Towards a Cleaner India

The current state of Cleantech Industry in India and opportunities for Swiss startups and SMEs

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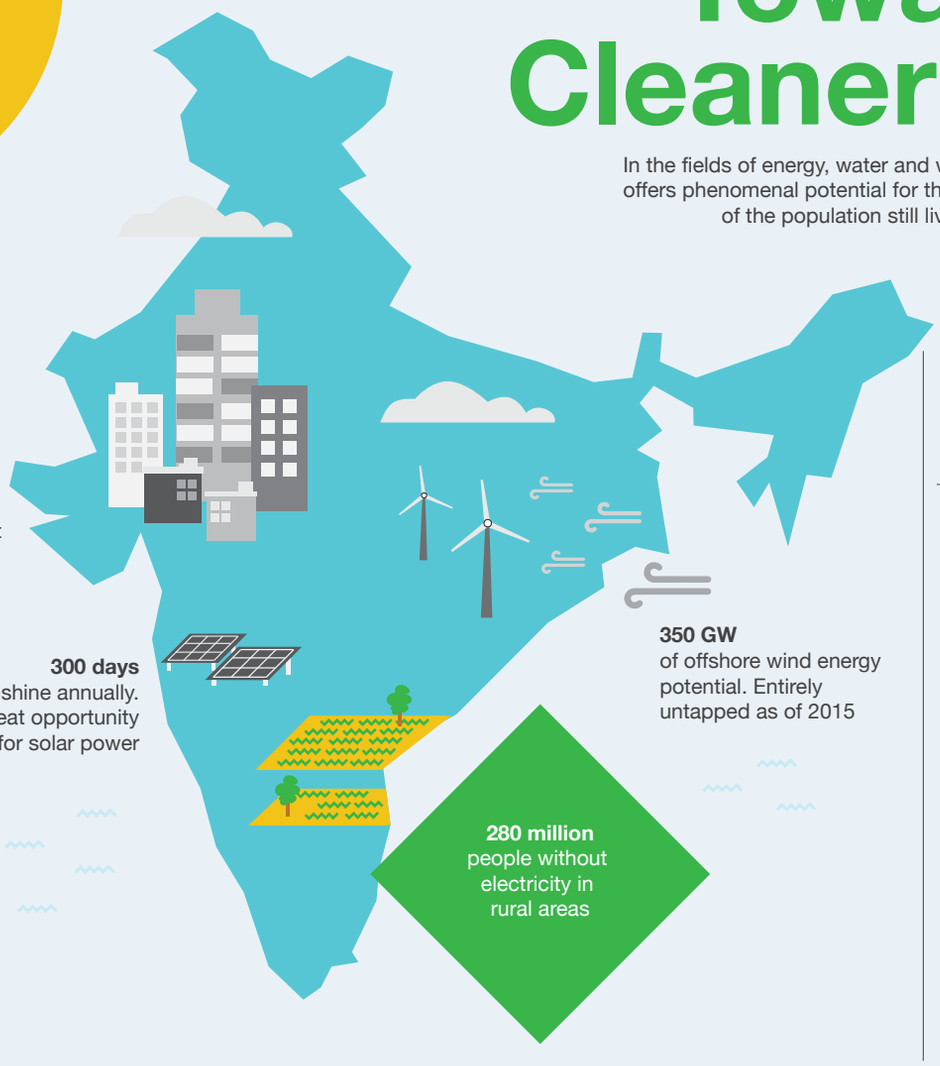
In the fields of energy, water and waste management, the country offers phenomenal potential for the Cleantech industry. A quarter of the population still lives without access to electricity.

Huge energy need



24 million people without electricity in urban areas

300 days of sunshine annually. A great opportunity for solar power

350 GW of offshore wind energy potential. Entirely untapped as of 2015

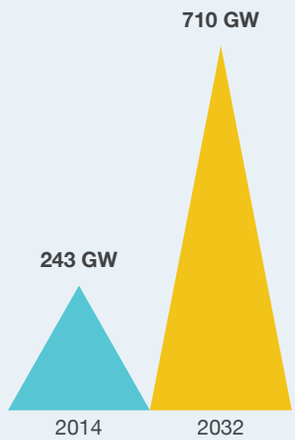
280 million people without electricity in rural areas

$100 billion

India's investment target in renewable energy over the next five years, towards 100 GW of solar and 60 GW of wind capacity by 2022

