Analysis of Circular Economy Practices in Beverages Industry: Case Study on Sula Vineyards Limited

Parul Nagar[1], Krity Malhotra[2]

[1]Professor-Finance, Indian School of Hospitality, Gurgaon, Email: parul.nagar@ish.edu.in
[2]Certified Sommelier, Head of Education, Tulleeho Portals Pvt. Ltd, Email: krity@tulleeho.com

Received: 29.08.2024 Revised : 16.09.2024 Accepted: 23.09.2024

ABSTRACT

Human development has led to increase in consumption, surge in material extraction and usage. The World Bank Report, 2022 titled 'Policies from Europe's Circular Economy Transition', states that by 2050, the demandis expected to double. Production of goods and services leads to nearly half of the global greenhouse emissions. Circular economy is a paradigm shift from the linear economy in which a product, component or material is made, used and finally disposed of with the underlying principle of sharing, renting and recycling. The material is not destroyed but used for making other products over and over again. To become a leading economic power, India is expected to increase growth of its manufacturing sector. According to the report, 'India's Tryst with Circular Economy' 2022, India has experienced an increase in material consumption by over 6 times from 1.18 billion tons to 7 billion tons between 1970-2015, which is expected to grow to 14.2 billion tons by 2030 with growth in both GDP and population. With increase in the growth of the economy, businesses would need to consciously adopt circular economy practices, innovate and apply them in all sectors of the economy so that the limited resources available are optimized. Circular Economy in the food and beverages industry aims to redesign the economy from a linear state to a circular one by using the waste of one plant as a fodder for the other. This brings higher economic benefits, reduces wastage of resources and detrimental environmental impact and helps to recover organic materials with nutrients. In addition, circular practicesresult in reduction of use of fossil fuels, better mineral and water usage, reduction of pollution, re-use of bio-waste, reduction of land-take and restoration of ecosystems, use of biodegradable and recyclable packaging. This study examines the circular economy business models adopted by Indian companies, identifies the Government and Industry initiatives that support adoption of circular economy in India. Further, it analyses circular practices in food and beverages industry with a comprehensive analysis of circular practices at Sula Vineyards Limited. Sula Vineyards is a member of IWCA where UN and its member wineries are committed to Net Zero Emission by 2050. The company is recognized for its contribution and growth in a responsible manner. The primary data and secondary data collected on circular economy practices at Sula Vineyards Limited has been analysed using descriptive statistics. The variables analysed include renewable energy generation, shift in pattern of consumption, water conservation, waste water management, utilization of by-products like carbon dioxide generated in the fermentation process as an inert gas, local procurement of bottles and recycling on site.The study evaluates the Government and Industry policies and circular economy framework using the PESTEL Analysis Framework. To analyse the circular practices at Sula Vineyards Limited the SWOC Analysis Framework has been used. The 5 different circular business models namely circular supplies, resource recovery, product life extension, sharing platforms and product as a service have been usedto understand the circular practices at Sula Vineyards Limited.

KeyWords: Circular Economy, Beverages Industry**,** Sula Vineyards Limited, Food and Beverages, Principles of Circular Economy.

INTRODUCTION

Human development with time has led to a rise in the material consumption per person. The hunters could survive with just 0.5-1 ton of per capita consumption per year, the agrarian societies with 3-6 tons per person consumption per year which has grown to 12.5 tons consumption per person per year. This increasing trend in consumption is leading to a further surge in material extraction and usage. By the year 2050, the demand is expected to double. Production of goods and services leads to nearly half of the global greenhouse emissions. Circular Economy can help to reduce the global emissions by 39%, especially in construction, food and transportation sectors. Transition to circular economy would shift

from the 'take-make-use-waste' linear model to a model minimizing the use of virgin materials without adversely impacting welfare. The life-cycle approach will reduce the raw material demand by bringing back the material into the cycle for consumption and production.[13]
Circular economy is a paradigm shift from the linear economy in which a product, component or material is made, used and finally disposed of. This transition to a circular economy will not only reduce the negative impact of a linear economy but creates benefits for the environment and society. It focusses on promoting renewable energy, green buildings, green technology.By promoting a change in policies will help not only to reduce pollution but also reduce any wastage, and thus attain a sustainable environment. The objective underlying a circular economy is to restore, regenerate and innovate so that the utility derived from the product, service, components and materials used is at the maximum and the finite resources are optimized.
Circular Economy focusses on reducing waste and improve material efficiency with reuse and recycling of the material. It promotes development of energy efficient products, use of renewable energy, endorsesdurable consumer goods and use of shared platforms.[1]
The Indian economy is experiencing a growth rate of 7% and above in 2023-24 and is expected to step up the growth over the next decade with greater macroeconomic and financial stability.[6]India has emerged as the fastest growing economy in the world and positioned at the 5th largest economy with a share of 3.37% of the world GDP.[7] India has vast opportunities for growth and development. To become a leading economic power India is expected to increase growth of the manufacturing sector. In India there is an increase in material consumption by over 6 times from 1.18 billion tons to 7 billion tons over the period 1970-2015. Material consumption is expected to grow to 14.2 billion tons by 2030 with growth in GDP and population. [8]Indians have since generations traditionally adopted circular practices and are ingrained with the habit of recycling of materials, higher utilization and repair. Some people collect and recycle these products.However, there are negative externalities involved in this process, which include adverse impact on health, waste on streets, overflowingdumpsites and sometimesmishandling,resulting in pollution and also water body contamination.[9]Increase in the growth of the economy and a higher per capita income will not only bringhigher standard of living for the people but may encourage adoption of linear supply chainsresulting in current circular practices becoming a thing of the past. Business would also consciously need to adopt circular economy practices, innovate and apply them in all sectors of the economyso that the limited resources in the economy are optimized.

Objectives of the Study

1. Examine thecircular economy business models adopted by companies in India.
2. Identify the critical factors that support adoption of circular practices in food and beverages industry.
3. Assess the Government and Industry initiatives that support Circular Economy in India.
4. Critically examine the circular economy managerial practices adopted by a beverage company, Sula Vineyards Limited.

