BUSINESS PLAN

GREEN SCREEN

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DELIVERING LIFE-SAVING HEAT RELIEF FOR DELHI'S MOST VULNERABLE

DATE

8 DECEMBER 2017

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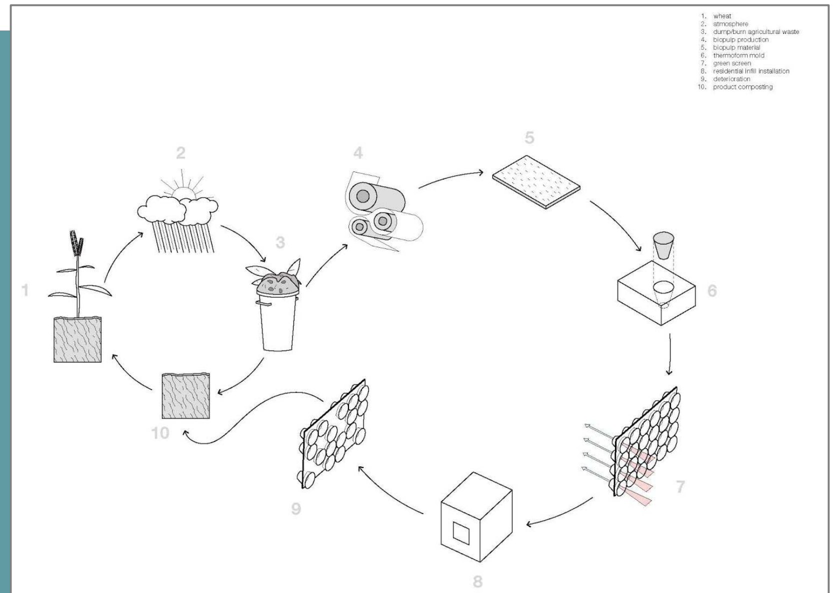
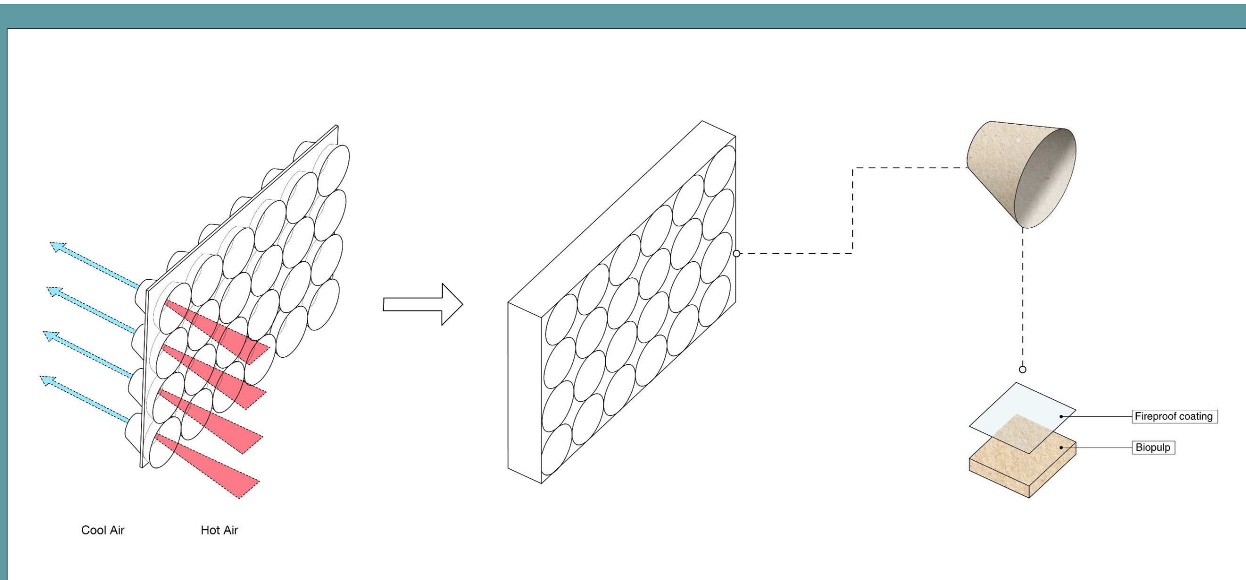
EXECUTIVE SUMMARY



Green Screen is a zero-electricity, modular air ventilation panel made from agricultural waste designed to serve the slum populations of New Delhi, India. The product simultaneously addresses two key factors driving negative health outcomes in New Delhi: the climatic issue of increasing heat waves and the ongoing agricultural issue of waste management contributing to acutely concentrated air pollution within city limits. Slum communities are particularly susceptible to heat-induced morbidity and mortality and represent approximately 50% of Delhi's total population. The Green Screen provides an alternative solution to the current practice of agricultural stubble burning while supplying vulnerable residents with a means of affordable, sustainable in-home heat reduction. With Green Screen, wheat straw is converted into biopulp and molded into an easily-installable screen that is geometrically optimized to allow the "Loo" winds typical of New Delhi summers to ventilate slum dwellings. After the first five years of development, Green Screen production will be scaled up and diversified from just a modular wall panel unit to a portable tent marketed toward day laborers and an inhabitable structure for community gatherings.