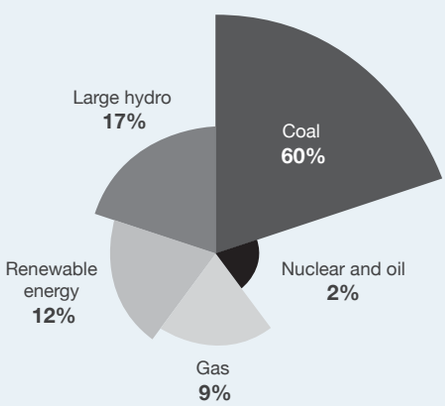
Electricity generation

Growth required to meet the rising demand



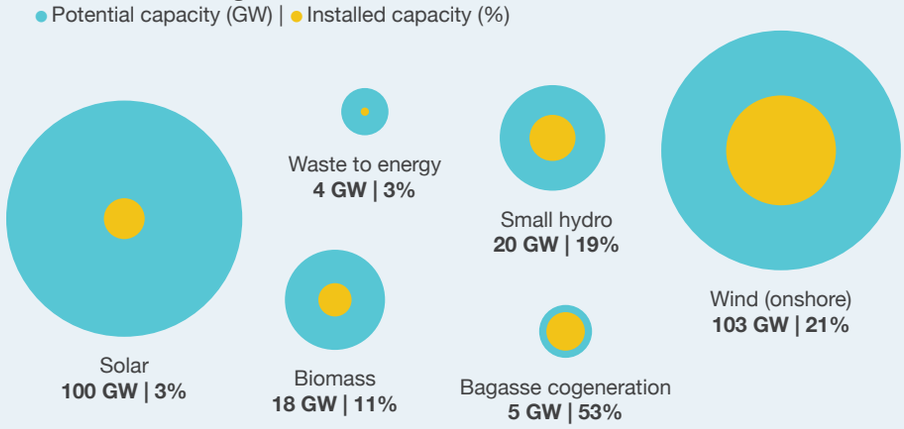
Energy mix

Installed capacity in 2014



Renewable energies

● Potential capacity (GW) | ● Installed capacity (%)



Water demand

Expected growth by 2030

2x Municipal and domestic

4x Industrial

Waste management

Expected annual growth of the market until 2025

+7% Municipal solid waste

+10% Electronic waste

Promising business areas

Solar power
Micro-solar stations that are located close to rural clusters

Wind energy
Technology and consulting, especially for offshore projects

Rainwater
Harvesting systems for new buildings; compulsory in 18 of India's 28 states

Biofuel
Small capacity plants that produce biofuels for local populations

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Read the full CTI Startup report on the Indian Cleantech industry at **www.swissnexindia.org**

EXECUTIVE SUMMARY: THE CURRENT STATE OF CLEANTECH INDUSTRY IN INDIA AND OPPORTUNITIES FOR SWISS STARTUPS AND SMEs

India has witnessed significant growth in the clean technology market over the past few years. A recent report submitted by Ernst and Young states that the share of renewable energy in the country's total energy mix grew from 7.8% (2008) to 12.3% (2013). In real terms, the growth of installed capacity for renewable energy in India has increased from 12.3 GW to 28.1 GW during the same period. Issues such as global warming, climate change, and pollution have exacerbated the need to adopt cleaner technologies, while the need for energy to power India's economic growth is rising. In order to provide a balance between economic growth, development and the environment; cleaner production strategies coupled with clean technologies is slated to increase resource efficiency, innovation, and reduced cost of environmental management.

Rapid economic growth has substantially fueled demand for energy countrywide. The heightened competition for procurement of fossil fuels, prices of petroleum, and stagnant domestic production of energy have propelled India into potential energy crisis. To this end, the need for adoption of cleaner technologies presents a relatively large opportunity for both domestic and international ventures looking to offer products and services in India. Renewable energy, energy efficiency, and water and water waste management in particular are the most important drivers of clean technology in India.

With this background, opportunities exist for Swiss entrepreneurs and SMEs to offer products as well as technologies in multiple areas including generation, distribution and storage of clean energy, as well as opportunities for recycling multiple forms of products. Specifically, opportunities exist for providing technology and consulting in the offshore wind energy market. In the biofuel space, there are opportunities for setting up small plants to cater to local populations. Water treatment offers opportunities in the area of technology transfer.

This report outlines India's Cleantech scenario, and is intended to give the reader a succinct overview of this sector, as well as areas of opportunity and challenges.

1.

India's Cleantech Industry

Past and Expected Performance, Scope and Size

Cleantech in India not only refers to just generation of Renewable Energy but also covers Water and Waste Water Management, Electronic Waste disposal and Recycling. The Clean tech range covers an array of products, services and processes that harness renewable materials and energy sources, dramatically reduce the use of natural resources, and cut or eliminate emissions and wastes.

The Renewable Energy (RE) market alone in India is estimated to be worth over US$ 17 Billion and is growing at an annual rate of 15%[1]. Of the total RE potential of the country (estimated to be around 200 GW, only 19.97 GW has been tapped, leaving a huge gap between potential and installed capacity. All forms of RE (wind, small-hydro, solar, biomass and waste to energy) have significant potential in India. The government is looking at attracting investments in RE of over US$ 200 billion for it to account for 15% of the overall energy basket.

On the Water and Waste Water Management front, the Indian Water Resources Ministry plans to invest US$ 50 Billion over the next five years in multiple geographies across the country.

While actual data on the generation or import of e-waste is currently not available for India, several studies conducted by various agencies have estimated that the volume of e-waste generated in India will reach 0.7 million Metric Tons (MT) by 2015, and 2 million MTs by 2025. This spells significant opportunities for ventures interested in recovering metals or plastics from e-Waste[2].

1.1 Current Market Potential and Scope in India

As mentioned earlier, the Indian renewable market is estimated to be worth over US$ 17 Billion, growing at an annual rate of 15%.