LITERATURE REVIEW

In 1976 a research report presented to the European Commission titled 'The Potential for Substituting Manpower for Energy'[3] envisioned an economy in loops (circular economy) Walter R Stahel coined the expression "Cradle to Cradle" which was later developed by William McDonough and MichealBraungart in 2002[4] with the aim to increase the product-life, prevention of waste, reduce environmental emissions, long-life for goods and reconditioning activities. The principle underlying cradle to cradle approach is that there is no wastage, what is a waste for one is a resource for another. Biological nutrients are returned to the soil and technical nutrients are reused. Walter R. Stahel promoted the idea of 'functional service economy', which would sell services rather than goods.[9][5]
A circular economy is a contrast to the linear economic system. The circular economy is based on the premise of sharing, renting and recycling. The materials are not destroyed but used for making new products over and over again. The circular economy is focused on optimization of the system as a whole and addresses the problems of climate change, loss of biodiversity and depletion of natural resources. The goods that are already produced, it aims to get more value out of it.[14]
Circular Economy in the food and beverages industry aims to redesign the economy from a linear state to a circular one by using the waste of one plant as a fodder for the other. This brings higher economic benefits, while reducing wastage of resources and environmental impact. In the food and beverages industry, this translates into recovery of organic materials with nutrients. This would encourage sustainable practices.[10] For the food and beverages industry adoption of circular practices should focus on reduction of use of fossil fuels, better mineral and water usage, reduction of pollution, reduction and re-use of bio-waste, reduction of land-take and restoration of ecosystems, use of biodegradable or

recyclable packaging. To restore the biological loop the resources like water, nutrients and materials should cycle back to the planet without damage [11]Food and beverages industry places demand for agricultural products and for every dollar spent on food, society pays two dollars in health, environmental and economic cost. The society bears a societal and environmental damage control cost to cover costs related to land use, water use, nutrient use, energy use, pollution, waste generation and also the detrimental impact on human health.[12]

Research Design

1. In order to conduct the study, primary data and secondary data collected on circular economy practices at Sula Vineyards Limited has been analysed using descriptive statistics. The variables analysed include renewable energy generation and shift in pattern of consumption, water conservation, waste water management, by-products like carbon dioxide generated in the fermentation process and its utilization as an inert gas, local procurement of bottles and recycling at their site.
2. To evaluate the Government and Industry initiatives which support circular economy the PESTEL Analysis Framework has been used to examine clear trends.
3. To analyse the circular practices at Sula Vineyards Limited the data has been analysed using SWOC Analysis Framework.
4. The five different circular business models namely circular supplies, resource recovery, product life extension, sharing platforms and product as a service have been used to understand the circular practices at Sula Vineyards Limited.

Analysis and Discussion

1. Circular economy business models

The circular economy is aframework which helps to derive more value from the existing resources which are limited and have multiple uses. It focusses on deriving value from what is already there, extending the usage, rethinking of how to reverse biodiversity loss, climate change, and depletion of resources.

India is one of the fastest growing economies in the world. Between the year 2011-2019, the number of people living below the poverty line (share of population living under extreme poverty with income of $2.15 per person per day) nearly halved. Post pandemic the economic growth supported by the monetary and fiscal policy has shown progress. The aspiration to achieve a high-income status by 2047 on completing 100 years since independence would require the economy to address challenges posed by climate change in line with the goal of achieving net-zero emissions by 2070.[15]According to the United Nations global natural resource consumption is forecast to grow by 60% by 2060 compared to 2020 from 100 to 160 billion tons, way higher than the Sustainable Development Goals requirements. Natural resources include food, wood, fossil fuels, metals including iron, aluminum, copper, non-metallic minerals, land, water. The increased demand for natural resources is attributed to industrialization, urbanization and increase in population.[16] Natural resources are critical to the growth and sustenance of economies, to reverse biodiversity loss, for reduction in poverty and inequalities and to prevent climate change. High income countries have been using 6 times more material per capita than the low-income countries and are responsible for 10 times more climate impact per capita. If economies continue to use the natural resources year on year at the same rate, it will exhaust the natural resources by year 2030 by a factor of 3. [17] In India, from the period 1985-2015, real GDP grew by 6% whereas the resource consumption grew at a CAGR of 4%. [16] A rapid growth in resource consumption would increase demand for resources, adversely impacting the resource availability for the economy. Circular economy could address the additional demand for resources in a growing economy without inflicting an additional strain on supply of resources. Adoption of circular economy could save $0.5 trillion dollar of GDP by 2030 and $4.5 trillion globally by curtailing utilization of natural resources, products and assets. [16][17]

The 5 different circular business models based on 120 case studies of companies that are generating improvements in resource productivity [18]include:

Table 1. 5 Circular Business Models Based On Accenture Strategy Report, 2014

S. No.	Business Model	Detail of Process:
1.	Circular Supplies	Provide full renewable energy, recyclable or bio-degradable resource which support circular production and consumption and replace single-lifecycle inputs. Especially applicable to companies with a major environmental footprint and dealing with use of scarce resources.
2.	Resource Recovery	Recover useful resources and energy out of disposed products

		or by-products. The waste gets transformed into valuable innovative recycling and upcycling services. The disposed products could be transformed into something new. The waste products are reclaimed and reprocessed in a cost-effective manner.
3.	Product Life Extension	Extend working lifecycle of products and components, maintain or improve them by repairing, upgrading, remanufacturing and remarketing. The products remain economically useful for longer, the product is upgraded in a useful way by changing only the component which requires a replacement instead of the entire product. This could also reduce e-waste.
4.	Sharing Platforms	Enable increased utilization rate of products by making possible shared use, access or ownership. The overcapacity or undercapacity gets a solution for a company and helps improve utilization rate.
5.	Product as a Service	Offer product access and retain ownership which would help to internalize benefits of circular resource productivity. The customers use the lease or pay and use model. The pay and use increases revenue generation and also helps to reduce costs.

Source: (Accenture Strategy, 2014)

Four key sectors of food and agriculture, building and construction, fibers and textiles and forestry account for 60-80% of biodiversity loss due to use of land for harvesting and extraction practices. Adopting circulatory practices reduces the pressure on nature. [19]Thus, adoption of circular practices for the food and beverages industry is imperative.

2. Factors that support adoption of circular economy in food and beverages industry.

Table 2 outlines the dynamics of the food and beverages industry in India and assesses the purpose of adoption of circular practices.

Table 2. Critical Factors That Support Adoption Of Circular Economy In Food And Beverages Industry In India

