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The City of Chennai

First information

Chennai, known by its former name of Madras, is the capital of the state of Tamil Nadu in South India. Chennai is the fourth largest city in India.

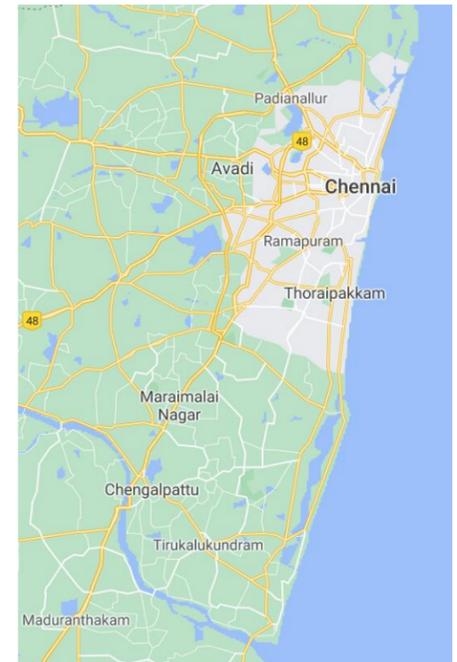
With over 6 million inhabitants, Chennai is the major commercial, cultural and economic center of South India.

Madras is located in northern Tamil Nadu on the Coromandel coast (on east coast), bordering the Bay of Bengal.

Two coastal rivers flow through it, the Cooum in the city center, and the Adyar further south. It has a large port and one of the longest sandy beaches in India, Marina Beach.

Culturally this region is mainly populated by Indians from the untouchable caste, the poorest.

The cultural heritage of this region is extraordinary: several sites like the chola temple, Mahabalipuram which are classified as world heritage by Unesco. There are 36 in all of India.



The circular economy in India

Chennai's case

India's population is expanding rapidly. In 2019 its birth rate was almost 19%. Thus, in order to meet the consumption needs of the population but also a certain placement in world trade, the growing manufacturing ambition of India will lead to global waste management problems. The question is this: Why not produce reusable waste which would lead to a circular economy approach ?

Circular economy policies can be applied to all countries whether they are developed or emerging countries (rich or poor). In the case of India, it seeks to catch up with the goal of improving the lives of its citizens who often face natural, physical and environmental resource constraints.

The circular economy corresponds to Gandhi's mantra of efficiency in production and sufficiency in consumption equivalent to resource conservation and waste minimization.

Even without a title on this type of economy it already existed for many years: no resource is wasted, everything is reusable. Requires a system of incorporation of environmental management, including recognition of the informal economy.

In this circular economy review in Chennai we will focus on three areas of expertise: Cities and construction, Food and agriculture, Mobility and vehicle construction. In this way we will address the new models of design and insertion of India in the circular economy. How do we move from a linear to a circular economy? Can we talk about the expected forecast if the economic scenario changes its course? Are the externalities generated beneficial for this country?



Production site of the michelin factory in chennai in 2014

Sector 1

Food and agriculture

What is Chennai doing to introduce circular economy in agriculture and food?

Sector 2

Cities and construction

What is Chennai doing to introduce the circular economy into urbanization issues?

Sector 3

Mobility and Vehicules

Indian technology, a major asset in this circular economy process

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Latest news on Chennai

The transition from a linear to a circular economy

This is the case for the Mahindra Group based in Chennai, working in four sectors: mobility, urbanization, agricultural technology and information technology. Their development strategy is innovative models that reduce dependencies on virgin raw materials with principles such as reuse, reduce (recycle and upcycle).