Wind energy remains dominant, and Swiss companies can take advantage of this market (India is one of the world's largest wind energy markets). India imports both finished goods as well as technology for wind turbines, windmill blades, wind battery chargers and converters.

The Government of India has stated that it has a target of creating 10 GW of biomass power by 2020. This includes the potential to generate energy from both household as well as industrial waste.

In a country which experiences, on average, 300 days of sunshine every year, the potential to generate solar power is significantly high. The Government of India has embarked on a plan to produce 100[3] GW of solar power by 2022. This is in addition to the potential for products that drive energy efficiency, which is projected to reach US$ 27 Billion in 2018. The market for technologies that target Green Buildings was US$ 3 Billion in 2012. It is estimated that Green Buildings could account for 20% of all construction in India by 2030 (an estimated 80

1 http://www.asa.in/pdfs/surveys-reports/power-and-energy-industry-in-india.pdf

2 http://borjournals.com/Research_papers/Ap_2013/1208M.pdf

billion square feet). Smart Grids, yet another innovation in the energy efficiency area, is at a nascent stage in India.

The water and wastewater management industry has seen a market potential of US$ 1.2 Billion in the past year, and is expected to grow at 10% for the next five years. Government projects contribute to a little over half of the market in terms of revenues. Increasing urbanization has led to growing demand in water and sewage treatment. Many manufacturing facilities have been forced to adopt water-recycling systems due to scarcity of water. The opportunity in water and wastewater management is exacerbated due to growing public concern, media pressure, and renewed legislation. Over 40% of this market is sustained by imports from the USA alone. In addition, the government of India plans to invest close to US$ 50 billion in this space in the next five years.

There is also scope for growth in solid waste management and electronic waste. The solid waste market is expected to grow at a CAGR of 7.14% by 2025 while electronic waste is expected to grow at 10.03% in for the same period, taking the potential waste management market in India to US$ 13.62 billion[4]. The new Indian government is launching a 'Clean India' mission, which aims to create Public Private Partnerships (PPP) with waste management companies to tackle the waste problem. According to the Central Pollution Board (CPB), the average solid waste generated in India varies from 0.21 Kilograms to 0.5 kilograms per capita per day.

In all, the scope of entry into India's clean tech market remains high, in a large and industrially - growing country, which will increasingly depend on clean methodologies for generation, transmission and management of power.

These scopes are further discussed in detail in the following section.

[3] http://www.asa.in/pdfs/surveys-reports/power-and-energy-industry-in-india.pdf

[4] http://www.greentechlead.com/recycling/indian-solid-waste-market-to-grow-at-7-14-cagr-by-2025-18255

2.

Cleantech in India

Scope, Challenges and Growth

2.1 **Renewable Energy**

India has the fifth largest power generation portfolio worldwide. Coal and gas are the popular sources of energy and account for 58% and 9% respectively of the total energy consumed in the country. India has been rapidly adding capacity over the last few years, with total installed power capacity growing to 223 Giga Watts (GW) in March 2013 from 98 GW in March 1998. Economic growth and increasing prosperity, coupled with factors such as rate of urbanization, rising per capita energy consumption, and a growing middle class are likely to push energy demand further in the country.

The Renewable Energy market is currently valued at US$ 17 billion and growing at an annual rate of 15%. The opportunity lies in the untapped potential in generating energy: only 19.97 GW out of the estimated potential of 200 GW have been utilized thus far[3]. Demand for power in India has been increasing rapidly due to industrialization and urbanization. The Government of India estimates that the country needs to add 150 GW of power capacity over the next five years - a US$ 200 billion investment coupled with many key incentives are in the pipeline to bridge the supply/demand gap.

The following is an overview of each renewable source of energy in India:

1) Solar: India has an estimated solar potential of around 100,000 MW, out of which the total capacity stood at 2,647 MW[5]. The potential for solar energy growth in India stems from two factors: first, around 304 million people in India do not have access to electricity[6], leaving a huge opportunity for renewable energy companies to tap. Secondly, it is estimated that India has around 300 sunny days, which amounts to around 1600 – 2200 kWh per square meter, translating to around 6 billion GW hours[7]. However, there are some challenges in maximizing this potential. India's land use per capita is relatively low at around 2.59 square kilometers per 1000 people[8]. Additionally, majority of solar power in the country is generated using photovoltaic (PV) technology, which has high distribution and transmission losses (around 40%). In this scenario, there is a real possibility for Swiss startups for setting up of micro-solar stations that are located close to rural clusters. This has proven to be a viable business model by renewable energy generating companies in India (mentioned in a later section).

2) Wind energy: As of 2014, India had a total of wind power potential of 102,772 MW with an installed capacity of 21,136 MW[9]. However, this only includes onshore wind turbines as offshore wind energy is still in the nascent stage in India. In late 2013, India created the National Offshore Wind Authority (NOWA) in order to carry out assessments and enter into contracts with offshore wind energy developers. India's offshore wind energy potential is slated at around 350 GW[10]. Setting up wind energy projects, however, do come with a few risks. Cost of debt in India via commercial banks proves to be unfavorable for companies investing in projects, despite government subsi-

[3] http://planningcommission.gov.in/hackathon/Energy.pdf

[5] http://www.greensummit.in/greensummit_2015/pdf/India-Renewable-Energy-Status-Report-2014.pdf

[6] http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/

[8] http://www.nationmaster.com/country-info/compare/India/Pakistan/Geography

dies. Margins of wind projects can also be impacted due to supply chain in India with shortages of critical components. A host of government incentives (covered in a later section) and favorable foreign policy on investments coupled with a huge untapped potential for wind energy poses a massive opportunity in this space. Swiss startups and SMEs can focus on entering the market in areas such as engineering design and consulting for setting up both onshore and offshore wind projects.