S. No.	Critical Factors Impacting Food and Beverages Industry in India	Impact of Circular Economy Initiatives
1.	Increased growth of GDP, adoption of circular practices and resulting cost savings for the economy.	Circular economy rests on the tenets of improving the natural resources, flow of bio nutrients and techno nutrients, use of renewable and technologically superior resources, which would support increase in GDP growth at lower cost.
2.	Water scarcity due to rapid industrialization, urbanization, agricultural practices, climate change.	Circular economy initiatives could improve availability of clean water and reverse the overexploitation of ground water tables, inadequate rainwater harvesting, mismanagement of water resources, poor quality of water that affects rural and urban areas. India accounts for 18% of world's population but accounts for only 4% of its water resources.[20] World Bank has supported the government to improve availability of clean water to the rural communities in Uttarakhand, Karnataka, Shimla, Punjab, Chennai, West Bengal, through sanitation drives, availability of sustainable water, build infrastructure and institutional capacity to face natural disasters like flash floods, earthquakes and landslides. Other measures include supply of affordable and sustainable water in urban areas, recycling of wastewater and conservation of fresh water.
3.	India as an agrarian economy experiences	Indian economy is an agrarian economy providing employment to 64% of the people in the rural areas and

	degradation of soil, impact on food security, health and environment.	contributes 17.4% of GDP.[21]Over exploitation of resources impacts soil health. Adoption of circular practices could reverse the damage and soil degradation. Soil degradation is estimated at Rs. 35,000 crores (US $ 5.4 billion). (Ellen Macarthur Foundation, 2016)National Bureau of Soil Survey and Land Use Planning, 146.8 million hectares, around 30% of soil in India is degraded with 29% of it lost to sea, 61% transferred from one place to another and 10% deposited in reservoirs. The natural nutrient of the soil gets destroyed by the use of pesticides, fertilizers, water tables get depleted. Untreated sewage and industrial waste enter the rivers and agriculture. Biomass has to be returned to the soil to regain the soil health, which include micronutrients like zinc, manganese, iron, copper. Villages can use degradable waste to make compost, like the use of grasses, dung, household vegetable waster, weeds, crop residues. Use of ecological, regenerative and organic agriculture could be used to reduce soil degradation. (Menon, 2023)
4.	Alleviate Congestion and Pollution.	Adoption of circular economy measures would help to reduce travel and vehicular movement on roads by 38% by 2050. (Ellen Macarthur Foundation, 2016) Adoption of EV and efficient fuel driven vehicles would reduce pollution and negative externalities. Shared use of cars and demand for mobility could be met by a common mobility system that would be safe, comfortable and with low negative externalities.
5.	Circular Economy would reinforce adoption of Digital Technology.	Knowledge transfer of efficient technologies, Digitized India, Internet of Things, digitized supply chains, shared platforms for transportation, floor space, buildings could increase utilization of resources for entrepreneurs and existing businesses.
6.	Cheaper products and services	Circular economy could enable cost savings and conservation of resources leading to higher competitiveness and higher productivity.
7.	Increased profits for business	India could save $624 billion a year by 2050 by adopting circular economy as estimated by the UNCTAD and the Ellen MacArthur Foundation Report. (UN Trade and Development, 2016)
8.	Mitigate Negative Externalities	By adopting circular economy principles could bring benefits to the environment. Greenhouse gas emissions could be 23% lower in 2030 and 44% by 2050, virgin material consumption could be 24% lower in 2030 and 38% in 2050, water consumption lower by 19% in 2030 and 24% lower in 2050 and synthetic fertilizer and pesticide use at 45% lower in 2030 and 71% in 2050. (Ellen Macarthur Foundation, 2016) Emerging economies have an advantage over mature economies as adoption of circular economy practices can be integrated at the time of building infrastructure and thus, would give them an edge over the mature economies. The emerging countries would integrate circular practices in the new set-up unlike the developed countries, giving them a competitive advantage.
9.	Impact on consumers in the economy	The cost reduction for the industry should translate into lower prices for food, which supports National Food Security Mission. Other industries supporting lower cost for consumers include housing under PradhanMantriAwasYojana, a housing

		for all initiative in India, along with increase in mobility and a higher income. Adoption of a Circular economy would result in reduction of negative externalities resulting in better health, lower pollution and congestion.
10.	Impact on job generation in circular economy	A circular economy will create job opportunities in waste management, recycling, construction sector, technology led opportunities, low-carbon jobs, green jobs, jobs generated by use of shared platforms due to the shift in nature of job opportunities.

3. Government and Industry initiatives that support Circular Economy in India.

European economy adopted the first circular economy action plan in December 2015 and the new circular economy action plan (CEAP) in March 2020which was further revised in 2023. Adoption of the transition to circular economy will create sustainable products with growth, optimizing the use of natural resources, encourage sustainable consumption, reduce biodiversity loss and waste of resources along with reducing environmental footprint. The sectors which use resources and require the transition have been identified as electronics, ICT, vehicles, energy, packaging, plastics, textiles, construction, building, food, water, nutrients.

Government of India, since 2021 began its journey to formalize the policies and build a circular economy framework. The various rules formulated include Plastic Waste Management Rules, e-Waste Management Rules, Construction and Demolition Waste Management Rules, Metals Recycling Policy. The PESTEL analysis of the Government and Industry support for circular practices highlights the policy initiatives undertaken and those that can helpor slow down implementation of circular economy.

Table 3. Pestel Analysis Of Government And Industry Support For Circular Economy In India

Political	1. GOI has set-up the Circular Economy Cell in Niti Aayog in September 2022 for establishing regulatory framework for environmental standards, resource efficiency, sustainable practices for the manufacturing sector. 2. The 11 end of life products, recyclable materials, waste include e-waste, municipal solid and liquid waste, scrap metal, lithium batteries, solar panels, gypsum, toxic and hazardous industrial waste, use of oil waste, agricultural waste, tire and rubber cycling and end-of-life vehicles. (Press Information Bureau-Niti Aayog, 2021) 3. GOI has set-up Ministry of Road Transport and Highways for Vehicle Scrapping program for scrapping vehicles of Central and State Government. 4. National Resource Efficiency Policy was launched in 2015 to promote sustainable production and consumption, improve resource efficiency, reduce adverse effects on the environment and climate change. Other policy measures include Extended Producer Responsibility for developing circular economy, building awareness and making producers responsible for waste generation, increase use of recycling, develop sustainable products and build business models for circular economy. 5. The 'Swachh Bharat Mission', 2014 with the objective of promoting cleanliness, hygiene and waste management and making India a 'zero-waste' country focuses on segregation, recycling, composting which are key drivers for a circular economy. 6. 'Make in India', 2014 initiative aims to incentivize global manufacturing promoting sustainable practices for environmental protection, economic efficiency. 7. Atal Innovation Mission, 2016 promotes innovation and entrepreneurship. It supports circular business models and use of sustainable technologies. (Economic Advisory Council to the PM, 2023) 8. The Government has been offering financial incentives like tax benefits, subsidies and low-cost loans to the recycling industry. 9. SEBI in May 2021 introduced the Business Responsibility and Sustainability Report Framework requiring top 1,000 listed companies to report non-financial data for the year 2021-22 and 2022-23. The businesses need to report their social and environmental impact and link their financial results with the ESG