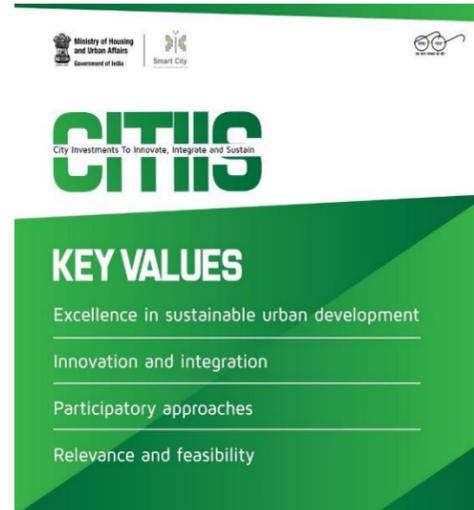
The circular economy in India provides a starting point for the circular economy in emerging economies. In India the government has incorporated circularity principles (e.g. vehicle repair rates and recycling of materials after use is high). The problem is that these circular economy solutions are informally managed but constitute a huge part of the income of the poorest Indians.

The first idea to implement would be to modernize the still linear supply chains. Indeed, as seen previously, companies operate on the principle of economies of scale that locks the country into a single model of one-way growth in the markets.

Currently we observe an economic growth of the middle class so the industrialists must react because local consumption increases (textile, electronic equipment). Companies must seize these profit opportunities which must last in time.

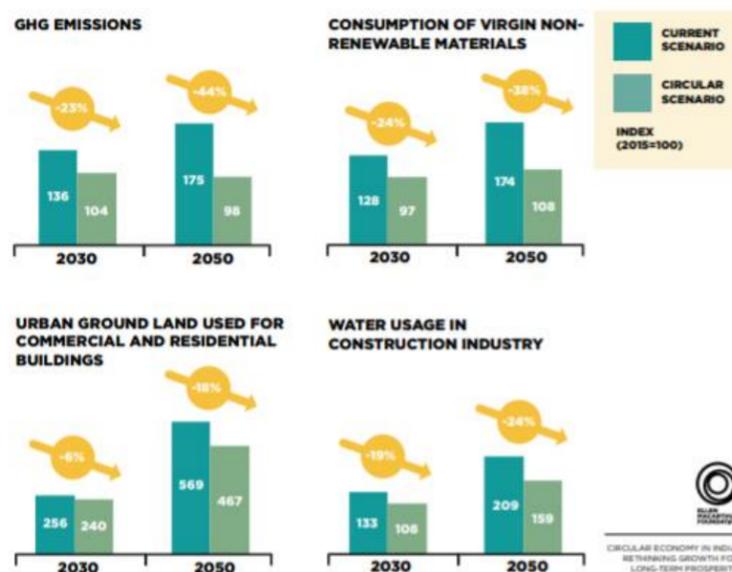
Chennai is one of the 12 laureate cities of the CITIIS program, supported by the Ministry of Urban Affairs and financed by the AFD and the European Union.

Each of the cities had to propose sustainable solutions for the environment. Chennai's dossier was focused on energy, with a productive offer focused on industrial and territorial ecology and recycling.



CITIIS program, ministry of housing and urban affairs - Government of India

FIGURE 2: COMPARISON OF POTENTIAL DEVELOPMENT PATHS



Explanations of two possible scenarios (with and without circular economy)

Natural resources are to be adopted in India. This circular economy is meant to be designing but restoring by using materials and energy efficiently in an optimized digital model.

For an efficient allocation of resources, circular economy and digital transformation should be combined. With dynamic system models congestion and pollution would also decrease significantly.

The aim is to develop knowledge and skills in circular economy with business issues.

To introduce our three application areas public policies suggest innovating to create new products adaptable to competitive business models through digital anticipation (minimizing transaction costs, organizing stocks).

It is also necessary to relay information from research institutes by encouraging pilot projects that are real opportunities for innovation.

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Opportunity analysis

Sector 1 - Food & Agriculture

For our 1st sector, the circular economy is intended to improve the well-being of the population and thus preserve its health. Chennai has set up a national food safety mission since 2016 and strongly encourages the reduction of pesticides that are very harmful to farmers.

Combining traditional practices and modern technologies to meet growing food demands (expanding population).

