of sectors. She also talked about how recycling material at the site of production can contribute to creating circular economy.

In her presentation, Dr Arora explained how research confirms that a sector wise sustainability framework can help understand the availability and production. A major issue about circular economy is that the primary material is cheaper than the recycled secondary material, then why should the secondary material should be used that is not even quality certified. The benchmarks have not been set for the utilization of the secondary materials. Here, district authorities can play an important role in smaller loops through Industry Symbiosis.

Life Cycle Assessment

Concept and Practice

Ms Zeenat Niazi, Vice President, Development Alternatives Group

Ms Zeenat Niazi in her presentation addressed the need of a Circular Economy for a greener, more equitable, more inclusive circular economic growth across the socioeconomic sectors. Calling Linear Economy unethical, she called for the need of new systems. She talked about the Vision Document 2023 that aims at making Angul self-reliant in its economy and natural ecosystem. She discussed how this is a crucial time to make choices to effectively respond to global environmental challenges. The thinking approach that we need to prevent climate change will help us in choosing our method of production, design and consumption. She advocated for the cradle to cradle framework to achieve sustainable development. She discussed the 'hidden costs' in production which includes health costs, environmental cost, social costs etc. The life cycle management frameworks considers all these hidden costs.

Her presentation identified how there is a lack of credible data which is required for better understanding of issues. She emphasised on the 4 steps in the environmental and social Life Cycle Analysis (LCA) Framework:

i. Define goal and scope
ii. Define boundary conditions
iii. Looking at the inventory to look at all the impacts
iv. Interpretation of the compiled data

The LCA framework can be used to design a policy or a program, or to assess an approach to policy and program. It can help in taking decision by comparing different interventions on varied aspects. All our actions should aim at reducing our ecological footprint, which is our ecological negative impact on the system and increasing the social handprint - the positive social benefits which can be achieved through LCA. LCA can also help in looking into the ecological and environmental aspects- reduce in use of virgin materials and use of more sustainable material.

Secondly, LCA can bring an economic competitiveness in the products. It can also be used to reduce external dependence and instead achieve local value creation. Lastly, the important aspect is how to retain the benefits that are created through LCA.

She also discussed the Life Cycle Sustainability Assessment which includes environmental life cycle assessment, life cycle costing, and social life cycle assessment. The emerging concept of energy accounting also formed part of her presentation

THEMATIC SESSION:

Efficient Use of Biotic Resources

Sustainable Management and Eco Restoration of Mining Areas

Mr Rohit Kumar Singh, Coordinator-Business and Biodiversity at IUCN

After introducing IUCN and its objectives, Mr Rohit Kumar Singh, started his presentation by defining ecosystem restoration- a process in reversing the degradation of ecosystems, such as landscape, lake and oceans and regaining that ecological functionality. He emphasised on the importance of ecological functionality of an area or of a habitat to define ecosystem restoration.

While talking about the objective of ecosystem restoration, he explained to the participants how it aims at contributing to the conservation and sustainable use of biodiversity, as well as creating social, economic and environmental benefits. Healthy and connected ecosystems should contribute to improve food and water security.

The benefits of ecosystem services includes the increased food and water security, contribution to climate change mitigation, alleviation of the pressures of conflict and migration. Talking about the process of restoration, he shared with the participants that restoration is not about planting trees. It's about turning degraded land into a healthy, resilient, and a productive landscape. How can this be achieved? He answered the question by giving examples of the Corporate Industries.

He discussed how corporates can focus on building action based relationship with businesses that goes beyond CSR, addressing the root cause of environmental degradation. Their global business and biodiversity program provides a wide range of expertise and it builds bridges between stakeholders that carries scientific biodiversity assessments, ecosystems services, reviews, and develop a comprehensive biodiversity management plan.

The plan not only enhances the biodiversity value and the ecosystem services in and around the area, but also integrates the socio-economic parameters of thecommunity as well nearby surroundings

While discussing the contribution of IUCN in enhancing the sustainable development, he talked about the BMP (IUCN Biodiversity and Management Plan), which is a comprehensive document that covers existing EIA compliances and also guides a company's management interventions to use biological and socio-economic development. There are three key steps:

- Biodiversity assessments followed by a comprehensive biodiversity assessment
- Ecosystem service review
- Impact and risk assessment

Risk and Sustainability Analysis Tool for Efficient Use of Biotic Resources

Prof. Rajiv Sinha, Department of Earth and Sciences, IIT Kanpur &
Mr. Prasad Babu, Founder Geo-Climate Risks Solutions Pvt Ltd

In a combined presentation, Prof Rajiv Sinha, Professor at IIT Kanpur and Mr Prakash Babu, Founder, Geo-Climate Risks Solutions Pvt Ltd delivered a session on water sector looking at the core part of water park space in circular economy in natural environment.

Water starts from its catchment and enters the natural system that is drainage and water bodies and ultimately gets into various industries. In the end, it has to return to the natural systems but with appropriate treatment. There is a major gap between the availability of fresh water and its demand. This demand, they said, can be met through technology and sustainable lifestyle.

To promote water conservation, they emphasised, incentives should be provided to those who have been conserving water through their small, individual or group efforts. They discussed how the current strategies are insufficient in returning to the system the same quantity and quality of water, which it had extracted from the system. Either it is polluted or wasted or brought back in different manner.

Taking the presentation forward, Prof Sinha focussed on specific example of water bodies that can be utilised in circular economy. The fresh water supply in Angul district is dependent on ground water or water in lakes, wetlands and ponds around the district. Current scenario is such that not only the fresh water supply is dwindling, but there is a serious ecological loss. In such a scenario, there is a need to have a science based management system for the water sources. For this, there is a need for effective collaboration among different stakeholders. There he talked about the availability of huge resource of satellite imagery, which can be used as baseline data to design result-oriented intervention.

A mechanism should be developed, he emphasised, to measure change and generate scenarios through modern technologies and then, using different frameworks, an appropriate model can be decided which is suitable for the given region.

They explained it through the example of Chilika where a large system was changed to have sustainable interventions. Chilika was a huge problem in 1980s - fungal bloom, siltation, clogged water and so on. Through gradual, sensible and sustainable interventions, it is in a much better state now.

They talked about the role of technology that can be used to map smaller water bodies in any region and with the help of frameworks, conservation works on these water bodies can be prioritised. Along with prioritising, they said, it is also equally important to understand whether a particular water body is actually restorable or not.

In case of wetlands, hydro-geomorphic conditions play a significant role along with mapping on the basis of water boundary. This should be followed by developing an understanding of how the wetlands have been connected to the adjoining floodplains. Without this knowledge, no restoration project can be implemented properly. All this can be easily done if the datasets are available.

Prof Sinha concluded by mentioning that there is a need to think in terms of local resource development and region specific solutions which can lead to water development in the area that will ultimately lead to new livelihood opportunities.

Project director of watershed, Angul raised two issues regarding the water bodies in urban and semi urban areas. The two issues were storage of water and its use. There is a decline in the water storage capacity as the water in water bodies has reduced due to construction along and across the drainage lines. Secondly, there is a widespread aquatic weed making water storage a challenge. He asked how this situations could be rectified.

Mr Rajv replied that this is where we need to understand the connection between water bodies and river channel. Lakes can start degrading in quality as well as in quantity when first, the surface inflows start to reduce which can happen because of contracting of barriers and second, when we start exploiting the water body directly or indirectly. So the first step is to understand the problem and then find the solution of the problem.

The second question was whether community behavioural change is important along with construction of water sheds to which Mr Rajiv said that it is very important and that is where incentivising the intervention works. There is a need to spread and awareness and disseminate knowledge in simple language so the community understands.

Mr Subhasis asked the third question that was the type of capacities required by residents to decode the huge dataset.

Mr Rajiv addressed that with the advent of new technologies like GIS and satellite imagery, it is now a need for building capacities at district and block level to train the people on basics of GIS analysis so that they can use technologies to manage their local resources.

The last question was asked by Ms Niladri on the relevance of behaviour change of communities living near water bodies in the management of those water bodies.

Behaviour Change is important and it needs to be brought out. Mostly all the villages have a water body in and around them and usually villagers are protective about the water bodies. But these water bodies are neither managed properly nor used efficiently as the community members are not conscious enough. A sense of responsibility has to be brought in people to encourage them to protect the water bodies in a more efficient way.

THEMATIC SESSION:

Green Livelihood

Skilling and Green jobs

Dr Sanjogita Mishra, Lead - Special Projects, Tata Community Initiative Trust

Dr Sanjogita Mishra discussed the future of livelihood in circular economy space. She started by emphasising on the capacity and skill gap that exists that prevents from implementing a Green and Circular Economy. She highlighted the importance of using right strategies to overcome this gap.

She shared with the participants how Circular Economy has been practiced by tribal communities in India for long time and examples can also be observed at household level. She believes that for creating Circular Economy, there is a need for an integration of indigenous and modern knowledge. To shift to a sustainable development model, she said, there is a need to promote sustainable production and sustainable consumption.

To achieve sustainable consumption, which is an important aspect of sustainable development, there is a need to change the mindset that can be achieved through a change in the education system by teaching young children about the concept of sustainability.

At larger scale, besides public-private partnerships, for promotion of sustainable production, nano and micro business owners need to be informed about how to calculate their productions cost over a longer duration of time.This can be followed by training the MSMEs to incorporate sustainability in their designs.

The loan providing agencies need to be trained to promote energy efficiency and sustainability criteria. Like other speakers, she also emphasised on the need of calculating total cost of the projects.

The NSDC has defined 34 job roles as green jobs but Angul district should not limit itself to just those 34 roles. She discussed the possibility of creating new job roles based on the intervention. For developing skills among local population to be eligible for these green jobs, she emphasised on skill development through:

- Green skills courses can be integrated in schools
- Recognition of prior working on green jobs
- Establishment of e-waste management unit
- Orientation of all skill providers and teachers

THEMATIC SESSION

Sustainable Management and Circularity in secondary resources

Municipal Solid Waste Management

Ms. Swati Singh Sambyal,
Waste Management Specialist,
UN-Habitat India

Ms. Swati Singh Sambyal's presentation started by setting the context of Solid Waste Management during Covid-19. She talked about how the municipal systems have been overburdened during these times of Covid-19 due to the addition bio-waste. The pandemic has also raised the need for our cities to have effective systems in place that are resource efficient, circular and inclusive.

Talking about the current trends, she said that today, the waste management practices are based on disposal-based systems, relying more on incineration and landfills to handle more waste, resulting in higher economic costs. There is a need for a comprehensive waste management approach that focuses on waste prevention. The goal should be to avoid sending trash to landfills. Such a system will enable:

- Zero waste communities/programs
- Robust recovery infrastructure
- Better incentives and more jobs
- Empowered citizens
- Effective wastereduction policies
- Clean manufacturing

She emphasised on the need of reinventing the resource hierarchy where more focus should be on reuse, reduce and recycle. While discussing the practical roadmap to ensure resources recovery in Angul, she discussed following points:

- Data Inventorisation and assessment: Lack of data leads to insufficient planning. There is a need for detailed inventorisation and assessment. UN-Habitat has developed a tool that helps in inventorising cities in order to understand the flow of waste, the leakages, the recovery rate and the amount of waste disposed. Sharing the example from a study from Mangalore, she showed how dump yards contributed to maximum leakage of plastic waste.