	performance for a better understanding of the company's growth, sustainability and stability.
Economic Growth	1. Increased growth opportunities due to increase in GDP and business opportunities. 2. Circular economy practices will optimize use of natural resources, flow of bio nutrients and techno nutrients, use of renewable and technologically superior resources, which would support increase in GDP growth at lower cost.
Socio-Cultural	Adoption of circular economy practices by consumers and businesses would require changes, which include: 1. Development of infrastructure for eco-friendly manufacturing. 2. Create awareness and education programs for businesses and consumers, invest in research and development for a smooth transition in adoption of circular practices. 3. Build consumer awareness for sustainable products. 4. Adoption ofsustainable supply chain practices by industry.
Technological	1. Digital technologies like AI, IoT, blockchain can be used to create business models of shared use and product as a service to achieve progress towards a sustainable and circular economy. (Economic Advisory Council to the PM, 2023) 2. Promote the use of clean and green technology to reduce wastage, reduce pollution and emissions and environmental footprint for the manufacturing sector. 3. Promote adoption of digital technologies to optimize resource usage, encourage efficiency and reduce wastage. 4. India needs to develop adequate infrastructure for waste management and recycling, improve waste collection and segregation systems. Inefficiency results in loss of collection of recyclable material limiting circular practices. Waste is sometimes burnt or dumped, adversely affecting the environment and attributing to climate change. 5. Contamination of material and improper recovery results in downcycling. This needs to be regulated and discouraged. 6. There is a need to educate and create strategies around reuse, refurbish, remanufacture along with recycling so that core essence of a circular economy can be formalized as a business model.
Environmental	1. GOI is encouraging adoption of circular economy principle by promoting optimum use of natural resources, minimize wastage and bring efficiency. 2. The Government and industry need to step up use of renewable energy including solar power, hydro and wind energy, promote water and energy management systems.
Legal	3. The policy framework to promote a circular economy in India include regulatory measures, financial incentives, advertisement campaigns, capacity building. 4. Training and upskilling the workforce, environmental compliances, use of eco-friendly technologies needs policy thrust. 5. Reporting of ESG compliances of companies and sustainable practices needs to be encouraged for all businesses and operations. 6. There is a need to develop platforms for implementing and sharing best sustainable practices.

4. Analysis Of Circular Practices at Sula Vineyards Limited

About the Company

Sula Vineyards Limited was founded by Mr. Rajeev Samant in the year 1999. The company became a market leader in Indian wine industry in sales volume and sales value in 2009 and crossed a 50% market share in the 100% grape wine market by 2012. Sula Vineyards Ltd. listed its shares on the NSE and BSE in 2022. It presently has6 wineries with 4 in Maharashtra and 2 in Karnataka.

The largest winery at Domaine Dindori at Nashik with a capacity of 8.74 million litres, Nashik Winery with 4.64 million litres, Domaine Sula, Karnataka with 1.14 million litres, York Winery with 0.48 million litres and 2 leased wineries Indian Ambiance and ND Wines with 1.65 million litres. (Sula Vineyards Limited, 2023)

The company has 2 resorts 'The Source' and 'Beyond' by Sula, 3 restaurants and 3 tasting rooms. These provide an immersive experience to the customers including wine tasting, vineyard tours and wine

making classes. The main wine categories include RĀSĀ, The Source, Dindori Reserve, Sula Classics and York. (Sula Vineyards Limited , 2022)The company is recognised as a leader in the Indian wine industry. Sula Vineyards was awarded the gold medal at the International Wine Challenge 2022 for its 'Sula Brut Tropicale', a rose wine and a bronze medal for 'Sula Late Harvest Chenin Blanc'. It has obtained the Brand Reputation Certificate from Brand Reputation Compliance Global Standards for its industry practices. The company also conforms to the government regulations of Food Safety and Standards Authority of India. The company has adopted sustainable wine making practices, sustainable vineyards and provides employment to farmers in Maharashtra and Karnataka in India. Sula Vineyards Limited has adopted circular economy practices and in addition to adopting the principles of 3Rs-Reduce, Reuse and Recycle, it has adopted a zero wastage practices including converting the organic waste into organic compost to nourish the vineyards. (Sula Vineyards Limited, 2023)(Sula Vineyards Limited, 2023)(Tumuyu, 2023)

Table 3. Key Highlights-Sula Vineyards Limited

Manufacturing Capacity	16.7 million litres
Turnover	5354.3 million with 10,66,000 cases of wine sold, 3,46,000 visitors in Wine Tourism facility
Recognition: Membership, Affiliation & Association	1. 'Great Place to Work' for 2 financial years 2021-22 & 2022-23. 2. International Wineries for Climate Action (ICWA) 3. All India Wine Producers' Association (AIWPA) 4. Confederation of Indian Industries (CII) 5. The Association of Bars, Hotels & Restaurants 6. The Federation of Hotel & Restaurant Association of India (applied) 7. Global Best Practices and Global Food Safety Initiatives: 2 facilities at Domaine Dindori at Nashik and Nashik Winery areBrand Reputation Compliance (BRC) Certified.
Sustainable Construction	At Domaine Dindori, Nashik the company has used pre-engineered metal building (PEMB) instead of the conventional construction. This has reduced carbon dioxide emissions, 20% lower than traditional buildings. The material is prepared and brought in at the site to reduce suspended material at site.
Silver member of IWCA, 2023	Sula Vineyards Ltd. was awarded silver membership in 2023 over base financial year of 2020, for their performance in greenhouse gas emission. The IWCA aims to achieve net zero by 2050 across Scope 1 to 3, third party verified GHG inventory of Scope 1 to 3, operation to be powered by at least 20% renewal energy and reduction in carbon dioxide emission from baseline inventory.

Source: Sustainability and Responsibility Report FY'23; Sula Vineyards Limited Annual Report 2022-23

Table 4. Five Circular Business Model Adopted By Sula Vineyards Limited

S. No.	Business Model	Detail of Process:
1.	Circular Supplies	Sula Vineyards Limited is committed to conserving energy, increasing adoption of renewable energy, phasing out of single use plastic, conservation of water and reducing the carbon emissions. Viticulture and winemaking are water intensive production processes. Water as a resource is precious and Sula Vineyards Ltd. has pioneered the rainwater harvesting method in the wineries with a total capacity of 36.8 million litres. The vineyards are drip irrigated. The Effluent Treatment Plants (ETP) at their sites help to recycle 100% of the rainwater collected. The recycled water in 2022-23 of 53 million litres was used for the purpose of irrigation of the vineyards, landscaping of their sites and for consumption in the office restrooms. The requirement of 3 million litres of water, accounting for 60% of the cooling tower water is met by the recycled water. The wastewater from the RO system and softener plants is used for floor cleaning and dish washing in the canteens. The company has adopted a multi-pronged strategy which includes energy efficient practices, regular monitoring of energy consumption, use green energy by adopting solar power for 52% of their energy needs. The winery process includes use of chilling operation. At Sula Vineyards the