A farming system oriented towards closing nutrient loops could provide a framework for conserving natural capital while building economic and ecological resilience. The idea is to form a national network of smart farmers working with a wide variety of species based on shared assets and knowledge to optimize yields and decrease primary needs for water, pesticides...With respect to food waste, production should be optimized and food supply chains digitized. Soils are enriched through composting and digestion of food waste and post-consumer nutrients.

The circular economy could significantly mitigate negative externalities such as those resulting from the linear use of virgin raw materials and water and the consumption of synthetic fertilizers. Agri-food engineers from the University of Madras are working on enriching soils by multiplying species. This is the economy of functionality.

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Opportunity analyses Sector 2 - Cities & Construction



Example of an innovative house in a neighborhood on Mount Road in Chennai, 100% sufficient in renewable energy, eco-design, responsible consumption model. A batch of 40 houses is planned.

Buildings are needed to accommodate India's growing population. Renewable and recycled materials combined with modular construction methods would be a solution to minimize waste and lower construction costs. Integrating into the urban era and contributing to the urban ecosystem is a catalyst for energy production, water purification, waste recovery. A systemic planner makes sense in a framework of integrating circular mobility.

A better distribution of population in defined urban spaces would prevent congestion and allow the use of already existing spaces listed in a digital application. In this way there is a real extension of the duration of use and thus a reduction of the overall costs of buildings and infrastructure.

In India 70% of the buildings that should have been built will not be built by 2030 (only 25% in the UK). They will teach this comparative advantage of circular construction to other countries. This is the case for the Michelin Factory, which is over 1 km long, with energy and water treatment equipment. This site, which is both a research and a production site, is a diffusion of the circular model. From an educational point of view, 40% of its staff have been trained abroad for 6 to 24 months (e.g. workshop managers spent 2 years in Clermont). Language courses are available on site. This has led to possible cooperation between Clermont-Ferrand and Chennai with the support of the European Commission on the themes of smart city (dynamic system adaptable to Chennai) and water management. The design methods of the modular buildings include the recovery of materials after demolition and reuse.

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Opportunity analyses Sector 3 - Mobility & Vehicules

What if we reinvented the way we sell cars to provide vehicles as a service, this is what the Chennai municipality explains. Real new sources of revenue for the auto industry, with innovative vehicle design to facilitate maintenance and improve fuel efficiency can create value by increasing utility (more km driven).

Currently 2% of Indians own a car but the demand is growing. The solution would be to develop public transport: reduction of energy, pollution etc...



Traffic jam in Chennai - January 2020

Currently, the sale of cars is booming and the country is expected to become the 3rd largest market in the world by 2030 after China and the USA. However, cars should be built with zero emission propulsion technology (no dependence on imported fossil fuels). A mobility system must meet the growing needs of the population by providing an efficient and effective multi-modal transportation system including research and land optimization work with a network of convenient routes planned with technological tools.

Less expensive transport lines because more subsidized by the state (upgrading of the bus line that serves Marina beach in Chennai) and a reduction of congestion (reduction of vehicle/km traveled on the roads) would lead in the long term to a considerable reduction of pollution.

Moreover, India is one of the countries with the highest road mortality rates: 65,000 people per year in Tamil Nadu.

Special feature: What if humans had a role to play in the circular economy?

CITIIS EDUCATIONAL PROGRAM

One important point has not yet been addressed. This is education. Many industry stalwarts are changing their operations to become more circular (Renault (MLF school), Caterpillar, Nissan motors, Tidel park). Thus for graduates to remain competitive in the job market, they need to have a fundamental knowledge of the circular economy with the aim of applying it across the different professional contexts in which they will be able to operate. It is an essential framework that graduates need to understand and engage with.

There is also a growing interest from students as many student-led circular economy initiatives are starting. The rise of initiatives such as the Circular Economy Club (CEC) present in India or projects supported by international aid show us the educational investment on the circular economy. MLF

The CITIIS program seen before has an important role to play with sustainability as its only watchword. In the theme "social and organizational innovation in low-income neighborhoods" projects for an effective duration of 3 years have been set up "model schools and smart schools".