- Mainstream Segregation: Segregation should be mandatory that can be promoted through incentives to enhance behavioural change for segregation at source. She shared the example of how in many cities in southern India, people who segregate their waste at source and practice composting get a 50% discount in property tax. She also shared the 'Shop with your waste' campaign in Goa where residents can barter their plastic waste for products.
- Effective collection and transportation: Infrastructure to be promoted for collection and transportation to support segregation and not disposal. Ensure maximum route optimisation and increase collection efficiency and enhance accountability and transparency. She shared the example of Vijaywada Municipal Corporation which has dashboard online for daily management of waste.
- Setting up systems for resource recovery: This can be achieved by creating decentralised infrastructure to promote segregation and prevent disposal by creating market linkages for product. She also discussed the idea of offering compost as a service in cities. For effective resource recovery, she emphasised on the need of calculating tipping fee on the quantum of water processed and not on the waste collected. She also proposed charging landfill tax.
- Engagement and Awareness: To move towards circularity, social engineering is the need of the hour. There is a need for campaigns to engage citizens and incorporate them and create micro plans for waste management.
- Social integration and inclusion: She highlighted that the informal sector is crucial/critical to zero waste systems. She believes that municipalities and private entities can play a key role in mobilizing. As far as integration is concerned, she proposed integrating waste pickers into directly collecting waste at source by associating them with cooperatives and municipalities. They should be provided training and skills on up-cycling interventions. She shared the example of Ambikapur where 447 women were segregated into 34 SHGs under the federation of 'Swachh Ambikapur Mission Sahakari Samity'. They entered into a contract with the Municipal Corporation for door to door collection of waste along with its segregations, processing and sale. She also shared the example of Swachh model in Pune.
- Policy integration for promoting sustainable circular systems: She talked about integrating bye-laws and development plans with more sustainable circular strategies. She discussed the idea of creating roadmaps that along with targeting heavy polluting industries should also offer scope for improvement on adopting circular economy practices. She mentioned that Goa has become the first UT in India which has a strategy for fostering resource efficiency and circular economy.

Project Director of Watershed Angul while giving his views regarding waste composting in urban and semi urban areas, said that there are two types of composting- city and vermi. Vermi composting should be practiced with vegetable waste and the rest waste to be used as city composting. Vermi composting can be practiced near the vegetable markets and parks. Ms Swati agreed and said that at a city level more decentralised way of composting can be practiced and even the option of bio gas can be explored along with even bio mechanisation.

Pravin Lawande, a participant suggested more focus on the health of women through frequent heath audits, group insurance and ensuring their children's education for upwards mobility. Ms Swati agreed and said that the first two initiatives need to be practiced and many companies are already doing it providing them with more facilities.

Plastic Waste Management

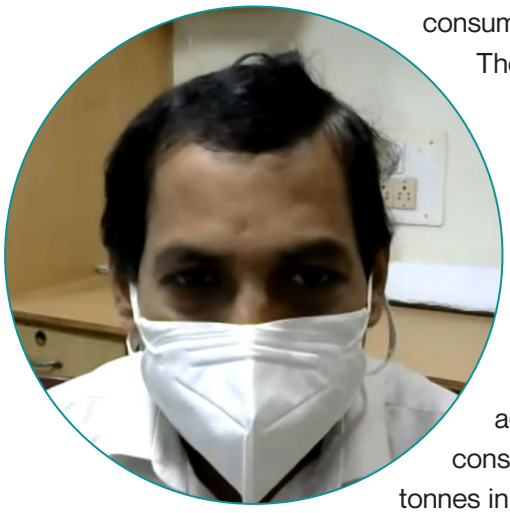
Mr PC Padhi, Chief Manager, Central Institute of Petrochemicals Engineering and Technology (CIPET), Bhubaneshwar

Introducing Central Institute of Petrochemicals Engineering and Technology, Mr Padi mentioned how CIPET has partnered with PWMC Talcher and UNICEF to set up a plastic waste management unit in the area. CIPET is a government of India organisation which is under the Ministry of Chemicals and Fertilizers having 42 centres across the country. The core objectives of CIPET are to cater technically trained manpower to various plastic and allied industries, provide technical support to centre and states in many aspects like skill training, inspections, testing and quality control. Apart from the technical support, CIPET also conducts graduate, postgraduate, diploma and certificate programmes along with skill development training programs.

Plastic waste is a hazard to a nation but its effective collection, segregation and reuse can provide many benefits to the stakeholders and also support the economy as processed plastic waste can add value if it is reused. Setting a plastic waste management unit at Talcher will also provide employment in the area and lead to skill development in youth.

Dr Ashwini Kumar Mohapatra, Principal, CIPET

The second presentation of this session started with a definition of Plastic which is a versatile material that is lightweight, cost-effective, easily available, easy to process,corrosion-resistantand sustainable. There is huge application of plastic in transportations, agriculture, packaging, healthcare and energy harvesting. There are two different types of plastic- Thermoplastics and Thermosets. Thermoplastics are recyclable plastic with a consumption of 14550 KT in 2016/18 and 18970 KT in 2019/20. Thermosets and non-recyclable plastic with the consumption of 950 KT in 2016/17 and 1090 KT in 2019/20. The spectra of application is wide hence plastic waste management becomes equally important.



Talking about dependency of people on plastic and increasing usage and comparing it with world usage, he informed that plastic is majorly used in packaging in India- it is 43% of plastic use as compared to 35% in world, followed by infrastructure (21%/25%), auto (16%/17%), agriculture (2%/8%) and others (18%/15%). Plastic consumption has increased in India from .061 million tonnes in 1996 to 17.8 million tonnes in 2017. Recycled plastic

comes with a recycled logo which ranges from 1-7. While discussing plastic waste management in India, he shared following keypoints:

- **25940 tonnage** per day is the estimated plastic waste generated
- **60%i.e 15384 tonnes** per day is collected and mostly recycled
- **40% i.e. 10556 tonnes** per day is not collected and littered
- **6.92% average plastic waste** in Municipal Solid Waste

In his presentation, he discussed the possibility of increasing collection of plastic waste by Angul Administration. He also talked about the role people can play which will require behaviour change in local communities to reduce waste all together. Some ways for waste reduction are the following:

- Using reusable bags
- Buying second hand products
- Reduce, Reuse and Recycle
- Learning to compost

Dr Mohapatra urged the participants to adopt 6 R's for plastic disposal

- Reduce
- Reuse
- Recycle
- Recover
- Redesign
- Remanufacture

While explaining plastic waste management, he discussed two ways – Conventional technology and new technology. Conventional technology includes recycle, incineration, landfilling while new technology will involve plasma pyrolysis technology, liquid fuel, polymer blended bitumen roads and co-processing in cement kiln. He informed the participants about four types of recycling:

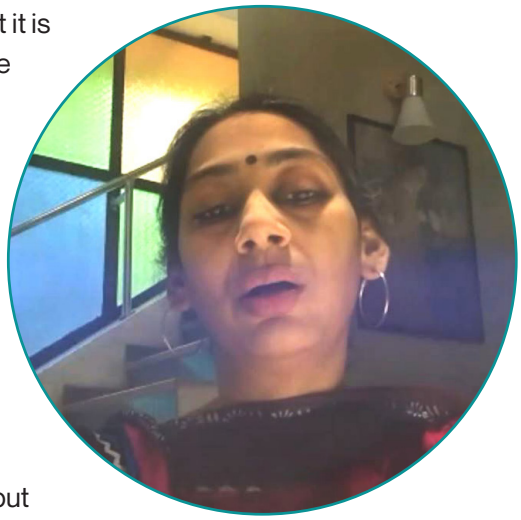
- Primary Recycling- It is the processing of waste into products of similar characteristics
- Secondary Recycling- The processing of waste into a product of different characteristics is called secondary recycling
- Tertiary Recycling- This involves the production of basic chemicals and polymer waste
- Quaternary Recycling- It is the energy extraction by the burning process

There are several advantages of plastic recycling. It helps reduce energy uses, in mitigating global warming. It reduces pollution and load from landfills. Adopting recycling helps creating awareness for the environment among common people.

He also introduced the participants to the concept of plastic credit which is a transferable unit representing a specific quantity of plastic that has been collected and possibly recycled from the environment. He also explained the term plastic neutral which means that for every amount of plastic created, a measured equivalent of plastic waste is recovered and removed from the environment.

E-waste Management

Dr Priti Mahesh, Chief Programme Coordinator, Toxic Links



Dr Priti Mahesh gave a presentation on E-waste. Discussing the reasons behind increasing E-Waste, she said that it is fuelled by consumerism and reduced life span of the product. In India, she said, per capita generation of E-Waste is 7 kgs. India is the fifth larger generator of E-Waste in the world.

The electronic contain hazardous material like lead, mercury, cadmium etc. which is released into the environment if E-Waste is not processed properly.Current practices for E-Waste processing in India are managed mostly by the informal sector. Not only some of the steps of processing are extremely dangerous and risky but the current processing methods are also harmful to the environment.

While discussing the social impact of the current E-Waste processing sector, Dr Priti Mahesh informed that it provides new employment opportunities for women and children. The sharing of gains, however, is disproportionate i.e., the workers are most impacted while the traders are most benefitted. The impact is mostly felt by vulnerable groups.

E-Waste rules came out in 2016 which makes it mandatory for manufacturers to take back their products for recycling safely. She said that with increasing consumers of electronic goods, the linear model is no longer viable. While discussing E-Waste from the perspective of circular economy, she said that E-Waste is an environmental as well as an economic problem. It requires a multitude of resources and materiel to develop circuit boards and chips. While only 11.7% of global E-Waste is documented to be collected, a circular economy of E-Waste is required also to conserve the precious metals that are used in manufacturing electronic goods. An average smartphone required 71 elements from the periodic table. Electronic markets consumes 80% of world's demand for indium and ruthenium and 50% of antimony.

While discussing the roadmap for Angul district, Dr Priti Mahesh also emphasised on 3 Rs - Reduce, Reuse and Repair. She advocated for:

- Green procurement
- Leasing instead of buying
- Creating banks for second-hand goods
- Creating an eco-hub for the creation of green jobs
- Promote local repair and refurbishment units
- Creating a formal market for repaired and refurbished units
- Campaign to educate users

As far as recycling is concerned, she discussed the possibility of:

- Inventorisation of E-Waste generated
- Inclusion of batteries, lighting equipment- solar energy waste
- Assessing the collection infrastructure
- Identification of bulk consumers and creating an online platform for assessing their disposal practices
- Developing municipal collection sites
- Financial models for taking back
- Creating a list of collection points for better accessibility by consumers
- Behaviour change especially in students

She shared the example of New Delhi Municipal Council which has an online system where people can log in and list the E-Waste they want to dispose and then a registered vendor will come and collect the waste.

The first question was on throwing some light on the ways and scope of eco hub?

Dr Priti replied that the eco hubs options are now being explored and it is basically creating space with public private partnerships where repair and refurbishment of electronics can take place. The eco hubs will provide them with a formal space with proper measures and also provide training for people working there.

Another question was to elaborate on green procurement.

Green procurement is specially looking at public procurement and how the government can change its procurement systems to motivate suppliers to use green materials and equipment e.g. use of recycled material in product. These criteria can be mentioned in public procurement system to select producers who are practicing green measures like using recycled product, providing buy back options, providing door to door collection system of old equipment, connection with a registered recycler etc.

Construction & Demolition (C&D) Waste Management

Prof. (Dr.) Abhijit Banerjee, Environmental Studies, Jindal School of Liberal Arts and Humanities

Dr Banerjee's presentation discussed the critical field of C&D Waste Management as construction is a booming sector without proper waste management system. Virgin resources are used in construction leading to pressure on resources. While talking about the economic, social and environmental benefits of C&D waste management, Dr Banerjee highlighted following points:

- Saving hauling cost
- Improves MSW management
- Employment generation
- Prevents flooding by unblocking the drainage channels
- This leads to cleaner wetlands and rivers
- Prevent leaching out of hazardous material
- Reduces airborne particulate pollution
- Relieves pressure of natural resources

The C&D waste that majorly consists of recyclable material like bricks, sand etc., has a low salvage rate. Typical composition of C&D waste in India is as follows:

- Soil, Sand and Gravel (36%)
- Bricks and Masonry (31%)
- Concrete (23%)
- Metals (5%)
- Wood (2%)
- Others (3%).