3) Biomass: In India, biomass provides fuel to more than 32% of the primary energy consumption (primarily as a cooking and heating fuel, and not as a fuel for electricity generation) and is available to almost 70% of the Indian population[5]. It accounts for 12.8% of the total renewable energy capacity installed. With an estimated availability in India of about 500 million tons of biomass per year, 120 - 150 million tons is available for power generation. The major advantages of entering the biomass sector in India are the policies and incentives. A company can claim 80% depreciation in the first year for equipment such as turbines and co-generation systems. Additionally, biomass projects attract income tax holidays of up to 10 years. However, it is to be noted that although biomass energy is free from fluctuation (like wind, which needs to be stored), there are several challenges associated with the supply of biomass. Agricultural biomass is only available for 2 -3 months in a year. Added to this there are logistical challenges of transporting fodder from farms to power plants. This unpredictability could lead to the inability of Swiss startups effectively using biomass as a source of energy generation.

4) Small Hydro: Small hydro projects are those that have a capacity of less than 25 MW. They are regulated by the Ministry of New and Renewable Energy as opposed to regular hydroelectric power, which is regulated by the Ministry of Power. Small Hydro Projects (SHP) are advantaged with not facing deforestation and resettlement issues like their larger counterparts and have the requirements to meet electricity requirements in remote areas. According to the International Journal of Electrical Engineering and Technology (IJEET), there are a total of 5415 potential sites to set up small hydro power plants in India. The total potential capacity of these sites put together will yield about 14.3 GW of power[8]. However, setting up small hydro projects are risky for international ventures – there are irregularities in the policy of allotting potential sites by state governments coupled with lack of inter grid connectivity due to land terrains for transmission of power. However, there is still potential to deploy small hydro projects as non-grid connected generators of electricity that cater to local clusters of inhabitation.

5) Biofuels: As biofuels seek to supplement petroleum and diesel, the intent of the Indian Government is to increase energy security while keeping a check on energy prices. However, the reality in India is that most biodiesel producers have started using inedible oils and oil waste (due to lower prices) instead of Jatropha seeds, which is an

[9] http://www.greensummit.in/greensummit_2015/pdf/India-Renewable-Energy-Status-Report-2014.pdf

[10] http://www.nrdc.org/international/india/files/renewable-energy-wind-financing-IP.pdf

[7] http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_New%20Delhi_India_6-20-2012.pdf

[8] http://www.slideshare.net/iaeme/future-potential-of-small-hydro-power-project-in-india

agro-product and therefore offers opportunities for agriculture too. Second-generation biofuels derived from non food sources such as Karanja oil (Pongamia oil derived from seeds of the Millettia tree) and micro algae are considered as the most suitable options for addressing energy security in India. However, the recent past has again seen the growth of small-capacity plants that produce bio-fuels for local populations (such as large privately owned transport fleets). This is definitely an area of interest, as international ventures (especially those with better technologies that offer higher yields) can enter this sector in a cost-effective manner.

2.2 **Water and Waste Management**

It is estimated that the Indian agricultural sector uses around 79% of the available freshwater in the country, but wastes one-half of it due to poor irrigation practices. At the same time, increasing urbanization is leading population away from the countryside to cities.
In the period between 1991 and 2011, the total number of cities and towns in India (with a population of over 100,000 people) has increased from 2250 to 7936 (as per the 2011 census indicators). The projected municipal and domestic water demand will also double by 2030 to 108 billion cubic meters, while demand from industry for water will quadruple to 196 billion cubic meters. Water companies from all over the world have established a presence in India to pursue an estimated 70 projects, worth several billion dollars. While these are large projects, the market is still open for rainwater harvesting systems. The Government of India has now mandated that all new buildings must offer rainwater-harvesting systems, and this system is now in practice in 18 of India's 28 states[10]. The possibility for international firms to jointly venture with Indian firms in the areas of water conservation (agriculture), re-use of water in industrial sectors, provision of better designs of rainwater harvesting systems and municipal and household water purification systems are some of the areas where possibilities of collaboration exist between Indian and Swiss entrepreneurs.

2.3 **Electronic Waste**

While accurate data on the generation of electronic waste in India is not readily available, multiple studies (based on obsolescence of electronic goods) have indicated that around 125,000 metric tons of e-waste are generated ever year and is growing at 20%[11]. Based on growth rates of the country's industrialization, it is estimated that India would generate around 1,850,000 metric tons by 2025[2].