		chilling operation is performed during the solar hours to help conserve energy consumption. Additionally, the company uses LED lighting, Variable Frequency Drives (VFDs) to reduce energy consumption for pumps, insulated wine storage tanks for energy conservation, ion exchange and electro-dialysis for wine stabilization and they use invertor-based ACs. The company has set-up barrel rooms to prevent heat loss for the process of wine aging which helpsto conserve energy. The company uses recyclable glass bottles in their restaurants which are re-washed and reused in the tasting rooms and restaurants to reduce wastage in the company. The glass bottles used are light weight bottles. The company has stopped importing the glass bottles and locally procures its requirements as given in Figure 4-Supply Chain of Glass Bottles. The company has optimized its use of packaging material, 96% of which is procured from local vendors. The emphasis is on minimum waste, bringing lower costs and minimizing the environmental impact.
2.	Resource Recovery	Sula Vineyards has adopted innovative measures for recycling and upcycling. The company generated 358 MT of solid waste in the year 2022-23. 99% of their packaging material is recycled. For disposition of organic waste, a 200kg biogas plant has been set up in the restaurant at the winery at Nashik and an additional plant has been set-up at the canteen at their winery at Domaine Dindori. The bio-plant at site is shown in Figure 3. Waste generated from the winery is used for making vermicompost which is used along with farmyard manure and shredded vineyard cuttings instead of using chemical fertilizers. The waste products are reclaimed and reprocessed in a cost-effective manner. The heat pumps powered by solar energy are used for heating the swimming pool water at the resorts, heatlinesanitation water in the bottling plants and for use in barrel cleaning and the sleeve tunnel. Cold air, which is a by-product of the heat pumps used for heating the swimming pool water, is used by the company to cool the office space. This reduces the need for air conditioning and thus conserve energy. The fermentation process in winemaking turns grape juice into an alcoholic beverage, during which yeast converts sugars in the juice into ethanol and carbon dioxide. Carbon dioxide, as a by-product can be used as an inert gas at the wineries. The company intends to set-up a plant for capturing carbon-dioxide to be used as an inert gas for preventing oxidation and protect wine. Figure 2 details the carbon dioxide generated from the 6 wineries at 864.01 tons against a requirement of 240.48 tons used in the 6 wineries. They follow a hierarchy of water use for wastewater management. All operations of wine making require water which is critical for viticulture sustainability, grape production, for its quality and viability. The wastewater management plan uses the recycled water for different purposes as detailed in figure 1.
3.	Product Life Extension	Sula Vineyards has adopted the Lees Filtration System in the year 2022-23, which is used for production of more wine from the same quantity of grapes used in production of wine. Lees Filtration System also helps to improve the quality of wastewater. Instead of using harmful weedicides the vineyard has adopted using sheep for the purpose of weeding, other measures include delayed pruning cycle to overcome uncertainty of rains, adoption of drip system for irrigation, nitrogen fixing cover crop plantation during the rainy season so that the harmful impact of climate change can be overcome, and the product remains useful for a longer time.
4.	Sharing Platforms	To enable increased utilization of products and services Sula Vineyards Ltd. has adopted 'Nurturing' by sharing the saplings with other growers and farmers in Maharashtra and Karnataka. Sula has long term supply arrangements with local farmers which ensures assured supply of quality grapes and use of sustainable practices in production. These include minimum use of chemicals and responsible water management.

		The company has access to more than 2800 vineyards for sourcing quality input, with partnership with contract farmers who implement best sustainable practices. The company had leased the vinery in the past, which is now being self-utilized by them with the objective to improve utilization rate. The Wine Tourism business creates awareness about wine consumption, production and consumer education. The company is earning 30% higher revenues in 2023 over the previous year from Wine Tourism.
5.	Product as a Service	The company has 2 leased wineries namely Indian Ambiance and ND Wines. Leasing as a model enables reduction of capital expenditure costs. The company has a strong distribution network in India in 26 States, 6 UT, & company depots, 50 distributors, 11 corporates, 14 licensed resellers, and 3 defense units. The company exports to over 20 countries. The company is selling through e-commerce platforms, select supermarkets. The company is also using the D2C sales channel at Nashik and Bengaluru, through its wine tasting facilities. The glass bottles in their tasting rooms and restaurants are rewashed and reused. The bottles are collected and then outsourced to a third-party vendor providing employment opportunities and sharing of resources with the local vendor.

Source: Sustainability and Responsibility Report FY'23; Sula Vineyards Limited Annual Report 2022-23

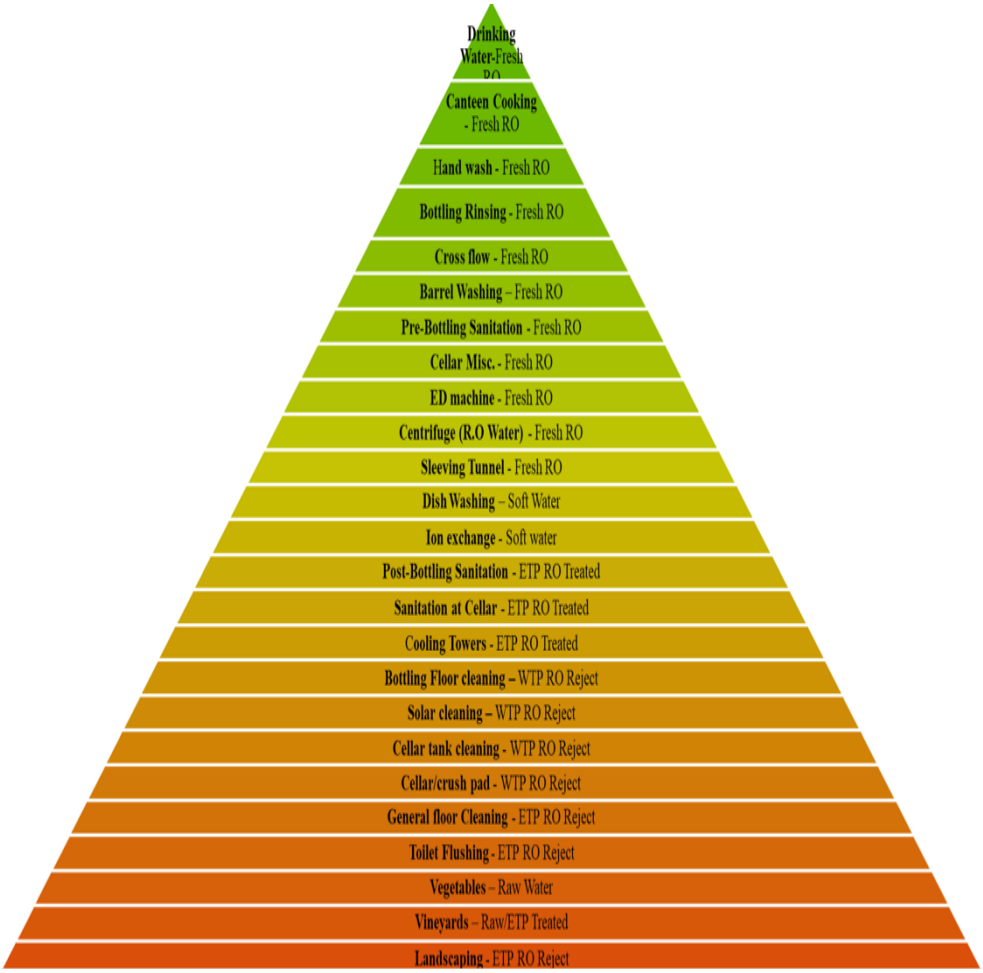

Figure 1. Hierarchy of Wastewater Management
Source: Sula Vineyards Limited, Primary Data (Interview)