The informal sector involved in C&D waste management salvage the metals and intact wooden frames but the rest of the materials end in landfills. This thrown material can be recycled to be productive. Crushers can be used for production of aggregates from C&D. Recycled aggregates can be used for landfill covers, ready mix concrete, substitute for sand, pre-cast covers, public toilets etc. and can be used to make kerbstones, tiles, concrete blocks, paver blocks etc. The major concern here is that due to their reduced strength, recycled aggregates should not be used in load-bearing structures.

As per the C&D Waste rules 2016, the generator of C&D waste is responsible to prevent leakage, file a waste management plan and pay fine to ULB. ULBs are main actors in implementing waste management plans and monitoring and the PWDs coordinate with ULBs for waste management. Certain ministries and agencies like Ministry of Urban Development, Central Public Works Department, Building Materials and Technology Promotion Council, Ministry of Housing and Urban Affairs have also come up with guidelines and advisories to manage C&D waste.

There are certain challenges in C&D waste management. For ULBs, the challenges are shortage of land, lack of monitoring and capacity, lack of experience in waste management, concern about financing and lack of concern and priority. On the other hand, for the construction industry, the challenges are lack of awareness, dominance of unorganised sector in demolition, lack of confidence in recycled product and concerns about the economic viability of the recycled products.

Roadmap for Angul: While sharing ideas about creating a roadmap for Angul, Dr Banerjee suggested moving ahead with a cluster approach with 2-3 nearby towns. The use of mobile crushers to achieve recycling of construction waste. This recycled aggregates can be used in public works. He proposed the district administration to incentivise local building manufacturers to use recycled material. Dr Banerjee in his presentation discussed the priority steps for setting a C&D waste management plan:

- Identification of generation location
- Identification of existing dumpsites
- Identification of suitable dumpsites
- Assess volumes to determine crushing equipment/ business plan
- Incentivise SMEs for recycled product manufacture
- Assess government product needs and create a buyback policy

The Regional Officer for Pollution Control Board, Angul asked if there are any frameworks or technological solutions for integrating construction and demolition waste management systems into government frameworks so that the operations go seamlessly.

Mr Abhijit replied that the government can collaborate with private institutions and can play a regulatory role while the operations are implemented by the hired agency. The contractor can be paid on the basis of the materials collected. Paying the contractor initially acts as incentives to the agencies to start practicing construction and demolition waste management systems.

Mr Subhasis asked if there are any models available where the construction and demolition waste can be utilised in new construction?

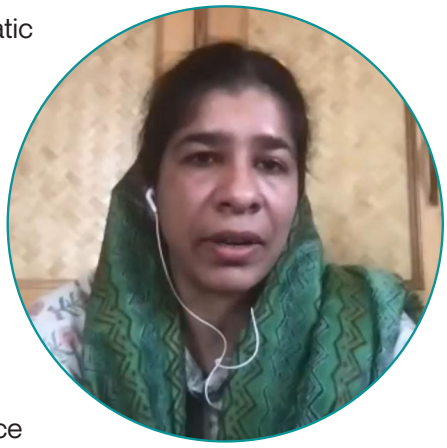
Mr Abhijit replied that initially if the municipality and PWD starts buying the construction and demolition waste materials, it will create a demand for the products and more agencies will start practicing it. It will also boost the confidence as this will show that the government trusts the waste material products.

Mr Subhasis also asked if schemes like MGNREGA and Urban Waste Employment Initiatives can be utilised in C&D Waste management.

Mr Abhijit replied positively saying that in terms of collection and transport, a lot of labour can be employed through the schemes but more capital will be required for the crushing unit.

Liquid Wastewater Management

Dr Mahreen Matto, Programme Manager, Sanitation Capacity Building Platform, National Institute of Urban Affairs (NIUA)



Dr Mahreen Matto presented the last topic for the thematic session i.e., Liquid Wastewater Management. Talking about wastewaters, she explained that wastewaters are not accounted for in many cities and most cities have no idea how to clean rivers. 80% of water leaves home as sewage. 10 states in our country do not treat their sewage at all. Wastewater is gaining momentum as a reliable alternative source of water. There is a Paradigm shift from 'use and throw' towards 'use, treat and reuse' approach following the principles of a circular economy that is minimal resource consumption and focus on resource recovery.

She said that treated water can be reused for agriculture, landscaping, and other urban use like street washing, fire protection, air conditioner cooling, car washing etc. and environmental and recreational purposes.It can also be used for industrial application, domestic and commercial use, direct or potable use and groundwater recharge.

She provided examples like Haryana, Delhi, Chennai, Hyderabad, Bangalore, Surat, Nagpur and Vishakhapatnam where treated wastewater is used as a resource.

While discussing the government interventions, she said that at the national level, there are several missions like Jal Jeevan Mission, Swachh Bharat Mission and 15th Finance Commission which talk about reuse of wastewater and decentralisation of wastewater.Emphasis should also be laid on Nature based Technologies like constructed wetlands, green bridge, bio-sanitizers, bio-remediation etc. as they are cost effective solutions. She explained to the participants the characteristics of decentralised wastewater management system:

- Cut or reduce the length of pipelines
- Requires basic skills to operate and maintain
- Reduces carbon footprint
- Safe reuse of treated wastewater
- Cost-efficient
- Meets the wastewater standards
- Follows circular economy
- Doesn't cause any nuisance
- Site-specific and flexible

As case studies of good practices, she shared the example of Indian Agriculture Recourse Institute, Pusa, New Delhi, Aravind Eye Hospital,Delhi Jal Board Head Office, Rajokri water body and Lodhi Garden.

Prof Abhijit Banerji also shared the example of wastewater management in Auroville in Tamil Nadu and Puducherry and in ICRISAT institute in Telangana which has also replicated their model in nearby villages.

Mr Pratap Ekka from the fisheries department mentioned that there are technology which can use the faecal matter from fishes in ponds as manure for agriculture products but asked how far will the society accept that?

Dr Mahreen replied that there is always an inhibition in public mind so there is a need for changing the mind set of people and drive them towards such initiatives.

Sharing an example from Angul District, it was mentioned that waste water was used in cleaning of roads and it is also being used in pisciculture.

Representative from Watershed Management asked whether the waste water will pollute the soil or not?

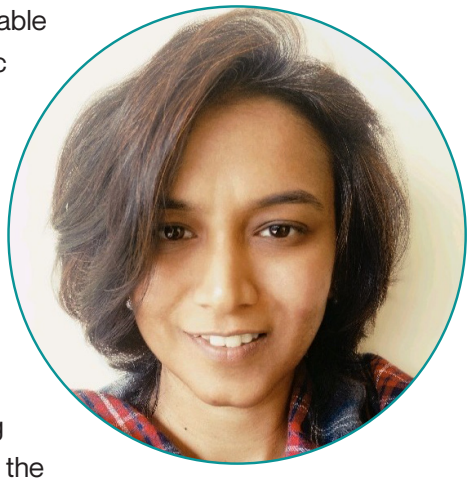
Dr Mahreen replied that if the water is treated and tested before use, it will not pollute the soil.

A worksheet was discussed by Ms Manisha Chaudhary to be used by Line Departments to brainstorm ideas, priorities and gaps present in their strategies and systems for implementing circular economy and the green economy at the district level.

THEMATIC SESSION:

Sustainable Public Procurement

Ms Nidhi Gupta, Senior Program Lead, Environmental Design Solutions



Ms Nidhi Gupta started her presentation on Sustainable Public Procurement by explaining the concept. Public procurement is everything that the government buys and sustainable public procurement is an amalgamation of public procurement and sustainability.

Public procurement wields enormous purchasing power accounting for approximately 25% of India's GDP. She explained that leveraging this public purchasing power by promoting sustainable public procurement policies play a key role in achieving sustainable consumption and production which is also the SDG 12. It also promotes SMEs and sets standards for the private sector.Sharing the example of an air conditioner, she discussed the key environmental impacts of an AC, which are pollution, GHG emissions, leakage of refrigerants, generations of waste material

and refrigerant disposal etc. A sustainable public procurement approach can address these challenges. In addition to the normal procurement steps that is, defining criteria, floating tender and technical evaluation, the sustainable procurement process includes two more steps:

- Evaluation for meeting the sustainable procurement criteria
- Life cycle assessment

The last step in evaluation of the cost which includes additional costs like maintenance, depreciation, recycling value etc.

She said that sustainable procurement can also be used for rural housing programs making it a green program adding alternate construction material, energy efficient appliances, renewable energy integration, and waste water management in the tender process. Ministry of Rural Development now has a draft of green criteria. Green housing can be defined as a house that has low energy impact during construction, optimizes the use of natural resources, is structurally safe, disaster resilient and less vulnerable and creates comfortable and healthy environment.

While sharing another example of the Lucknow Development Authority under the urban sector of PMAY-U. Lucknow Development Authority has come up with a Vision and Roadmap for Green and Energy Efficient Buildings. Any building coming under the purview of Lucknow Development Authority will now have to meet the standards set for green buildings. Even railways is looking into green and net zero energy buildings and they have a vision now for de-carbonisation and are opting to be net zero carbon emitter by 2030.

While discussing the roadmap for Angul district, Ms Gupta made following recommendations:

- Setting a vision and target for the district
- Prioritization products/equipment's/services tendered
- Identification of sustainable criteria.
- Identification of tender evaluation method
- Incorporation of the process into tender and compliance with evaluation and monitoring.

Mr Subhasis asked if there is any case study or an example which Angul district can follow to integrate sustainability into their public procurement systems.

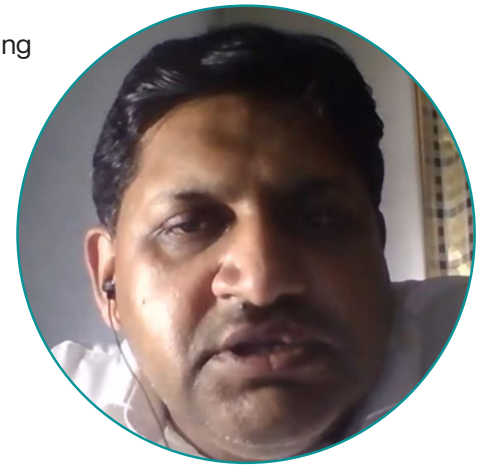
Ms Nidhi mentioned the three case studies she presented and suggested that Angul can start with identifying public procurement avenues in the district and certain sustainable and green practices could be added in the tenders.

Prof Abhijit mentioned that the energy dimensions is easy to measure using a single matrix but there are certain externalities for any product like use of toxic chemicals, de-forestation, etc. Ms Nidhi replied that calculation of energy is just one of the quantitative aspects to measure the sustainability of the public procurement system. Other aspects are use of restrict narratives like having a 'buy-back' clause, maintenance, use of green material, use of recycled material etc.

THEMATIC SESSION:

Environmental, Social and Governance (ESG) Reporting

Mr Shikhar Jain, Principal Counsellor, CII-ITC Centre for Excellence for Sustainable Development



Mr Shikhar Jain in his presentation titled ESG reporting said that in contemporary times, before investing in a project, investors look at the ESG reports. In ESG, environment refers to a company's interaction with the environment and ecosystem, social refers to a company's practices that have a social impact on the stakeholders while governance relates to factors of how a company is governed. A good ESG report can ensure increased investments. ESG matrix maps the performance of the companies through the following key matrices:

- In the environment, they look at carbon emission, pollution and waste, land use and biodiversity. More restorations of the environment will lead to a better score for the district.
- In social consideration is given to the human capital- literacy, number of start-ups, employment rates, labour standards, indigenous communities etc.
- Governance relates to business ethics- procedures, anti-corruption, open etc.
- ESG can help districts gather more financial resources through open markets, foreign banks, international funding agencies etc.