The Government of India has taken legislative measures to manage this alarming growth. The Ministry of Environment and Forests (MOEF) is the nodal agency for policy, planning, and coordinating all environmental programs, and disposal and recycling of e-waste is

[11] http://www.aninews.in/newsdetail2/story202329/delhi-gets-an-innovative-model-for-safe-disposal-of-electronic-waste.html

[2] http://borjournals.com/Research_papers/Ap_2013/1208M.pdf

[10] http://ebtc.eu/pdf/111031_SNA_Snapshot_Water-and-waste-water-in-India.pdf

under their purview. Other bodies such as the Central Pollution Control Board (CPCB) and the State Pollution Control Boards (SPCB) are enforcing agencies for the MOEF plans. Under the guidance of the MOEF, a number of R&D projects have been conducted in various institutions in India. At the National Metallurgical Laboratory, indigenous technology has been developed to recover metal contents from e-waste with a recovery rate of 90%. At the Center for Materials for Electronics Technology, studies have been carried out to recover metals from printed circuit boards (PCBs). At the Central Institute of Plastics Engineering and Technology, research has been conducted to recover various forms of plastics from e-waste for reuse.

With all this, there are opportunities for Swiss ventures to provide technology and participate in extraction, re-use and disposal of e-waste in India.

Overall, there is tremendous scope for Swiss startups to enter the aforementioned segments of clean technology. However, with each area having its unique set of challenges, it critical to have a deeper understanding of the market in order to carve out a niche. Notwithstanding the challenges, newer business models coupled with favorable government policies pave the way for disruption in the clean technology space. With Swiss startups producing robust clean technology startups, there exists a significant opportunity to scale for the coming decade.

3.

Human Employment and Infrastructure Support in India

Human employment plays a pivotal role in shaping the future of any industry. It is one of the most basic resources an economy can use to stimulate growth in a particular sector.

Much has been made of India's demographic dividend in the past couple of years. Data taken from the Population Census in 2011 shows that India's working age population (15 - 64) now constitutes 64% of the population. Added to this, globalization and market forces have contributed significantly to creating job opportunities in Cleantech sector.

India's support (both manpower and infrastructure) for Cleantech, both in terms of available manpower and technology, has significant potential.

Available manpower: The Cleantech industry in India employs mostly people with graduate degrees and diplomas, across multiple domains. Indian higher education universities graduate an estimated 27.5 million students (and growing) every year. These are graduates who span multiple disciplines: Arts, Commerce, Social Sciences, Engineering and Technology, and Science. It has been estimated that close to 30% of the graduates from this population have either Engineering and Technology or a Science Degree: almost 9 million graduates every year.

While it is true that many of these Engineering and Science graduates seek a career in ICT in India, many of them do not achieve that ambition. Two other sectors in India, namely Biotechnology and Cleantech offer them similar returns on their career ambitions.

In addition, the Cleantech industry has the potential to pick the best students from other relevant streams such as Humanities, Commerce and Social Sciences (estimated at about 45% of the graduating population, or close to 11 million graduates), for relevant jobs within the industry.

There is significant support available for startups in Cleantech space from Indian Universities. As of 2011, there were 621 Universities (multiple discipline), 32,947 colleges and 11,095 independent institutions for higher education operating in India. Many of these are supported by Government grants to promote entrepreneurship across domains, including Cleantech. It would be advantageous for Swiss Cleantech ventures to leverage these advantages from a geographical perspective.

4.

Cleantech Intellectual Property Scenario in India

India has taken strong steps in strengthening IPR in the country. The rise in Indian economy is a clear impact of strong Intellectual Property policies. The importance of intellectual property in India is well established at all levels - statutory, administrative and judicial. Indian patent laws were promulgated in 1856. The new patent laws were made after the independence in the form of the Indian Patent Act 1970. January 1, 1995 brought with it the full impact of WTO (World Trade Organization) along with the Agreement of Trade Related Aspects of Intellectual Property Rights (TRIPS). The Indian Patent Act 1970 has now been radically amended to become fully compliant with the provisions of TRIPS. India is also a member of the Paris Convention, Patent Cooperation Treaty and Budapest Treaty. Recently, India signed the Madrid Protocol, which further enhances the applicability of Trademarks in 89 countries. India is a member of the Berne Convention, an international treaty on copyright. India is party to the Geneva Convention for the Protection of rights of Producers of Phonograms and to the Universal Copyright Convention.

Broadly in India, intellectual property is divided into two categories: industrial property and copyright. Industrial property includes patents, trademarks, industrial designs and geographic indications while copyright include creative works like books, poems, plays, films, musical works, computer software and artistic works.

4.1 **Patent**

The laws pertaining to Patent in India are governed by the Patents Act, 1970 and have been amended twice by The Patents (Amendment) Act. Both Indian nationals and foreigners can apply for patent in India. Under the Paris convention an inventor/ assignee can file a patent application within 12 months in other member countries from the date of priority. This period can be extended to 30 months under the PCT (Patent Cooperation Treaty) and the patent application is termed as Internal Phase application. The inventor/ assignee can file the National Phase application in each of the PCT member countries within 30 months from the date of priority. However in India, the inventor/ assignee can file the National Phase application within 31 months from the date of priority.

Software per se cannot be patented in India and there are explicit provisions against patenting of algorithms and business methods. Indian Patent System follows TRIPS guidelines as far as software patents are concerned. Term of the patent in India is 20 years from the date of priority.