An improvement in the learning experiences of children in public schools is expected. Although the literacy rate in Chennai is 90.18 percent higher than the state average of 80.3 percent, there is a decline in learning levels, and willingness to learn is declining (Annual State of Education Report (ASER) data for the state of Tamil Nadu reveals that Chennai district ranked 20th out of 30 in Class 3 learning levels in government schools).

For this project 7 corporate schools have been selected (including a Michelin school) with new physical and digital infrastructures, pedagogical trainings, extracurricular activities, collaborations with NGOs or universities... Thus, each student will have a solid framework of skills and will be able to put their knowledge to good use.



Pictures taken in a school for girls in Chennai. Smart cities Project - CITIIS

Strengths: The government has incorporated circularity principles, including housing for all "Pradhan Mantri Awas Yojana" as well as the national food security mission. India is brilliant in IT, it is one of their leading sectors. There is a program: Digital India (a flagship program created to empower India in New technology). Transportation is also well positioned with a very complete train network. Finally, the satisfaction rates on the new educational programs (CITIIS) are very conclusive.

Opportunities: India is currently experimenting with growing market segments. Thanks to an excellent global IT investment, it is implementing applications that identify urban spaces still available to house the growing population. Some of its companies, such as Mahindra and Michelin, offer innovative models that reduce fossil fuels and increase their recycling and waste treatment efforts. They have a real comparative advantage in circular construction with the implementation of modular buildings.

Weaknesses: India remains a country with gaps. Its production lines are past, they should be modernized (water collection system of the groundwater). This country is still in a phase of rapid development and sometimes projects itself on the short to medium term, which is not enough to position itself in a circular economy. For its transport, India is systematically bottled up, which pollutes the territory considerably.

Threats: As a vector of potential future innovations but also of resource depletion, India still suffers from the weight of its constantly expanding population. To develop, it is obliged to increase all its sectors of activity: housing, food, mobility, education, industry. Its growing manufacturing ambitions are causing global waste management problems, and it is necessary to react very quickly. Global warming is a variable to be taken into account for this hot and arid region. In 2019 temperatures of up to 50°C have been recorded. The water tables are exhausted and the monsoons are getting shorter every year. Finally, 50% of the economy remains informal in India, about 40.5% in Chennai in 2020, which reflects a weak and precarious economic activity.

Summary table of the current situation of circular economy in India based on the case of the City of Chennai.



The key lies in stakeholder collaboration to achieve systemic change: connect producers, municipalities, informal sector, waste management companies and research.

Focusing investments in integrated post-use collection and sorting systems could support investment in the circular economy by the private sector. Education is an important part of the circular economy, we need to form a mindset, a consumption pattern, which would increase knowledge and bridge the skepticism about a dying planet.

In Chennai, Michelin teams met with village representatives and conducted soil surveys, population census, health and education infrastructure accessibility surveys, as well as numerous discussions and agreements with Indian politicians. 1 billion euros were spent to improve villagers' living conditions: electricity was restored or repaired, a biogas unit was installed. In the field of health, a clinic has been built with 30 doctors with different specialties, including an extremely efficient neonatal service. An important network of schools, in the secondary specific to new technologies, innovations, design, biotechnology engineering ... Thanks to trainings in France, the United States and Canada, the workshop managers have been able to benefit from 2 years of training in one of its research/production centers.

These circular economy principles must be integrated into the design of an organization's governance structure and decision-making processes. That is, the creation of value in the medium and long term. It is also crucial to collaborate with other companies even if they come from the informal sector, one is obliged to consider its proportion. It is the sector that feeds a large part of the poorest Indians.

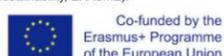
However, there is a need to maintain a clear, yet binding, roadmap that allows for the visibility necessary for development.

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« connect producers, municipalities, informal sector, waste management and research companies »



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