ESG matrices have now been followed all around the world by many investors to choose their investment avenues. ESG is required for an inclusive and sustainable growth. Many ESG funds have been now available in the last 15 years to companies in India which has increased the number of investments in India. The cities, companies, district administration etc. can display their ESG status to companies and investors to gather external finances. ESG regulations are also increasing. SEBI has recently launched the Business Responsibility and Sustainability Reporting (BRSR) matrix. Smart City Indore is one of the smart cities that displays its ESG score.

Dr Anup Mallick, Regional Officer with State Pollution Control Board asked about the difference between sustainability and ESG,

While responding, Mr Shikhar Jain said that sustainability is a triple line approach whereas ESG also address three aspects- environment, economic and social but key difference is that ESG is usefulfrom investors' point of view while sustainability is more of voluntary practices.

Another participant ask about if there are any ESG rating agencies?

Mr Jain replied that there are agencies like Dow Jones Sustainability Index and many Indian companies like CRISIL will also start ESG rating.

Dr Niladri Gantayet asked that no presentation in the last two days have discussed about the life cycle risks, so how would you factor in the life cycle risk of ESG?

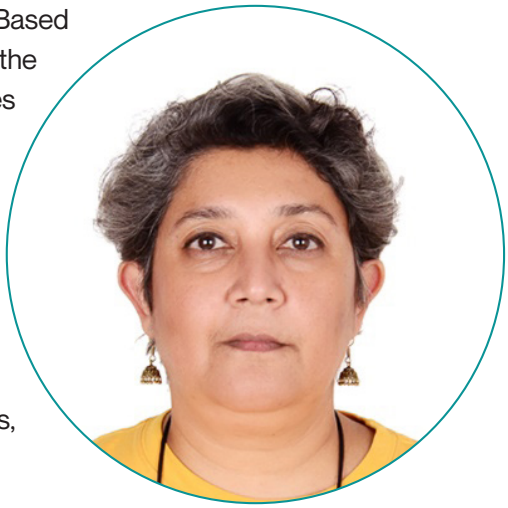
Mr Jain replied that the complete practice of ESG says that any investment done in the city looks into if the sustainability, recyclability, reuse etc. can be promoted in the local context. In ESG, indicators like how the operations take place and usage of tools like life cycle assessment can be factored in while giving the rating.

THEMATIC SESSION:

Circularity in Infrastructure and Textiles

Landscape Based Approach in Green Infrastructure

Ms Zeenat Niazi, Vice President, Development Alternatives Group



Ms Zeenat Niazi while explaining the 'Landscape Based Approach in Green Infrastructure' shared with the participants how the construction sector contributes 22% of Green House Gas (GHG) emission. 350 million tonnes of topsoil, that is the agriculture soil is lost annually due to brick making. 32% of India's population lives in urban areas, this is projected to become 50% by 2050. As the demand for construction material will only increase in future, resource circularity should be looked at in conjunction with other aspects for sustainability like the aims, objective, outcomes, implication and responsibility.

She shared an example of New York City which chose Nature Based Solution over infrastructure solution for addressing their water needs. The infrastructure solution would have cost them 6.5 billion dollars three decades back while the NBS cost them 0.7 Billion dollars. The water supply system comprised of 19 reservoirs and three controlled lakes and was spread over an area of 2000 square-milewatershed. The watershed is known as Catskill Watershed.

While discussing green and circular economy in the local context, she emphasised on taking into consideration the diversity in cultures, materials and geo-climate contexts; decentralised and distributed nature and rural settlements; disparity in quality of life and necessitating increased consumption; demand for jobs and avenues for economic development and demography of young but not skilled/educated youth. Making a responsible choice will include culture and climate costs along with energy and material footprint and generating avenues for jobs. Imperatives for sustainability and green growth include the following:

- Cleaner and circular production and consumption- environmentally sound, energy efficient, resource efficient
- Augmentation of supply- more production, diversity of options
- Improved access- affordable options, better delivery, greater know-how
- Increased affordability- rural economy, demand creation, financial options
- Increased local value creation and retention- local production, jobs, local construction services

She explained how there are now new resources that can be used in construction like fly ash, pond ash, red mud, furnace slag, marble dust, secondary timber and bamboo, construction debris etc. She shared the example of Kishangarh where 15 feet deep marble dust is just spread across fields waiting to be reused. There is 716 million tonnes of C&D waste across the country. So there is a lot of potential in construction sector to reuse materials.The potential driving the design of circular models include saving in capitals cost, saving in operational costs, reduced environmental impact, new economy streams (businesses), and new green jobs and skills. She shared examples from Punjab, Pondicherry, Bundelkhand and Uttarakhand where more than 10000 rural building that have been constructed over the last few decades. These buildings have through using different techniques, material and technology, have a 30% less carbon footprint, 20-30% less material footprint and 60-70% more money into the local economy than conventional method of building.

Sharing some good practices, she highlighted the mandatory use of fly ash in government buildings and trainings been provided to the informal sector for generating good quality fly ash. She informed the participants about LC3 cement that has been introduced as a greener option than normal cement. Further good practices include banning of movable chimney brick kilns, social housing linked to green technology and material, technical improvement in production systems and scaling up of operations, provision of skilled services, industry collaborations to set up decentralised green buildings centre, demonstration of pioneering building, consumer awareness for green buildings and financing linked supply of technical services and green materials.

While discussing the challenges in mainstreaming the green material, Ms Niazi shared that despite architects and designers asking for new alternate material, there are not many alternatives specified in the State schedule of rates, nor are there many suppliers of the alternate material. She also cited lack of enough.The market potential and price point comparison of new material is favourable, however financing for entrepreneurs is difficult. This is further impacted by lesser technological solutions and poor supply chains. In her presentation, she explained how despite having direct impact on resource and energy, alternate material are not preferred due to lack of information on CBA, LCA and materials, lack of mapping and inadequate quantification of secondary resources along with policy and programme silos.

Her recommendations for creating roadmap for Angul district included:

- Land and infrastructure support to SMEs.
- Aggregation services that enable developers to access green materials at scale.
- Industry partnerships and investments.

- Training of contractors, artisans and engineers with the provision of a certificate of skills.
- Consumer finance is incentivising the use of green material.
- Setting a supply chain for the materials.
- Markets for green materials

She shared the following examples of MaS-SHIP - Mainstreaming Social Housing in India: A research project of the UNEP's One Planet Network. The MaS-Ship includes 18 attributes of sustainability that measures the performance of established and emerging building systems; an update data base on sustainability assessment tools and methods; a dynamic updating of mapping; catalogue of 17 assessed technologies, design guidelines for housing development and policy recommendations. It provides an assessment method that can be replicated in other countries like Asia, Africa and Latin America. MaS- SHIP was tested in a rural situation (Uttarkashi) where the following risks were identified:

- Technical: Risk of multiple disasters poses severe threat to people and built environment
- Environmental: Increase dependence on high energy materials and transport from far-away plain regions
- Economic: High component of non-local construction materials undermines contribution to the local economy
- Social: Lack of opportunities for skill development among women

Proposed solutions were as follows:

- Technical: Trained local masons in disaster resilient construction techniques
- Environmental: Value add to local resources, low-carbon-resource efficient, building material & technologies
- Economic: Local enterprises setup to produce and supply green building materials & construction services.
- Social: Women empowerment through skill development, local skill base up-gradation.

She also shared the example of Bundelkhand where green infrastructure like watershed has been implemented through community participation using MGNREGA funds leading to green water supply infrastructure where water is pumped through solar system and water is filtered through green solution.

She ended her presentation saying that district administration needs to be proactive in using green material in public infrastructure like schools, secretariat, hospitals etc. to increase demand for the material and also to set an example.

Mr Mohapatra asked if there is a need to revise construction regulations.

Ms Niazi replied that there is a need to revise the guidelines and regulations such that they become a part of approval process. The government has been recommended to have a building demolition plan along with construction plan. The data of green material used, recycling done, virgin material used etc. should be a part of the approval process.

Circularity in Textiles- Concept and Best Practices

Somatish Banerji, Associate Vice President - Business Consulting & Research, Intellecap Advisory Services Pvt. Ltd.

Mr Somatish Banerji presented the second topic of the thematic session that is, Circularity in Textiles- Concepts and Best Practices. He informed the participants that the textile and apparel industry is 2nd largest polluter globally. 20% of industrial water pollution is due to the textile industry while 80% of textile waste generated from the textile industry is not recycled. Because of 'Fast Fashion', 60% more clothing with shorter life cycles is being purchased today. This has made the textile and apparel industry contribute 8.1% of global climate pollution. Along with the problem, there exists an opportunity in the sector specifically in the Indian context as the Indian apparel market is predicted to become the world's largest because of the increased purchasing power of the burgeoning middle-class and a growing market. The transition to a circular economy could unlock not only economic, but also positive social and environmental impact.

He urged the participants to look at this industry through four circular economy lenses:

- Resource Efficiency - Material (raw material, fibre, chemical, dyes, etc.), water and energy efficiency. Sharing a simple example, she shared that a normal cotton t-shirt consumes 7000 litres of water throughout the value chain. Thereby, fibres from natural sources like hemp, banana fibre etc. can be utilized as alternatives to cotton. Similarly vegan dyes can be used instead if chemical dyes. Also the water that comes out of the apparel industry should be treated and reused.
- Reducing waste - Pre and post-production waste and post-consumer waste should be reduced. Up to 30% of wastage happens during these 3 stages which can be reduced through use of greener and biodegradable material.
- Reclaiming value for waste aggregation and segregation, recycling and up-cycling. Segregation of the waste is important as the waste is not homogenous. Once the waste has been segregated, there are a lot of opportunities to recycle and the non-recyclable waste can be up-cycled.
- Social Inclusion- green jobs, gender equality, formalisation of the informal workforce. 45 million people are directly or indirectly employed in the apparel sector and 80% of them are women. With the advent of technologies, many of these jobs will be redundant. There is a need to form new form of jobs in the apparel sector which can look into sustainability and greener production and post-production cycle. Since majority of the employed force in women, there is a need to look at the future of apparel industry from a gender lens.

Some Circular Economy solutions emerging across the textile industry in India are in the Yarn and Fibre, Alternate Materials, Water/Energy Efficiency, Traceability and Supply chain, Packaging Material and Systems, Retail models, Up-cycling and Social Impact. Based on his experience, Mr Banerji put forth the idea that a circular economy cannot happen in silos but requires inputs and collaboration of different sectors and stakeholders and Angul district will need to adopt a holistic approach towards a circular textile industry. Some of the mentioned considerations were:

- Use of alternate material- promotion of new and recycled material in manufacturing
- Waste reduction by design and promotion of life extension of garments
- Waste management
- Water efficiency through reduced consumption and recycling of waste water
- Energy efficiency through reduced energy consumption and adoption of renewable energy

THEMATIC SESSION:

Sustainable Development Goals

Localisation of SDGs – District level experience

Ms Supriya Khound, Project Coordinator - Green Growth & SDGs, UNDP India

Presentation on the last thematic session for the day on Sustainable Development Goals was given by Ms Supriya Khound. Giving a background on the SDGs, she informed the audience that 17 SDGs were adopted in 2015 to address several social, economic and environmental challenges for sustainable development. In India, NITI Ayog along with MOSPI is overseeing the progress of the country towards achieving these SDGs. At the sub-national level, states have come up with vision documents with short and long term strategies. They have mapped their budgets and finances. They have developed monitoring frameworks to track performances at district level. She recommended that the localisation of SDGs should consider the following aspects:

- Inclusion
- Building capacities
- Whole-of- society approach
- Identification of priorities
- Creation of knowledge

Localisation of SDGs, she said, is important for ensuring participatory planning with inputs from different stakeholders that will lead to locally appropriate SDG action. It is important for SDGs centric implementation and investments. It will ensure availability of data sources at local level. Most importantly, it will ensure accountability.