4.2 **Copyright**

India has a very strong and comprehensive copyright law based on Indian Copyright Act (1957), which was further amended in 1983, 1984, 1992, 1994 and 1999. The general copyright term of protection in India is for the life of the author plus 60 years. Computer

programs and software are covered under literary works and are protected in India under copyrights. For cinematographic films, records, photographs, posthumous publications, anonymous publication, works of government and international organizations the term is 60 years from the beginning of the calendar year following the year in which the work was published. For broadcasting, the term is 25 years from the beginning of the calendar year following the year in which the broadcast was made.

4.3 **Trademarks**

India has taken steps towards fulfilling its international obligations. Consequently, the Indian trademark law has now become fully compatible with the International standards laid down in the TRIPs Agreement. India's obligations under the TRIPS Agreement for protection of trademarks, inter alia, include protection to distinguishing marks, recognition of service marks, indefinite periodical renewal of registration, abolition of compulsory licensing of trademarks, etc.

As per section 18 (1) of the Trademark Act, 1999, any person claiming to be the proprietor of a trademark used or proposed to be used by him may apply in writing in prescribed manner for registration. The validity period of registration certificate is for ten years but may be renewed from time to time for an unlimited period by payment of the renewal fees.

4.4 **Protection of Integrated Circuits Layout Design (IC)**

India has now in place Semiconductor Integrated Circuits Layout Design Act, 2000 to give protection to IC layout design. The term of the registration is 10 years from the date of filing or from the date of first commercial exploitation.

4.5 **Industrial Design**

The existing legislation on industrial designs in India is contained in the New Designs Act, 2000. The total term of a registered design is 15 years. Initially the right is granted for a period of 10 years, which can be extended, by a further period of 5 years.

4.6 **Government Initiatives and Policies**

The policy and regulatory environment is a critical factor to stimulate the acceleration of clean technology in India. The current clean technology policy is governed by both Central (Federal) and State level jurisdictions.

The Central Government introduced the National Action Plan on Climate Change (NAPCC) in 2008. It outlines a national strategy that aims to adapt to climate change and enhances the ecological sustainability of India's development path. Under this plan, the government has identified certain core "National Missions" that are spread across sectors in the clean technology industry.

4.7 **Jawaharlal Nehru National Solar Mission**

The JNNSM is one of the most significant drivers for the development of solar energy in India. It is estimated to add a total capacity of 2 GW by the year 2020, spread out in three phases. The Central Government has opened biding for projects that fall under the purview of the JNNSM. The first batch of the first phase registered 333 project developers with a combined potential of 1,815 MW saw winning quotes of US$ 0.18 per kWh. The average tariff of US$ 0.19 was substantially lower than the benchmark price of US$ 0.29. Companies can either avail accelerated depreciation or GBI, but not both. This incentive is over and above the tariff approved by State Electricity Boards.

4.8 **Generation Based Incentives (GBIs) for Wind Energy**

A generation-based incentive has been implemented to foster wind power projects that generate electricity rather than just add capacity to the overall renewable energy scenario in India. Under the scheme, GBI will be provided to wind electricity producers at US$ 0.009 per unit of electricity fed into the grid for a period not less than 4 years and a maximum of 10 years in parallel with accelerated depreciation on a mutually exclusive manner, with a cap of US$ 1,000 per MW.

4.9 **Hydropower Policy**

The New Hydro Power Policy of 2008 has been drafted out of a need for a separate policy framework in the new market environment. It seeks to address the needs of sharing costs of geological and hydrological data and proper sequencing of implementation. Thus, a coordinated release of water for optimized generation is achieved without straining the infrastructure. This policy also unifies state and central policies to facilitate project development through price regulated contracts in contrast to the earlier framework, where distribution licenses were procured through competitive bidding alone. This provision is expected to improve financing of projects

4.10 **Energy Efficiency**

The Central Government has set a comprehensive strategy aiming to encourage energy service companies by preparing structured programs to leverage international financial instruments including the Clean Development Mechanism (CDM) specified by the Kyoto Protocol (IPCC 2007). This enables companies to generate Certified Emission Reduction units, which can be further traded in emission trading schemes. Further, the government has also set up partial risk guarantee funds to protect energy efficiency companies.

4.11 **Regulatory Framework Policy**

Renewable Energy pricing falls under the purview of Electricity Regulatory Commissions (ERC's) in the states of India. As per the Electricity Act of 2003, Section 62 (1) (a) stipulates that tariffs for supply of electricity by a power generation company to a distribution licensee is to be determined by the Appropriate Commission (in this case, ERCs). Sales of renewable energy based power are predominantly at the state level; State ERC's have the primary jurisdiction on determining tariffs.

4.12 **Policy and Regulatory Environment for FDI and Investment in Clean Technology**

India is among the more liberal countries that has liberal and transparent policies in Foreign Direct Investment (FDI). Most of the sectors in India allow 100% FDI unless the activities or items require an industrial license. This means that investment does not require prior approval from the Government. The Renewable Energy Industry is allowed 100% FDI.