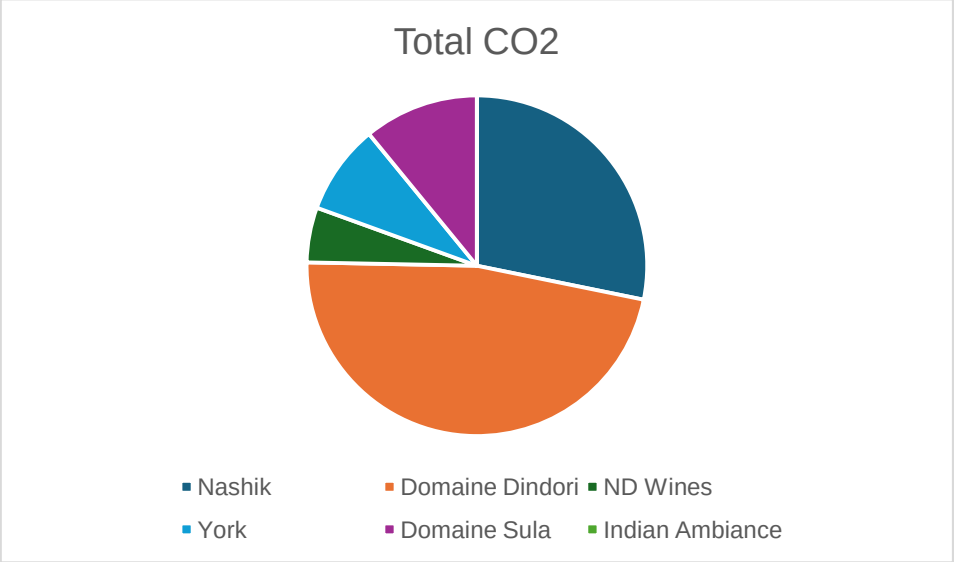

Figure 2. Carbon-di-oxide in the Fermentation Process generated at the wineries
Source: Primary Data, Sula Vineyards Limited

Table 5. Carbon Dioxide Generated In Fermentation Process And Used As Inert Gas At The 6 Wineries

	Total CO_2 (tonnes)
Total Winemaking FermentationEmissions	**864.01**

Wineries	**Wine/Juice Fermented (Ton)**	**Average Harvest Brix (g/100ml)**	**Average RS (g/100ml)**	**Fermentable Reducing Sugar (%)**	**Fermentable Sugar (tonnes)**	**Total CO_2 (tonnes)**
Total	9408.13	20.92	0.21	20.71	1918.35	**864.01**

Average Brix Working- Winemaking	
	FY'24
Grape Crushed (in ton)	13,440
Liters per Ton	700
Total Wine produced (in liters)	94,08,126
Average Brix (%)	20.9%
Alcohol content is determined with an alcohol conversion of 0.50 and rounded to the nearest tenth. It is common to see conversion from 0.55-0.65 depending on grape type, yeast strain, data collection error.	

Source: Primary Data, Sula Vineyards Limited.

CO_2 Used in Winemaking					
	Location	**Alternate Name**	**Kgs**	**Global Warming Potential (GWP)**	**Total CO_2 (tonnes)**
CO2	**All wineries**	**Carbon dioxide**	240,482	1	**240.48**

Source: Sula Vineyards Limited

Figure 3. Images of the Bio-Gas Plant at Site, Sula Vineyards Limited
Source: Pictures from Sula Vineyards Limited

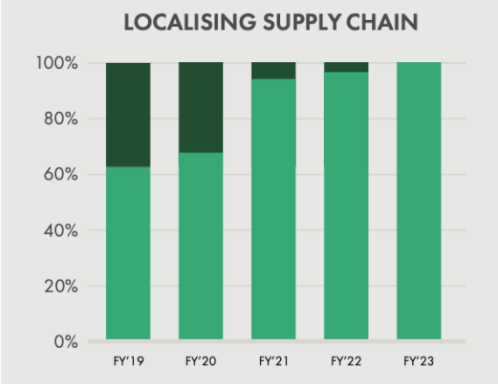

Figure 4. Supply Chain of Glass Bottles
Source: Sustainability & Responsibility Report, 2022-23

Table 6. Circular Supplies Data Over 2018-2023

Source	**Unit of measurement**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**Long term target**
Water	Liters per 9 lit. cases*	84.2	71.5	77.4	60.1	55.1	40
Energy	Units per 9 lit. cases*	5.1	5.8	6.7	5.9	6.0	4.0
Solar Generation	In millions	2.53	2.96	3.30	3.66	3.98	-
Solar as % of total	Percentage (%)	45%	49%	61%	60%	52%	70%
*Number of units dispatched *Excluding York operations							

Source: Primary Data, Sula Vineyards Limited

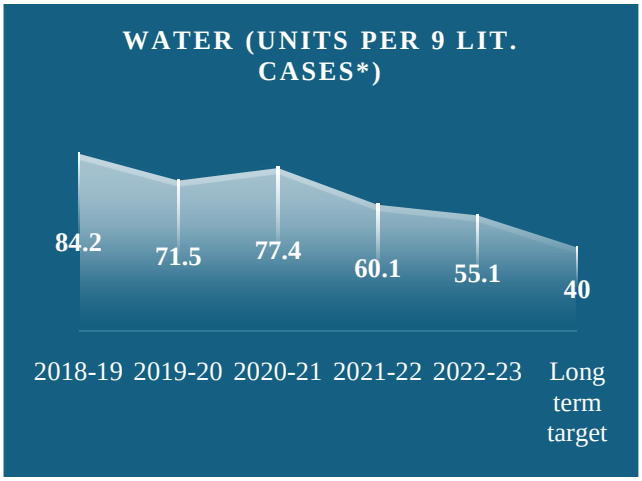

Figure 4. Water Consumption At Sula Vineyards Ltd. (2018-2023)