Sharing some best practices from different states, she informed the participants how the north Indian state, Uttarakhand has implemented a local dashboard for indicator framework and monthly monitoring framework. Karnataka, she said, is using SDG community broadcast to reach out to the communities for innovation challenge while Punjab has linked SDGs with Gram Panchayat Development Plans. In Haryana, SDGs are mapped through district priorities and what are the gaps and where the partnerships are required. In Punjab, there has been another localisation awards where citizens were awarded for recognition of their work. SDG4Youth is a program by Karnataka government to encourage the youth to participate in fulfilment of SGDs, to spread awareness of SDGs, to promote entrepreneurial mind set,

To encourage youth to be self-reliant and to understand the challenges and come up with solutions.

She emphasised on the need of integrating SDGs into planning process of the district. While designing the thematic approach, work of other department needs to be considered. She also said that using SDGs as indicators, strong timelines should be created and for tracking progress of any intervention, strong monitoring systems are required. She also suggested that there is need to expand SDGS to block and village level. There is a need for capacity building and training exercises and a simplified method where information can be disseminated to people without using heavy jargons.

Mr Subhasis Samal started the session welcoming Shri Atul Bagai, Shri Siddharth Shankar Swain, IAS, all the panellists and speakers. The panelists for today include representatives from the line department, representatives from industries and also representatives from MSME. This is the final day of consultations which will eventually be followed by an action plan document.

Mr Atul Bagai while setting the context for this concluding day, emphasised the importance of the workshop and the role played by the district administration in organising it. The workshop highlighted the concrete issues on ground and the way they can they be addressed. The third day of the workshop is to chalk out the way forward towards a long term goal of making the district circular.

Shri Siddharth Shankar Swain, IAS, thanked UNEP and Mr Atul Bagai for their support. Accomplishing the vision is a long term commitment which can be achieved through proper guidance and support.The objective of the session held on third day is to find gaps in the process and come up with practical actionable ideas

On the third day of the workshop, several presentations were made by stakeholders on sectoral priorities, challenges and opportunities for circular and green economic growth in Angul district.

Presentation: Circular Economy and Resource Efficiency

Mr Gagan Bihari Nayak, General Manager of DIC, Angul

The first presentation of the day was by Mr Gagan Bihari Nayak from DIC, which is a promotional office under the MSME department without any strong regulation. It is a first referral unit for sorting issues like vendor development for large industries, access to strategic resources and difficulties in implementing IPR etc. Sharing the background of DIC, he said that it is working towards development, skill development, training for traditional industry, facilitating loans, raw material and marketing assistance to MSMEs. The gaps the sector has realised to implement circular economy are lack of technical capacity and training facilities, limited human resources, lack of data and limited financial capacity.

He shared the challenges DIC will face while implementing the actionable plans for circular economy:

- Shifting to self-regulation through MSME association
- Regulating primary and secondary resources without adequate authority
- Developing an eco-system of business development service providers
- Lack of financial authority

To overcome these challenges, he explained that DIC requires training in LCA, risk and sustainability assessment tools, skilling and green jobs, ESG reporting, sustainable public procurement, circularity in agro-food processing sectors and mineral-based industrial sector.

While sharing the best practices of DIC, he informed the audience that they have been using fly ash bricks in the construction along with the formalization of the informal sector. The following suggestions were given by the speaker:

- The utilisation of capacities to increase awareness about the Circular Economy (CE)
- DIC need superintendence over a start-up eco-system
- DIC can be a registered dealer in Carbon Credits to develop expertise for future markets
- DIC in collaboration with Industry Associations can host a Livelihood business incubator oriented to CE

Presentation: Role of MSMEs in Integrating Circular Economy Principles

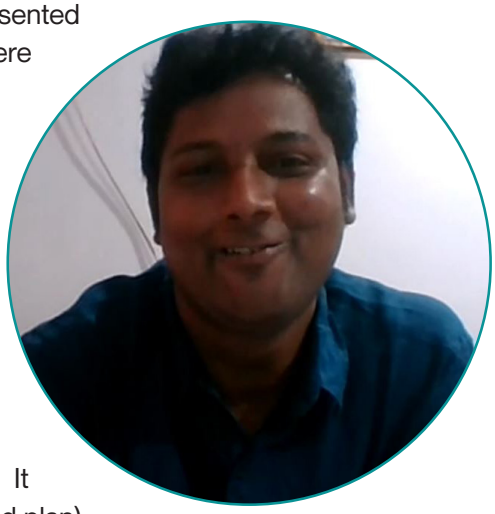
Mr Subhash Chandra Pradhan, President, District Industrial Association

The second presentation was given by Mr Subhash Chandra Pradhan, who shared how MSME can contribute towards achieving Circular Economy. The general idea he presented focused on the long-term role MSMEs can play in different industries. For example, in agriculture sector, MSMEs can manufacture all equipment and take responsibility for their maintenance. In the mining sector, MSME can help in maintenance. In tourism industry, it can help in providing park facilities, drinking water facilities and development of the tourist places. It can help in the production of fly ash bricks, solar panels, jute bags, paper bags etc. MSMEs can also help in the development of livelihood opportunities. It can manufacture materials, equipment, furniture etc. for different industries.

Gaps identified to implement Circular Economy included the need of good training sector, the appointment of trainers, entrepreneurship development, organising skill development programmes for labour, exposure to different organisations, upgraded machinery, availability of raw materials, supply chain management, the establishment of common facility centres, marketing facilities, limited capacities and limited human resources. While talking about the challenges, he said that there is no strong support from the government towards marketing, no favour to MSMEs and high rates of interest.

Presentation: Circular Economy Approach For Rural Development and Strengthening Rural Livelihood

Mr Shyamal Kumar Ray, Block Development Officer (BDO), Kishorenagar Block



BDO, Kishorenagar block, Mr Shyamal Kumar Ray, presented the next presentation in which he mentioned that there is a relationship between rural development, rural livelihood and natural resources. One of the pitfalls of linear economy is in equal wealth distribution. Circular Economy ensures sustainability and equity in use. Local natural resources can be used in a manner which ensures local livelihood and prevents migration. Circular Economy approach is vaguely mentioned in schemes like MGNREGA under Integrated Natural Resource Management (INRM). He suggested that Circular Economy must use a people-centric implementation approach. It should begin with a need assessment (micro-livelihood plan) followed by plans for asset development. Need assessment has to be people centric involving participation of every household with special focus on vulnerable groups. Livelihood diversification is an integral part of Circular Economy. If practiced through MGNREGA, Circular economy also leads to asset development- land, water, livestock etc. and community asset development.

Some examples of INRM include setting Nutrition gardens, vermi-composting, water conservation techniques like ditches and ponds, check dams etc. The indicators of sustainable economy include sustainable livelihood, optimum and sustainable use of common property resources (CPR), enhanced local livelihood opportunities, soil and water conservation etc. Circular Economy practices have also been followed under the Swachh Bharat Mission and Rural Housing Mission. The organic waste coming out of twin pits can be used as organic manure in farming in the Swatchh Bharat mission whereas fly ash brick are being used in the Rural Housing Mission.

THEMATIC SESSION

Food and Agriculture

Circularity in Food and Agriculture Sector

Dr Sanjay Pradhan, Lead- Affirmative Action, National Skill Development Corporation, NSDC

The next presentation was given by Dr Sanjay Pradhan on Circularity in Food and Agriculture Sector, a thematic session that was left out during the 2-day session. He started with a discussion on one of the most pressing issues of the country – Poverty. He said that poverty in India is highest among Scheduled Tribes and Scheduled Casts, 43% and 29% respectively. 30% of Indian population earn less than 2 dollars a day. Odisha's population comprise of 23% schedule tribe and 17% as Schedule Caste. Despite the government efforts along with NGOs and others, there has been a small change. He discussed the case study of Thuamul Rampur Block in Kalahandi District in Odisha. The vision of the program was to co-create an 'Unemployment Free' saturation model by generating employment opportunities for 100% households in backward regions. It aimed at shifting the below poverty line to above poverty line through improving of livelihoods and to ensure that one member from each household generates an income of Rs 1 Lakh per annum. The approach which the organisations adopted was:

- Primary study for skill development and livelihood- a survey of youth, FGDs and interviews of local stakeholders.
- Feasibility Study- Market study for identification of products/enterprises based on demand and supply of the local area.
- Validation of enterprises- Consultation with experts, government, investors, world bank etc.

The key insights were that 90% of youth needed skill training, preferred trades were agriculture, agri-allied, hospitality and tourism, 68% of youth wanted to be self-employed where 88% needed financing and 58% required mentoring. This was followed by the product selection using a matrix and assigning weightage to different aspects, followed by implementation of the project which will require a generation of livelihood for local people and utilize waste in the local area. The product identified in the case study was meat which has a high demand but low production in state. The waste from production of maize and soya can be utilized as feed for the poultry leading to increase in quality and quantity of the poultry. Employment opportunities will be created which will enhance the local economy. The waste will be used and the quality product will be available at an affordable price. The waste from one sector can be utilized as a fuel in another sector. The whole intervention can be supervised by institutions.

He focussed on the need of collaboration between concerned departments, an integrated approach where people from different sectors like agriculture, animal husbandry, fisheries need to come together for a better CE.

Presentation: Circular Economy in the Veterinary Sector

Dr. Ranjeet Kumar Das, Chief District Veterinary Officer, Angul

Dr. Ranjeet Kumar Das, Chief District Veterinary Officer, Angul talked about the scope of Circular Economy in the veterinary sector. Odisha has more than 10 million cattle population and Angul has 3.7 lakh cattle populations and 2.35 lakhs of sheep and goat as per the 2019 census. The ruminants like sheep and goat release methane gas that contributes to global warming.

- He said that technology can be employed in breeding sector to produce cows of high quality. This will lead to decrease in the number of bulls leading to low methane production.
- The cow dung to be used in bio gas plants and the slurry to be used in fodder production and crop production as organic manure.
- Poultry farming is a good source of revenue. However slaughter houses need to be equipped to collect waste material that can be reused as feed and manure.

Presentation: Role of Financial Inclusion in Circular Economy

Ms Anubha Prasad, General Manager, SIDBI and Founder and CEO at Karekeba Ventures

She started her presentation addressing the SDG 12 that is, Sustainable Production and Consumption. India is the 3rd largest greenhouse gas emitter responsible for 6.9% of global emissions. 240 million people have no access to electricity. 315 million people are expected to live in cities by 2040, increasing the carbon footprint. Certain sectors that have a lot of potential in

sustainability are Agriculture, Energy, Transportation and Pollution Control. There is a 25.8 trillion INR credit gap in MSME with maximum gap i.e., 65% in small enterprises. The gap is shared equally between manufacturing and services. Across geographies, the low income states, North East States and rest of the country contributes 23%, 1% and 76% to credit gap respectively.