However, FDI in the cleantech space in India will require government approval if the foreign venture proposes to acquire equity stock in existing Indian companies where the SEBI (Securities and Exchange Board of India) is a regulatory authority (primarily for public listed companies).

5.

Startup Scenario in Cleantech Industry in India

5.1 **Venture Capital and Investment Scenario**

In the past few years, venture capital investment in the clean technology space has been on the rise, albeit taking a fall in the year 2012. According to research firm Mercom Capital Group, the total VC investment for the solar energy sector in the year 2014 amounted to US$ 432 million with 26 clean technology based companies receiving funding. The smart grid sector also attracted significant venture capital investment – in 2014 there were a total of 73 deals totaling US$ 383 million. Solar energy startups in particular are attracting large amounts of funding. Some notable examples are:

1) Welspun Renewable Energy rasied US$ 24 million from GE Energy Financial Services

2) CaptureSolar Energy rasied US$ 125 million from PG Concept, a Cyprus based PV solutions provider

Despite a decrease of global venture capital funding by 50% in the clean technology space, India is still attracting large amounts of investment[13]. Although most of the specialized funds allocated for clean technology and clean energy in India are global offshoots, India is emerging as the key target for investment. The last 5 years in particular, has seen significant policy changes driven by the government to incentivize investors in this line of business.

Here is a list of investors that are active in the technology space including clean technology:

Name of the firm	Investments made
Accel Partners (VC)	TeaBox, ChargeBee, CommonFloor, MobStac, Konotor, Taxiforsure
Sequoia Capital (VC)	Fashionandyou, Octro, Akosha, Knowlarity, TinyOwl, Freecharge, Newshunt
Tiger Global (VC & PE)	Quikr, Ola Cabs, CarTrade, Flipkart, Grey Orange Robotics
IDG Ventures India (VC)	Silveredge, Peel Works, MyNoticePeriod, e-Shakti, iProf Learning, FieldEZ Technologies
SAIF Partners (VC)	Appiterate, Bookmyshow, Touchtalent, Urbanladder, CapitalFloat
Indian Angel Network (Angel Investment)	Fareye, Zippr, Hashcube, XSI semiconductors, Uniphore Software
Blume Ventures (Angel Investment)	Greytip Software, WeAreHolidays, Hashcube, Instamojo, VoxPop
Unitus Seed Fund (seed stage up to $100,000)	Jiffstore, mGaadi, Medypal, Blowhorn, Milaap, Caravan

[8] Mercom Capital Group

5.2 **Success Stories**

Clean technology in India has only existed in the mainstream market for about half a decade. Therefore, success in this field is measurable in two ways. In the first way, a startup is considered successful when it receives private equity funding based on promising potential technologies that could significantly reduce the cost of deployment. The second way in which a startup can be considered successful is when it comes up with an innovative way through its business model to provide clean technology access in a large scale and create real impact. Based on these measures, here are some success stories in the Indian clean technology space, categorized by stage of the venture and a note on the sector they focus on.

Private Cleantech Ventures in India	**Investments made**
Azure Power India Private Limited.	Solar
Auromira Energy Company Private Limited	Biosmass and small hydro
Sunnova Energy	Solar
Sunrun	Solar
Greenko Energies Private Limited	Small hydro and biomass

Interestingly, most of the private funded ventures operate in sectors other than the wind energy space.
Here are some of the upcoming startups in the clean tech space:

1) Avani Bio Energy – Avani Bio creates conservation based livelihood opportunities by using renewable energy and other technologies to enhance the lives of low-income households in rural regions. They raised an initial round of US$250,000 in 2012 from Acumen Fund.

2) Husk Power Systems – Husk is a renewable energy startup engaged in rural electrification and power generation. They have raised US$5 million from Acumen Fund and Bamboo Finance.

3) Ecozen Solutions – Ecozen makes solar – powered cold storage units for farmers and also makes irrigation systems that run on solar power. They raised US$1 million from Omnivore Ventures.

India's clean technology sector is attracting several startups from US and Europe. Some of these are listed below:

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India's clean technology sector is attracting several startups from US and Europe. Some of these are listed below:

Fenix International – Fenix International was founded in 2009 and is a San Francisco based clean technology startup. Its flagship product 'ReadySet' is a durable device that can charge phones, medical devices, radios, lights, and batteries while it can recharge itself using solar power. According to a World Bank report, there is a captive market of nearly 100,000 villages in India.

Simpa Networks – Simpa Works is a venture backed clean technology company in India. The company has come up with a new way to sell the solar energy apparatus. Targeting the off grid solutions market, the venture is estimated to have a value of US$ 2 billion[12]. Founded by a foreign team, Simpa's business model follows compelling and flexible pricing model of prepaid cell phones.

ToughStuff - ToughStuff, a four year old startup uses an approach that is different from the ones mentioned above. It uses a market-based approach that employs local villagers, selling basic solar panels and focusing on small-scale personal electricity use. Their flagship product is a one watt thin-film solar panel that is flexible and water proof.