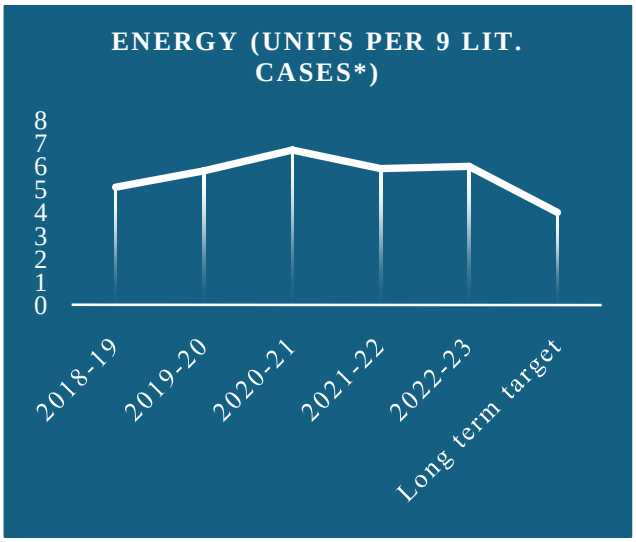

Figure 5. Energy Consumption At Sula Vineyards Ltd. (2018-2023)
Source: Table 6: Circular Supplies Data, 2018-2023

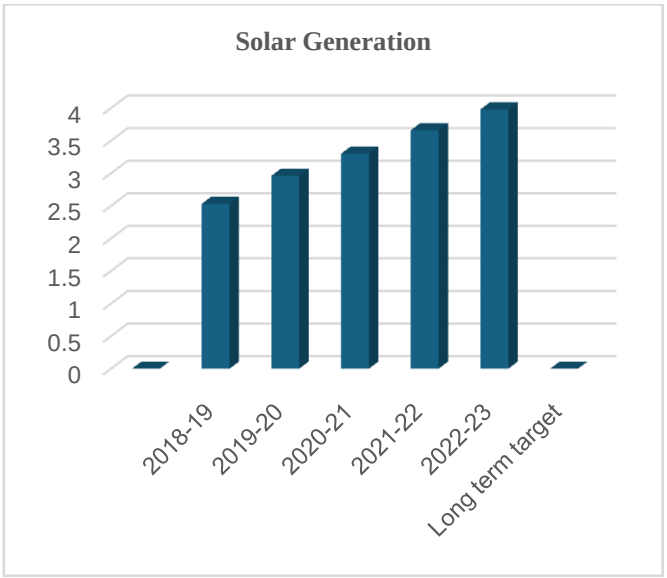

Figure 6. Solar Energy Generation At Sula VineyardS LTD. (2018-2023)
Source: Table 6: Circular Supplies Data, 2018-2023

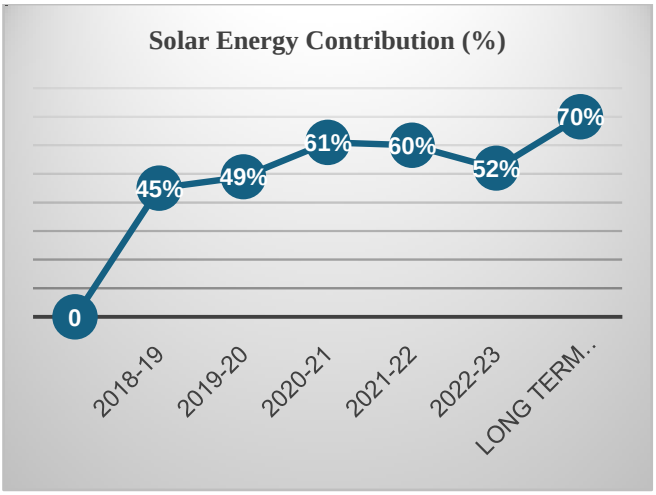

Figure 7. Solar Energy Consumption For Sula Vineyards Ltd. (2018-2023)
Source: Table 6: Circular Supplies Data, 2018-2023

Table 7. SWOC Analysis of Circular Practices adopted by Sula Vineyards Limited

Strengths	Weaknesses	Opportunities	Challenges
1. Sula Vineyards Limited is committed to conserving resources, adopting renewable sources of energy, and reducing carbon emissions. The more energy efficient the facility is, more efficient is the company. 2. The company uses drip irrigation, rainwater harvesting, solar energy, recycling and reuse of wastewater generated in the plant using the ETP. 3. The company reuses and recycles wastewater from RO and softener plants. 4. They have adopted energy efficient practices-use of LED, Variable Frequency Drives, solar energy, insulated wine storage tanks, barrel rooms to prevent heat loss, invertor ACs, ion exchange and electro-dialysis and use of Electric Vehicles on the premises. 5. Sula Vineyards uses recyclable glass bottles which are rewashed and reused in their tasting rooms and restaurants. 6. The company has a locational advantage for sourcing of grapes and climate. 7. Management support and commitment for innovations, research and development. 8. Attention to social welfare and support of employees. E-bike loans for the employees. 9. Recipient of international	1. Need to adopt use of glass bottles for wine which can be recycled and reused. 2. Improved labelling to cut waste. 3. High costs and capital expenditure required for adoption of circular practices. 4. To utilize the Circular Business Model of Product as a Service, could use more of the lease and pay and use model. 5. Larger investments in AI, IoT, blockchain to create business models of shared use and product as a service to achieve progress towards a sustainable and circular economy.	1. Circular economy practices can benefit the food and beverages industry by adopting technological innovations like digital apps for collection, recycling and operation of shared platforms. 2. Wineries are dependent on natural resources, solar energy, climate and soil. 3. Adoption of sustainable buildings and infrastructure for all the wineries would position it as an environmentally sustainable company. 4. Sula Vineyards has adopted innovative measures for recycling and upcycling.Circular practices are the future of sustainable winemaking. 5. Adoption of resealable packaging, reuse of labels and innovations could further the circular initiatives. 6. The company has provided employment opportunities in the local areas and could further involve the local community and provide	1. India ranks 111/125 countries in the Global Hunger Index in 2023. In India the food wastage is throughout the value chain, with only 10% at consumption stage unlike the developed countries where it is consumer and post-consumer stages. This remains a challenge for the food and beverages industry. 2. Greater Government support and well - structured policy framework for circular initiatives. 3. Climate change and environment changes has significant impact on the wine industry. 4. Competition in the winery business from domestic and international players.

certifications. 10. Achieving economic benefits of circular economy practices for the company. 11. Waste generated from the winery is used for making vermicompost used with farmyard manure, shredded vineyard cuttings in place of chemicals. The waste products are reclaimed and reprocessed in a cost-effective manner.		empowerment opportunities. 7. More initiatives for education and informative assistance for customers to promote 3Rs. 8. The company intends to set-up a plant for carbon dioxide generated in the fermentation process to be converted into an inert gas.	