She said that Circular Economy investment can be done in retrofitting and replacements. The reasons for the low uptake of Circular Economy projects despite high investment potential are:

- Lack of business case for CE projects translated into improved bottom lines
- No real cash generated from CE projects
- Generally, assets are not available as security or may not have a resale value
- Technical incompetency due to lack of training
- Low awareness amongst MSME unit owners
- Lack of securitization as they require need of guarantee apart from collateral
- Lack of sector friendly financing
- Lack of training of bankers/financial institutions
- No incentives for FIs for green financing
- Lack of specialised institutions (e.g. TATA Cleantech Capital)

Sharing a few Policy and Fiscal Instruments for Circular Economy financing, section 32 of the Income Tax Act 1961 offers accelerated depreciation benefits (80% in first year) for a range of circular economy equipments such as:

- Specialized boilers and furnaces
- Instrumentation and monitoring sytems
- Cogeneration systems
- Electrical equipment (automatic voltage controllers, TOD energy meters, PF controllers for AC Motors)
- Energy efficient burners
- EE manufacturing devices (burners thin film evaporators, fluid drives and fluid couplings, glass manufacturing equipment, RE devices)

Similarly, municipalities are offering incentives for promoting green buildings in residential sectors like rebate in development fee and property taxes; government subsidy schemes on Solar Rooftop Plants and States, e.g. Haryana insisting on installation of solar rooftops in MSME units.

There are certain banks like SBI, Canara Bank, Bank of Baroda, SIDBI etc. which have financing schemes like concessional rate of interest, relaxation in Promoter's Contribution, Debt-Equity Ratio, Asset Coverage Ratio etc. and separate quicker dispensation. She shared examples of companies which are practicing circular economy:

- Hindustan Unilever Limited which has taken a pledge to reduce plastic content in packaging

- Coke is using fully recyclable PET bottles made partially from plants
- J&K agro is making carry bags out of potato and corn starch
- S. Café has created a method of transforming coffee grounds into wearable textiles
- Aqualonis converts fog into safe drinking water which can also be used in irrigation whereas LYSPACKAGING had made a vegan bottle from an all-natural bio-plastic.

Karekeba ventures is curating and incubating start-ups providing them access to world class mentors and seed assistance and provide handholding and strategic advice along with ongoing monitoring and nurturing and syndication services.

Shri Siddharth Shankar Swain, IAS, mentioned that the government investing a lot in MSMEs and focussing on financing SHGs through initiatives like mission SHAKTI, he asked how this can be used in the concept of SHGs.

Ms Anubha replied saying that more than 90% beneficiaries of micro-financing are women centric groups and the district can introduce sustainability in smaller establishments as their loan size will be less and therein they could practice sustainable activities.

Ms Zeenat Niazi asked what it takes for a District Government to offer a market for green products and what can be done on the purchase end?

Ms Anubha replied that public procurement can play a large role as MSMEs are given preference in procurement and procurement can be a good driver to create a markets for green products. Marketing is a major part for selling a product and if the marketing is assured after government becomes a buyer then a major challenge is addressed. There can be incentives provided to improve the market and increase the usage of green products.

Presentation: Environment Management

Dr A.K. Mallick, Environment Scientist-cum-Regional Officer at State Pollution Control Board (SPCB), Angul

The next presentation covered the issue of Environment Management in Angul-Talcher Area and was presented by Dr A.K. Mallick. Giving a background of the presence of industries and mines, he informed the participants that there are total 477 number of industries and mines in and around this region. Four manual ambient and one continuous ambient air monitoring systems have been established. The board monitors surface water quality at 24 locations under National Water Monitoring program.

Major industries in Angul are Nalco, NTPC, GMR Kamalanga, Jindal India Thermal Power Ltd, Anhul Energy Ltd, TATA Steel BSL Ltd, JSPL etc. and major coal mines are Bhubhneshwari OCP, Anata OCP, Jagannath Colliery, Lingaraj OCP, Bharatpur OCP, Balaram OCP all of MCL and Utkal coal mines of NALCO.

Based on air quality, Angul is in the list of 102 cities that have been classified as non-attainment cities. He informed that following action plans are being implemented by the National Clean Action Programme (NCAP):

- Emission inventory and source apportionment study for Angul-Talcher by Automotive Research Association of India, Pune.
- Installation of three CAAQMS in Angul
- Daily air quality public information dissemination system
- Implementation of solar rooftop policy
- Improvement of Solid Waste Management
- Repairing and maintenance of roads, road diversion, fly over construction and widening of roads
- Cleaning of roads and dust suppression
- A complete ban on garbage and stubble burning
- Plantation and brick lining of roadside nullahs
- Development of electrical vehicles for public transport
- Provision of wind barriers along coal transport road
- Backfilling of mines'
- Installation of fixed sprinklers
- Use of raw coal banned
- Use of single-use plastic ban
- Vehicle washing system
- Coir matting for dump yards
- Covered sheds of hazards waste management
- Railway washing systems
- Surveillance systems

Future Initiatives

- Development of drainage network in municipal areas and installation of sewage treatment plant.
- Development of common bio-medical waste disposal facility
- Promotion of plastic waste recycling and processing units

Challenges faced

- River pollution due to the discharge of untreated waster

He ended the presentation by emphasising on the fact that as the state of Odisha is only 17% urbanised, there is a huge potential for integrating circular economy in urbanisation projects.

Presentation: Action Plan, Resource Efficiency and Circular Economy, Angul Municipality, Urban Local Bodies

Mr Girija Shankar Mallick, Executive Officer, Angul Municipality

The theme of the next presentation was Urban Local Bodies presented by the Mr Girija Shankar Mallick who began by giving a brief on Circular Economy and the philosophy behind it that is aimed at equitable opportunity for economic participant by optimum use of resources. The institutional framework for implementation of Circular Economy consists of designing a project at district level followed by implementation at ULB level and monitoring by third party consultant.

He said that there is a need for achieving Circular Economy in Angul because of rapid urbanisation, supply and price risk because of imbalances demand and supply, ecosystem degradation, consumer behaviour - consumer demanding greener products, and advancement in technology.

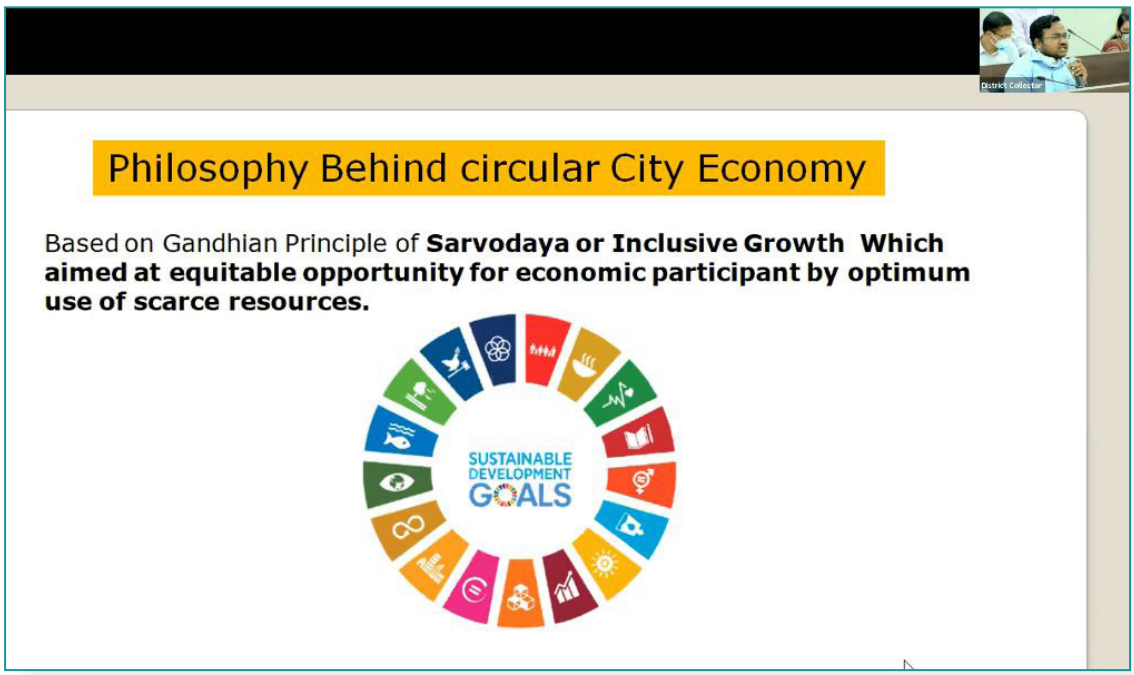
Discussing the scope of Circular Economy in Angul, he made following points:

- Channelizing used building material into making new buildings
- Water harvesting and reuse (through MUKTA scheme)
- Circularity through reduced energy use (its promotion and transition)
- Handling of electronic waste
- Organic waste including food through decentralised processing (through decentralised processing)

- Processing plastic waste
- Employment generation through Swachh Bharat Mission

There are certain barriers to circular economy which can be divided into four sub-categories- financial, social, technical and institutional:

- Financial- high transition cost, up-front investment, economic viability and recycling, product pricing
- Social- lack of awareness and sense of urgency, resistance to change
- Technical- designed to dispose, planned obsolesce, lack of merit to measure circularity
- Institutional- deep rooted linear mind set, complicated of inflexible regulatory structure, limited integrated action/leadership



The most prominent avenue of circular economy in urban area is waste management. Waste- liquid, solid, organic, can be reused in a number of ways in urban areas.

Shri Siddharth Shankar Swain, IAS, mentioned that the district has already taken steps to work towards circularity in plastic, food, textile etc. They are continuously working towards leveraging technology and scientifically based systems and by end of year will able to fully integrate the solid waste management system with technology. The district is also working on a pilot at ward level to develop an integrated complex where people at ward level can come and donate used material that can be reused and recycled.

Presentation: Watershed Management for Soil and Water Conservation

Mr Siba Prasad Padhy, Project Director - Watershed, Angul

The next presentation was given by Mr Siba Prasad Padhy, who spoke about the role of soil and water conservation in Circular Economy along with the department's vision in complying with the Circular Economy and sustainability.

He mentioned that there is a huge loss of water and soil every year mainly because of surface run-off of water. The main objective of their department is the conservation of soil, water storage, judicious use of water and groundwater recharge. The appropriate projects have been implemented based on treating and using the land as per its capacity. . He shared a video on the water conservation initiatives like dug wells, ponds etc. being implemented through the MGNREGA. Projects like farm ponds and dug wells have already been implemented in the district. 1311 farm ponds have been constructed in 8 blocks of Angul district in the last 2 years while 185 dug wells have also been built. 52 hectares of a watershed area has been constructed storing 1.5 million cubic litres of water.

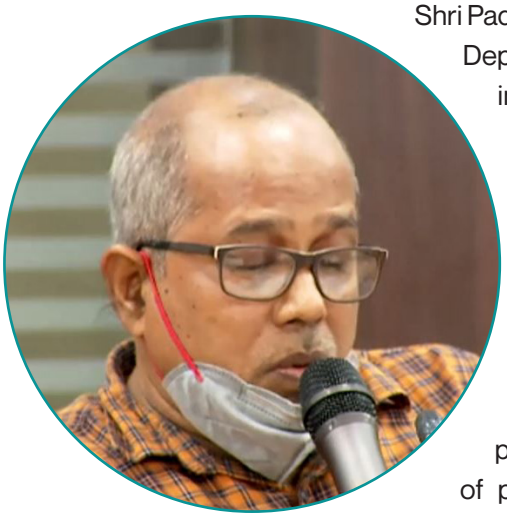
Under MGNREGA, employment amounting to 4.5 lakh person days have been generated because of these projects. This has led to the social-economic development of farmers especially women farmers. After the construction of water storage structures, farmers have been motivated to use integrated farming systems. These initiatives have been providing additional income to the farmers through increased productivity. Farm ponds have also led to an increase in pisciculture activities. This has led to a collaboration of different departments of the government to work towards rural developments.