[12] http://articles.economictimes.indiatimes.com/2012-01-13/news/30623761_1_solar-power-india-s-national-solar-mission-harish-hande

5.3 **Startup Ecosystem**

India offers a healthy start-up ecosystem for ventures in the clean tech area. While many academic institutions offer incubation support, the Government of India through its many departments including the Department of Science and Technology (DST), the National Science and Technology Entrepreneurship Development Board (NSTEDB) and the Ministry of Small and Medium Enterprises (MSME) offer various forms of startup capital to specific ventures. The Ministry of New and Renewable Energy (MNRE) too offers support in the form of startup capital to select ventures.

In addition, the availability of trained engineers as employees for ventures in clean tech environment again supports the startup ventures in this space.

Service provider support for startups has seen a steady rise with the ecosystem. Many firms that deal in law, intellectual property, accounting, financial, and payroll services perceive an increasing demand stemming from startups. As the market size for providing ancillary services such as accounting and tax auditing increases, more firms are likely to enter the fray to cater to the 'startup' market.

Between the years of 2012 and 2015, the number of incubators and accelerators that support early stage entrepreneurs has grown exponentially. Incubators usually work with companies that are in the earlier stage and are often based in campuses of academic institutions. Accelerators, on the other hand, work with entrepreneurs that already have a proof-of-concept and accelerate them to get customer traction. The following is a list of some of the well-known startup incubators and accelerators:

1) Microsoft Ventures (www.microsoftventures.com)
2) GSF Accelerator (www.gsfindia.com/accelerator)
3) TLabs (www.tlabs.in)
4) The Startup Center (www.thestartupcentre.com)
5) NASSCOM 10,000 startup warehouse (www.10000startups.com)

6.

Opportunities and Challenges in India in Cleantech Sector and Entry Barriers

Broadly, there are large opportunities across multiple sectors (clean energy, energy efficiency, and waste management) for clean technology adoption in India. Acute shortage of power and poor grid connectivity are the cause of a burgeoning energy demand in India.

While there are a number of advantages and opportunities for ventures seeking to enter the Cleantech sector in India, a number of challenges still remain. While a majority of payments made in India in the B2C (Business to Consumer) space are made online – they are made either in advance or at the time of delivery of the product or service, in the B2B (Business to Business) domain, however, payment cycles typically extend from 30 to 60 days. For example, if a startup is selling its product or service to a large enterprise, it can expect to collect revenue a month or two after delivering the service or product.

Cash flows for Swiss ventures in the Business-to-business space will need to be carefully managed. In the case of Business to Government transactions, cash flow periods from the government in return for products or services delivered can be long, and it is recommended that early-stage startups have a long term strategy for such projects. Finally, it is advisable that payment terms are signed off between the start-up and a business consuming the product or service through a legally enforceable contract.

A weak transmission infrastructure limits the participation of private organizations in public grid operations. This, coupled with transmission losses and pilferage, can be detrimental to early-stage startups entering the power generation arena.

Poor payment practices from State electricity boards can lead to cash flow crunches and dampen investor enthusiasm. In addition, a weak Rupee can lead to short-term pressure on project financing.

Differences between states on policy (both agreement and implementation) add to confusion on where Cleantech projects can be implemented. This includes policies on acquisition of land for wind, solar and small hydro projects which can change drastically from state to state.

For Biomass, lack of predictability of raw material availability can lead to pressure on both generation as well as pricing. Feedstock management in this area can again lead to wildly fluctuating prices.

While other Cleantech sectors such as water and wastewater treatment, and recycling do see consistent supply, issues of pricing remain. These are cost-sensitive areas of operation for a new venture to make a mark in.

7.

Conclusions and Recommendations

It is important that Swiss startups seeking growth opportunities in India have a long-term vision as far as India as a potential market is concerned. Rapid technology developments, increasing demand in Cleantech, a large number of small and medium sized businesses (45 million, next only to China in the world), favorable government policies and regulations make India one of the most favorable destinations in the world. Several companies' revenue in India has grown by 7 to 15 percent compounded annually in past ten years - almost twice the rate of the parent company in the same period. Several international companies have succeeded only in niches and not achieved large-scale market leadership, while others haven't maximized economies of scale or tapped into the country's breadth of talent. To be successful in India, the Swiss startups will have to empower their local operations, understand Indian culture and the need of the Indian consumer and businesses, and invest in local talent. Depending on the business model, the Swiss startups will also have to explore joint-venture approaches with Indian companies. Their success in India is more likely to be achieved by having a superior understanding of the market.

The important factor for Swiss startups to be successful is to learn to do business the Indian way by understanding Indian market, rather than imposing global business models and practices. As India's Cleantech sector continues to grow year after year, it has presented a vast range of opportunities for entrepreneurs and startup companies to grow in India. Every component in the startup ecosystem including angel investors, incubators, large enterprises and the government have made the business environment conducive to achieve scale. The government has enforced various policies and provided fiscal benefits specifically for the Cleantech sector to maintain its momentum in the years to come. Further, the government has taken steps to pave the way for foreign firms looking to conduct business in India in the Cleantech sector. It is extremely important for Swiss startups to understand the challenges related to scale in India. Federal regulations for renewable energy in India varies from state to state, which means what might work in one state might not work in another, even from a fundamental business model perspective. Therefore, with sound analysis of business models, the possibilities are significantly high for Swiss startups to be successful in India.


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