CONCLUSION

Adoption of circular model as a path of development will bring economic, social and environmental benefits. The world has limited resources, and adoption of circular practices will be a game changer for the economy, businesses and people. Support from the Government, Industry and civil society will be essential to achieve the global standards of efficiency, conservation and sustainability. In India, the regulatory and policy framework will play an important role in a transition from a linear to a circular economy. The initiatives of circular economy will leverage the existing programs and schemes of the Government of India, regulation on recycling and waste management, resource efficiency, innovations and entrepreneurship, adoption of renewable energy, end of life products, technological progress, and product development.

Sula Vineyards Limited is committed to achieving sustainability as a business practice. The company has successfully adopted the 5 circular practice business model of circular supplies, resource recovery, product life extension, sharing platforms and product as a service. These include a commitment to conserve energywith use of morerenewable energy, phasing out of plastic, conservation of waterand reducing carbon footprint. Sula Vineyards has adopted innovative measures for recycling and upcycling,waste products are reclaimed and reprocessed in a cost-effective manner. The Lees Filtration System, improved weeding, pruning, measures to reduce impact of climate change improves useful life. Other circular practices include 'Nurturing' of saplings, long term arrangements with local farmers, access to local vineyards, leasing of vinery, running consumer education initiatives, a strong distribution network across the country, adoption of e-commerce and reuse of glass bottles helping to engage the local vendors and community at large. The more efficient the facility is the better the impact on the company. As a silver member of IWCA the company is committed to achieve 'net zero' by 2050.

ACKNOWLEDGEMENT

We would like to thank all staff members of Sula Vineyards Limited for their cooperation and kind support through out our research period. Special thanks to TrambakOturkar, Vice President-Projects and Procurement, Sula Vineyards Limited and Mr. Rahul More, Winemaker, Sula Vineyards Limited for providing us with the data collection, analysis, interpretation on the sustainability initiatives and technical assistance on this research project.

REFERENCES

[1] Development, I. I. (2020). Effects of the Cicrcular Economy on Jobs. Canada: International Institute for Sustainable Development.

[2] Ellen MacArthur Foundation. (n.d.). The Circular Economy in Detail. Retrieved from https://www.ellenmacarthurfoundation.org/the-circular-economy-in-detail-deep-dive#:~:text=In%20his%201976%20research%20report,co%2Dauthored%20with%20Genevieve%20Reday.: https://www.ellenmacarthurfoundation.org/the-circular-economy-in-detail-deep-dive#:~:text=In%20his%201976%20research%20report,co%2Dauthored%20with%20Genevieve%20Reday.

[3] Reday-Mulvey, G. (1977). The Potential for Substituting Manpower for Energy:. Geneva: Battelle, Geneva Research Centre, 1977.

[4] Sherratt, A. (2013). Cradle to Cradle. Encyclopedia of Corporate Social Responsibility, 630-638.

[5] Stahel, W. R. (August 1986). The Functional Economy: Cultural and Organizational Change. Hidden Innovation.

[6] India, R. B. (2024). Annual Report 2023-24. Reserve Bank of India.

[7] Bank, W. (July 25, 2023). World Development Indicators. World Bank.
[8] S.P. Sarma, S. G. (April 2023). India's Tyst with Circular Economy. EAC-PM Working Paper Series EAC-PM/WP/17/2023.
[9] Ellen MacArthur Foundation. (2016). Circular Economy in India: Rethinking Growth for Long term Prosperity. Ellen MacArthur Foundation.
[10] Moslinger, M. (2019, September 20). A CE Indicator Scorecard and Circular Economy Business Model Canvas for the Food and Beverage Industry. A CE Indicator Scorecard and Circular Economy Business Model Canvas for the Food and Beverage Industry With a pilot study at the La Trappe Brewery for circular and sustainable resource use.
[11] (2016). Nutrient Recovery and Reuse (NRR) in European Agriculture A review of the issues, opportunities and actions. Rise Foundation.
[12] Foundation, E. M. (n.d.). Food and the circular economy-deep dive. Retrieved from https://www.ellenmacarthurfoundation.org/food-and-the-circular-economy-deep-dive: https://www.ellenmacarthurfoundation.org/food-and-the-circular-economy-deep-dive
[13] The World Bank. (2022). Policies from Europe's Circular Economy Transition. Washington DC: The World Bank.
[14] SITRA STUDIES, 2. (2024). Circular Solutions For Nature-Handbook for Businesses. SITRA 2024.
[15] World Bank. (n.d.). https://www.worldbank.org/en/country/india/overview. Retrieved from https://www.worldbank.org/en/country/india/overview: https://www.worldbank.org/en/country/india/overview
[16] United Nations Environment Programme. (2024). GLobal Resource Outlook 2024-Bend the Trend . United Nations Environment Programme.
[17] FICCI and Accenture. (2018). Accelerating India's Cicular Economy Shift-A HAlf Trillion Dollar Opprtunity. FICCI and Accenture.
[18] Accenture Strategy. (2014). Circular Advantage. Accenture.
[19] SITRA Studies 241. (April 15, 2024). Circular Solutions For Nature-Handbook for Businesses. SITRA Studies 241.
[20] World Bank Group. (February 14, 2023). How is India addressing its water needs? World bank.
[21] World Bank Indicators. (2014). World Bank Development Indicators, Agriculture, Value Added (% GDP). . World Bank.
[22] Ellen Macarthur Foundation. (2016). Circular Economy in India; Rethinking Growth For Long Term Prosperity. Ellen Macarthur Foundation.
[23] Menon, R. (2023, November 6). Soil degradation in India could spell disaster for food security and livelihoods. scroll.in.
[24] UN Trade and Development. (2016, December 5). Circular economy principles could help India realise $624bn. Retrieved from https://unctad.org/: https://unctad.org/news/circular-economy-principles-could-help-india-realise-624bn
[25] Press Information Bureau-Niti Aayog. (2021, March 18). Govt. Driving Transition from Linear to Circular Economy. India.
[26] Economic Advisory Council to the PM. (2023, April). INDIA'S TRYST WITH A CIRCULAR ECONOMY. EAC-PM Working Paper Series EAC-PM/WP/17/2023. India: Government of India .
[27] Sula Vineyards Limited . (2022). Sustainability and Responsibility Report FY'23. Mumbai : Sula Vineyards Limited .
[28] Sula Vineyards Limited. (2023). Sustainability and Responsibility Report FY'23. Mumbai, India: Sula Vineyards Limited.
[29] Sula Vineyards Limited. (2023). Sula Vineyards Limited Annual Report 2022-23. Mumbai. India: Sula Vineyards Limited.
[30] Tumuyu, S. S. (2023, October 13). Strategy on circular economy transition: A case study of agrocompany in Indonesia. Journal of Infrastructure, Policy and Development 2024.
[31] (n.d.).
[32] (n.d.).