In the coming years, there is a target to build 4500 farm ponds with the objective of saving 4-5 million cubic litres of water in 200 hectares of land along with the integration of the concept of circularity. Along with farm ponds and dug wells, the department is also conducting plantation drives planting cashew trees, lemon trees and more.

Mr Prasad Babu suggested that while implementing farm ponds and afforestation initiatives, monitoring of such initiatives is the key for their sustainability. He also suggested that since the district is conducting many plantation drives, it can also work on carbon credits.

Presentation: Organic Inputs for Integrating Circularity in Horticulture

Shri. Padmalochan Das, Deputy Director, Horticulture Department



Shri Padmalochan Das, Deputy Director from the Horticulture Department, in his presentation, emphasised the importance of judicious use of groundwater through micro-irrigation systems to minimise the wastage of water. Sharing the successful interventions, he informed that his department is providing subsidies from 60%-80% to farmers to implement such systems. The system also increases the yield of the farmers.

Similarly, the use of organic inputs like vermi-post, natural manure etc. which improve the quality of produce are being promoted through training and awareness. A lot of wastage from sugarcane and mushroom cultivation has been reused for composting. Fruit and vegetable production and honey bee production is promoted to increase livelihood opportunities. Farmer producer organisation will be set up to look after the marketing and sales of farmer produce. He informed that the department is also planning to convert the big farms and government parks into tourism destinations.

For the next 5 years, the focus will be on organic farming to increase the yield and also improve the quality. Organic farming will also lead to the demand for organic inputs which the district has a lot of potentials to produce. Organic farms have been identified where training can be imparted to the farmers through exposure visit. For protection of plants, alternate methods have been used under the Paramparagat Krishi Vikas Yojana where people have been educated. Under the Integrated Development in Agriculture, Angul is promoting the production of vermin composting. Availability of organic inputs is a challenge for the district as they are not produced here. The production in the district will therefore increase the scope of small scale industries.

The district also has a scope for the food processing industry. The challenge, however, is the limited human capacity especially the low number of women employees. He suggested that there should be a provision for using the fallow land i.e., agriculture land which is not used by farmers for years. These lands can be leased out for plantation practices to improve the green cover.

Presentation: Circular Economy in Pisciculture- Sewage Fed Aquaculture

Shri Pratap Ekka, Deputy Director, Fisheries Department

Shri Pratap Ekka presented the plan and vision of his department to integrate with Circular Economy. He informed the participants that the increased human-animal interaction in the district, where the farmers are prone to elephant attacks, has led to the destruction of their crops. Due to this, many have been shifting to pisciculture making it one of the upcoming sectors. In context of Circular Economy in pisciculture, he said that waste from one department can be used as wealth for others.

The sewage is full of organic content that can be used as fertilizers. It is important to manage sewage. Using sewage in pisciculture was first developed in Germany and independently practised in Kolkata in 1930. It is now being practised in many states in India. In the course of time, the area under sewage-fed fish culture has reached up to 12000 ha. Recently due to rapid urbanisation, this area has come down to 4000 ha. The pH level of sewage is 6.9-7.3. Sewage water can only be used after treatment. He discussed following three methods that can be used treat sewage making it suitable for pisciculture:

- Mechanical- screening, filtration, skimming and sedimentation
- Chemical- treating sewage through chemicals chlorine and ferric chloride can be used
- Biological- oxidation can be used to make water usable for pisciculture

Fishes like ClariusBatrachus, Heteropneustesfossalis, ChannaSpp, Tilapia Mossambicus and CtenopharyngodonIdella are the choice of species considered for culture. Tilapia has proved to be the most suited for culture in sewage irrigated ponds. Sewage can be used for pisciculture through sedimentation, dilution and storage. The use of sewage leads to the production of planktons in fish ponds which act as nutritious food for fishes eliminating the use of feed. Also, the mud in pisciculture ponds is filled with decomposed food materials and excreta of fishes which can be used in horticulture. The nitrogen in the soil can lead to nitrogen fixation improving the quality of the soil.

With bio-flock technology, pisciculture can now be practised by small landholders. This method uses sewage for pisciculture in a small area which eliminates the use of supplementary feeding, has high production with low input cost, is a biological method of treating waste, reduces pollution load, produces animal proteins and in addition these ponds can be used as water harvesting systems providing security and livelihoods.

Presentation: Integration of Circular Economy- Sustainable Mining in CIL

Mr Arun Kumar Swarnkar, General Manager, Jagannath Coal Mining Area, MCL

MCL is a major coal-producing company in India and is one of the 8 subsidiaries of Coal India Limited. Coal India is the world's largest coal producing industry. This year they are producing about 710 million tonnes of coal out of which 150 million tonnes will be produced by MCL. Coal industry contributed to 6% of the GDP. Being a major industrial player in the district, MCL is also responsible to work towards sustainability. The coal industry causes air, water and land pollution which is inevitable. Certain challenges of coal mining are:

- Coal is a site-specific product requiring the acquisition of a large area of land.
- Coal mining causes major disruption of surface, pit footprint, waste dumps, high visual impact etc.
- Open pits catch rain making them vulnerable to flooding
- Coal mining cause immense air pollution as well as water pollution in addition to groundwater depletion.
- Coal mining has a socio-economic impact on the population as it also causes migration.

He explained that for the integration of Circular Economy and sustainable mining, the following can be implemented:

- **Environmental Sustainability**
  - Decrease pollution while production
  - Biodiversity preservation
  - Sustainable use of resources
- **Socio-cultural sustainability**
  - Focussed social initiatives
  - Improving the education system and employee motivation development
  - Provision of drinking water and livelihood opportunities
  - Promoting sports
  - Women empowerment
- **Economic Sustainability**
  - Effective risk management
  - Improve product and service quality
  - Strong management systems
  - Technical development

He shared with the participants different initiatives taken by MCL in this direction:

- Air pollution control measures like truck/ trolley-mounted fog cannons, fixed sprinklers, mechanical sweepers, robotic nozzle, coal corridor, wheel wash system, plantation/ green belt and first-mile connectivity have been implemented.
- To sustain the environment, MCL has planted close to 6151000 trees since its inception covering an area of 2555 hectares of land.
- Continuous Water Quality Monitoring Systems have been installed in Brahmani and Ib rivers. The water quality data is sent in real-time to State Pollution Control Board
- 1611 hectares of land has been biologically reclaimed by plantation.

The way forward by the sector include vertical gardens and wind barriers, application of blast free technology, application of drones for monitoring and management of environmental activities and development of eco-parks, recreation centres, tourist spots etc.

Shri Siddharth Shankar Swain, IAS, congratulated MCL for all the activities they have been implementing to reduce their environmental impacts. They will also be starting green mining in the coming future which does not require blasting. The challenge of achieving circular economy in coal sector will be the change in livelihood opportunities because of sue of technology and sustainable interventions which will require skill development and training.

Presentation: Circular Economy and Resource Efficiency, NTPC- Talcher Kaniha

Mr SS Pradhan, Additional General Manager (AGM) and Mr Rafiqul Islam, AGM (HR-CSR), NTPC

In their presentation, representatives from NTPC, shared the 7 key focus areas of NTPC's - The Brighter Plan 2032. These are:

- Health and Safety
- Community Development
- Sustainable Supply Chain
- Circular Economy
- Water and Biodiversity Conservation
- Decarbonisation and Air Emission Control
- Strong Finance and Ethics

Discussing their contribution towards sustainable development, they informed that NTPC has also been disclosing its ESG reports since 2012. Few initiative take are bio mass co-firing, and hydropower complexes. For decarbonisation, NTPC is working towards:

- Fuel diversification- 7% of carbon free generation capacity, decommissioning of plants, no new green field thermal project,
- Efficiency improvement- Saved 1622 TJ of eq. heat and electrical energy, 95% of coal capacity under construction is super/ultra-super critical technology
- CCUS- MoU with ONGC for carbon capture and utilization, carbon sink development through plantation of 35 million trees till date
- R&D- Pilot project for 10 TPD CO2 Methanol plants, development of green ammonia and urea, offset through use of fly ash

With respect to SOx, NOx and PM emissions, the NTPC has to cut their emissions by 2023. DeNOx activities have been completed through the capital invest of 5.6 crores. NTPC is working towards SOx reduction through an investment of 14000 crores. NTPC is also actively involved in usage of fly ash, tree plantation, and community development in health, sanitation, education and water.

As far as Circular Economy is concerned, NTPC has been working on water conservation, resource conservation and energy conservation leading to surrendering of 15 cusecs of allotted water quota, saving of 24000MT/year of fine coal dust and saving approximately 15-20 MU of energy respectively. In its endeavour to contribute towards achieving Circular Economy, NTPC's future plans include:

- Ash Utilisation- use of fly ask in dyke raising, FAB manufacturing units, NHAI road projects
- STP waste eater management- Planned to use AFM technology to re-use 150m3/hr treated sewage water as CW make up thereby conserving water resources
- Waste management- Foodie machines for MSW reuse, composting, roper management
- FGD System- in addition to control SO2, the by-product of wet FGD system shall be sold to prospective users
- Waste to Energy- proposal for pilot project for use of terrified MSW and horticulture waste for waste to energy plant in under active constructions

Mr Bannerji from TATA BSL asked that since NTPC is using STP water in cooling plants, is the STP water being used as it is or is being treated before use.

Mr Pradhan said that the STP is being treated by using activated carbon filter and using Chlorine Dioxide.

Presentation: Environment Protection and Sustainability at Jindal Steel and Power LTD, Angul & Way Forward to Circular Economy

Mr Alok Sahu, Environmental Department, Jindal Steel and Power Limited (JSPL)

In his presentation, Mr Alok Sahu informed the participants that the world crude steel production has increased from 189 million tonnes in 1950 to 1878 million tonnes in 2020. India is the second largest producer of steel in the world. As steel can be recycled 9 times, it is an appropriate product for Circular Economy. Increased strength of steel can reduce its consumption, it can be reused, remanufactured as well as recycled. Steel production leads to 33% of by-products like slag, dust, process gases and other by-products all of which can be reused. Steel industry in India contributes to 2% of GDP employing 5 lakh people directly and 2.50 million indirectly. In FY20, the crude steel production stood at 108.5 million tons whereas expected steel production in FY21 is 128 million tonnes. JSPL promotes clean technology by using reusing coal ash, washing coal in washery, washery rejects and middling being used in power generation, walking beam furnace for the mill. The residual gases have been used by JSPL for power generation. Other technology used are dry quenching to be used in coke oven, direct use of hot slabs in rolling mills, direct use of hot DRI in the steel melting shop, heat recovery from all waste flue gas, sinter plant to use all solid waste as part of raw material and use of residual gases in furnace and for power generation.

By-products like tar, phenol, gasification oil, sulphur, benzol, ammonia etc. are used partly in-house or sold as raw material outside. Wastewater is treated and complete reused.

The Direct Reduced Ion (DRI) plant based on coal gasification process at JSPL has very low emissions as compared to conventional coal-based DRI plants. The plant does not generate any char solid waste like the conventional plants. The solid waste slag is used in road making and also used in railway tracks. Iron bearing dust is also collected and recycled.

In the Coke Oven, coke is used in blast furnace and sinter plant. The by-product has high calorific value and can be used for oven heating and in furnace of the plant. Waste water is treated with Bio TEP and is reused in the plant.

The Sinter Plant recycles all the solid waste material it does not generate any wastewater. The slag produced at a blast furnace at JSPL is used as raw material in a cement plant. The blast furnace gas is cleaned which can be used for stove heating. The ash generated in the power plant is reused in brick plants and brick manufacturing units as well as in road-making.

JSPL also use many air pollution control systems and energy recovery and reuse systems. In the JSPL Township, there are two sewage treatment plants. The treated water is used in green belts.

The electronic waste is given back to the seller under the buyback scheme. Waste is collected from the township and segregated manually and sold to recyclers. JSPL has done around 4 lakh plantation inside its premises and about 4 lakh plantation in surrounding areas. It has developed an in-house nursery and has raised about 1 lakh saplings for current year. In the way forward:

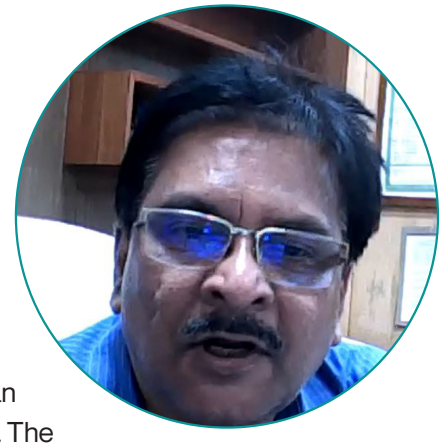
- Installation of iron ore slurry pipeline from Barbil iron ore mine area to JSPL, Angul
- Installation of coke dry quenching system at coke oven
- Utilization of ash
- Make alternate coal transport road corridor
- Further installation of covered conveyor belt for transportation of coal
- Low lying land development

Mr Subhasis asked the quantity and costing of the aggregated formed as opposed to natural aggregates.

The price of aggregated is equivalent to natural aggregates and the strength is also same. It can also be used in the structural part o f the building since it is less dense and puts less load on the foundation. The capacity produced is 2.5 lakh tonnes per annum.

Presentation: Circularity for Infrastructure Development

Shri Sudhanshu Ranjan Nayak, Executive Engineer, Roads and Building Division, Angul



The Executive Engineer, Roads and Building, Angul district informed the participants how his department is promoting sustainable development and adopting the concept of Circular Economy. The usage of fly ash in the construction of roads is one such example. It is, however, being used only in road construction around industrial areas and not in rural areas due to its high transportation cost.

He suggested that the procurement of earth should be done at the level of Gram Panchayat and the Sarpanch can be made responsible for finding the source of procurement. The procurement from individuals leads to non-accountability.

He mentioned that with technology, today plastic can be reused in road making. Road side plantation leads to environmental up gradation and livelihood generation. A matter of concern for the roads division is felling of trees required for road construction. He suggested that there is a need for a department that can work as a focal department where all the other departments can collaborate.

Presentation: Development Initiatives for Circular Economy- Practices and Opportunities

Ms Pushpa, Jindal Steel and Power Limited Foundation

On behalf of the JSPL Foundation, Ms Pushpa presented the foundation's contribution towards social development in areas around the plant.

She said that there are 37 villages in two blocks that are near the plant. Approximately 1.5 lakh households have benefited from the foundation's interventions. She informed the participants about the 11 core areas in which the foundation works which includes health and nutrition, drinking water and sanitation, education, skill development, sustainable livelihood and women empowerment, environment and agriculture/ entrepreneurship development programmes, youth development, rural infrastructure, social inclusion, arts and culture, calamity management. She said that these programs have been aligned with the 9 SDGs.

The CSR follows a triple bottom line approach working on 'People', 'Planet' and 'Profit':

- People- working on building social capital by development of health, education, skill building and community asset creation
- Planet- harmonizing environmental factors through energy management, natural resource management and environment conservation
- Profit- adding economic value through income generation and sustainable livelihood options

Some of the flagship projects run by the CSR are:

- Health- 'Kishori' express to address adolescent girls' anaemia
- Nutrition- Project SNEHA to address hunger and malnutrition of children of pre-school age and orphans
- Skill building- OP Jindal Community College
- Social Inclusion- Project 'ASHA the Hope' for children with special needs
- Livelihood- Integrated Livelihood centre (Jan Jeevika Kendra)
- Natural Resource Management- micro watershed project

The initiatives for need-based community assets use waste material from the steel plant. Fly has and blast furnace slag is used for constriction and cement respectively. Steel mining Shop slag is used for road construction. For natural resource management, through CSR, the foundation has

planted 225017 trees, renovated 39 community ponds, excavated and renovated 18 farm ponds, did soil conservation of 1365 hectares of land and integrated watershed management helping 1800 families.

In partnership with the Horticulture Department, 1200 farmers are now cultivating mushrooms, 607 farmers have been introduced to trellis, green shade net for nursery and raising of playhouse for vegetation cultivation to maximise land and water management, 60 farmers have been introduced to micro-irrigation systems and 607 farmers have been introduced to vermi-composting.

For managing waste, the paper used in the plants is recycled by SHGs and used as paper bags. vermi-composting is practised and cement bags are used for making ropes and shopping bags. Women have been engaged in income generation through CSR activities. The CSR advocates Eco friendly daily needs by promoting leaf cup making and pottery, replacing plastic bag with cotton or jute bags and promoting back yard nutri-gardens. For integrated livelihood under the Jan Jeevika, micro industries supporting women SHGs have been promoted. Value addition of locally grown fruits, vegetables and oilseed through production of herbal had made body care products aims towards achieving sustainable income generation of women empowerment.

Certain challenges faced by the CSR initiatives are issues related to common property resources, improper need analysis, skill transplantation, equity issues, peoples' participation, project approach, exit mechanism and prospect of replication and sale.

The way forward include creating successful models of Circular Economy, credible partnership and collaborations, replication of best practices, converting limitations into opportunities.

Presentation: Integrating Circular Economy Principles in Industrial Plants

Mr Sunil Kumar Rout, IB & MT, TATA BSL

The next presentation was given by representatives from Tata Steel BSL. Tata BSL is committed towards safety, health and environment. They are committed to 'Zero Harm'. 93% of the employees' health has been checked. The 'Mediclaim' Policy covers 100% of employees. They rolled out 'KAVACH' plan for Covid pandemic. 100% of fly ash is utilized and there has been an increase in the utilisation of LD slag from 32% in FY19 to 66% in FY21. The significant waste from the steel plant is blast furnace slag (43.20%), SMS & BOF slag (26.52%) and power plant waste (23.69%). The presentation highlighted the importance of the 3-R approach - Recover, Recycle and Reuse, which can be used for maximum solid waste utilization. Many bye products can be used internally. Fly ash - one of the key solid wastes, can be used sustainably in the cement industry, brick and walls, paver and roads, mortar industry and are also exported.

While discussing strategies to improve utilization of fly ash, they made following recommendations:

- Supply to cement manufacturers and brick and AAC makers
- Supply to paver blocks and roads and RMC and Mortar industry
- Sale to domestic and overseas customers

They said that Linz-Donawitz (LD) slag is one of the waste materials that can also be reused in many ways but it comes with the challenge of having hydrated free lime which makes it non-usable for road construction. The LD slag is processed on-site to remove all the metallic components from it which are then reused completely. For the first time in India, the LD sludge from the plant can be used in the making of pellets thereby facilitating the use of sludge which is a hazardous material. 16 lakh tones of LD slag has been processed. There is also a facility for atomisation of slag. The LD sludge can be utilized by conversion of sludge to pellets. Few more measures to control dust are use of mist cannons and sprinklers.

Presentation: Circularity Initiatives for Industrial Waste Management

Mr Sanjeev Kumar, General Manager, Environment & Safety CPT, NALCO

Representing NALCO, Mr Sanjeev Kumar, presented the work of his company that focussed on the environmental protection measures and the future plan of action for sustainable development.

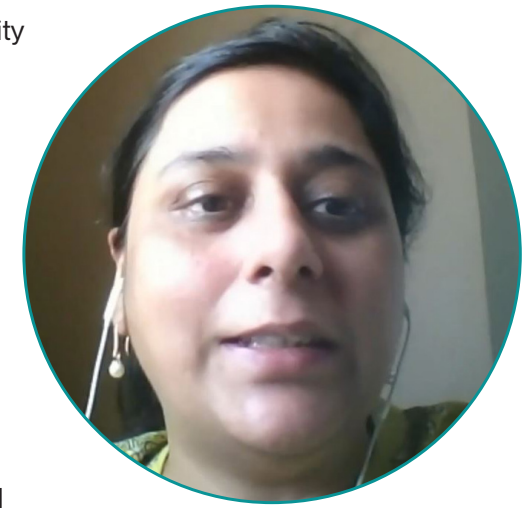
He informed that several measures have been taken to control air, water and land contamination in the area. For air pollutions, 99.9% efficient ESPs have been installed. Ammonia is injected to further improve the stack position for reduction of Sulphur Dioxide. NALCO is also working on substituting heavy fuel oil

For water pollution, they have achieved zero discharge, and are using rainwater harvesting systems, waste and sewage treatment systems for water conservation.

For solid waste management systems, they are targeting 100% utilization of ash which currently stands at 75%. NALCO has a buy-back system for the majority of its systems and the rest are given to authorised recyclers to control e-waste.CFCs have been replaced to prevent ozone depletion. Majority of appliances used by NALCO are 5-star emission rated. NALCO has also conducted huge plantation drives that is working as a carbon sink. NALCO is also tapping renewable sources of energy such as solar and wind power.

Way Forward

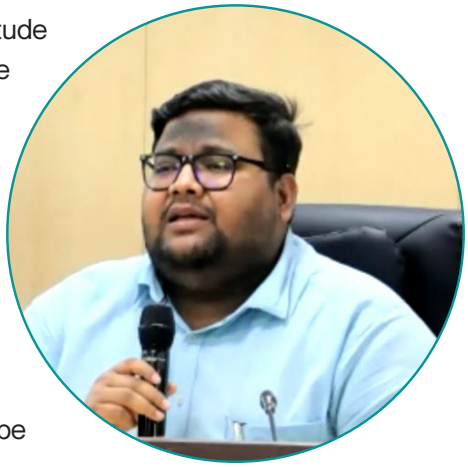
Ms Manisha Chaudhary, National Coordinator, Partnership for Action on Green Economy with the UNEP, India Office



- The workshop will be documented and priority areas will be identified after the consultations workshop.
- It will be followed by the identification of members/experts for a task force on Circular Economy
- After the consultations, further prioritization will be done based on primary and secondary research and interaction with stakeholders at the ground level.
- Technical agencies and experts will be identified to prepare sectoral road maps
- The structure of the road map will have the following broad points: sector-wise situation analysis, prioritization, challenges and opportunities, capacity needs, compilation of best practice, implementation and finance plan - log frame, detailed activities like timelines, responsible parties, finance avenues, institutional arrangements, key stakeholders, replication and scaling up plans, resource mobilization plan, monitoring and reporting etc.,
- Training and capacity building module
- Bi-monthly guest lecture/exposure visits

Concluding Remarks

Shri Siddharth Shankar Swain, IAS, District Magistrate, Angul



Shri Siddharth Shankar Swain, IAS, expressed his gratitude to all the panellists and participants from the line departments, industries, NGOs, CSOs etc. for being a part of the session. He thanked UNEP for the support and Ms Manisha and Mr Subhasis for organising the sessions. He mentioned that much more points will be added to the road map ahead after internal deliberations. The vision is long term and priority is making Angul a circular economy. A timeline will be created after documentation for execution of the vision in an organised and timely manner. Committees will be made at the district and ULB level.

Various stakeholders participated in this workshop highlighting the concept of Circular Economy, its need and challenges. Several presentations were made by representatives of various line departments and industries focussing on their sectors' experiences, gaps and the way ahead. The workshop is a step taken towards realisation of Angul District 'Vision 2030' to transform it into green district of the country. It will require continuous monitoring by district officials to achieve the targets and to propel the district towards Circular Economy.