THE PROBLEM

Climate change has directly contributed to a dramatic rise in heat-related morbidity and mortality worldwide. Currently, more than 30% of the global population is exposed to at least 20 days per year of heat wave conditions, in which daily mean surface air temperatures and relative humidity combine to produce deadly effects.[i] The Indian city of New Delhi has experienced a series of devastating heat waves in recent decades, with deaths reportedly concentrated amongst slum populations living in informal and unregulated housing structures. Adverse health outcomes due to heat waves are projected to skyrocket in the city by 2080; heat waves have also been shown to intensify ground-level ozone, which is formed when hydrocarbon and nitrogen oxide pollution combine in presence of heat.[ii] The impact of heat waves on extraordinarily high levels of air pollution already present in New Delhi will exacerbate the health impacts of heat alone.

Poverty, and its complex relationship to societal standing, quality of infrastructure, and access to services, clearly drives disparities in population-level health outcomes in New Delhi during heat waves. With limited access to electricity and insufficient funds to erect housing structures that promote cooling, the most vulnerable suffer. Current efforts across the country to combat the negative effects of heat waves are largely policy-oriented, and focus on the dissemination of early warnings, trainings to improve health system response, and designation of 'cooling' stations. As increases in frequency and duration of heat waves are anticipated to coincide with a continuing influx of migrant populations into informal urban settlements, an affordable solution that can be implemented at the household level is urgently needed**.**

GLOBAL IMPACT OF HEAT WAVES IN A CHANGING CLIMATE | The occurrence of extreme climate events worldwide is anticipated to intensify as average temperatures rise due to global warming.[iii] Heat waves in particular are expected to occur worldwide with greater frequency if current levels of greenhouse gas emissions are maintained. By the year 2100, three out of four people on Earth could be subject to at least 20 days per year of the extreme heat associated with deadly heat waves.[iv] According to the U.S. National Weather Service, an extreme weather event meets the definition of heat wave if there is "an extended period of unusually high atmosphere-related heat stress" which necessitates modification in lifestyle and can cause adverse health consequences for the exposed population.[v] Other meteorological departments have classified heat waves as periods during which average temperatures exceed 46°C for more than five consecutive days.[vi] Heat waves are detrimental to human health, as exposure to combinations of high heat and humidity impede a body's ability to cool itself effectively through evaporation of perspiration.[vii] These weather events are associated with increases in temperature-induced cerebrovascular, cardiovascular, genitourinary, infectious, and respiratory disease outcomes in addition to heat exhaustion and heat stroke. [viii]

An increase in heat waves is expected to occur across the globe, although urban areas and countries geographically situated within the tropical range will be more prone to extreme heat.[ix] There is limited literature available assessing the impact of heat waves on populations in developing countries; however, research in Pakistan and Bangladesh demonstrates high rates of morbidity and mortality during heat waves in elderly, young, and poorer populations within urban settings with limited access to electrical grids.[xxi] The combination of high temperatures, extreme crowding, weak infrastructure, and limited mechanical relief means that even a small increase in mean temperature can lead to a large increase in heat deaths in certain contexts, such as New Delhi.[xii]

While evidence points to greenhouse gas emissions as the driving force behind worldwide temperature increase – and related heat waves – countries worldwide are reluctant to implement emissions caps necessary to ultimately reduce the morbidity and mortality caused by heat waves, including India. Under growing pressure to join in an international accord to mitigate the effects of climate change, countries such as India have signed the Paris Treaty with plans to reduce rates of greenhouse gas emissions.[xiii] However, an international enforcement body to ensure all signatories work towards meeting emission reduction promises remains absent.[xiv] Upstream voids in the developing country context also complicate heat wave response, including inconsistent and insufficient power supplies to vulnerable communities in urban settings. Given these voids, the solutions that have been tried and tested in developed countries, such as green roofs, complex and/or electricity-dependent cooling systems, and emission reductions may not be practical or enforceable in a low-resources setting.

FOCUS ON URBAN INDIA | In May 2015, India tackled the fifth-deadliest heat wave in world history. Temperatures in New Delhi remained 10 degrees above average for two weeks uninterrupted, contributing to 2,500 deaths.[xv] This was only India's second-deadliest heat wave on record. In 2003, heatwaves caused the deaths of 3,054 people and in 2013, over 1,500 individuals were killed across the country due to extreme heat.[xvi] Current research predicts a rise in frequency and intensity of heat waves in India over the coming decades. According to the India Meteorological Department, New Delhi is now experiencing more days above 98°F within a calendar year than ever before.[xvii] Annual spatial warming in India is projected to be between 2.2° and 5.5°C by the end of the 21st century.[xviii] Urban areas in India will experience the highest increases in heat-related mortality as a result of global climate change; research predicts that mortality rates in New Delhi will increase 140% by 2080.[xix] A number of complicating factors unique to New Delhi will drive high mortality due to heat waves. The high concentration of air pollution has historically contributed to higher death toll. During the 2015 event, data monitors indicated that 24-hour average ozone and fine particulate matter ($PM_{2.5}$) concentrations were between 50 and 235 micrograms per cubic meter, or well above WHO safety guidelines of 25.[xx] Furthermore, the urban health island effect in New Delhi will exacerbate heat wave health risks. The Energy and Resources Institute points to concrete and asphalt surfaces in the city as heat traps which have driven surface temperature increases by 2-3°C since 1998.[xxi] Urban areas in India have also been shown to experience nocturnal temperature elevations of 5-7°C compared to rural counterparts.[xxii]

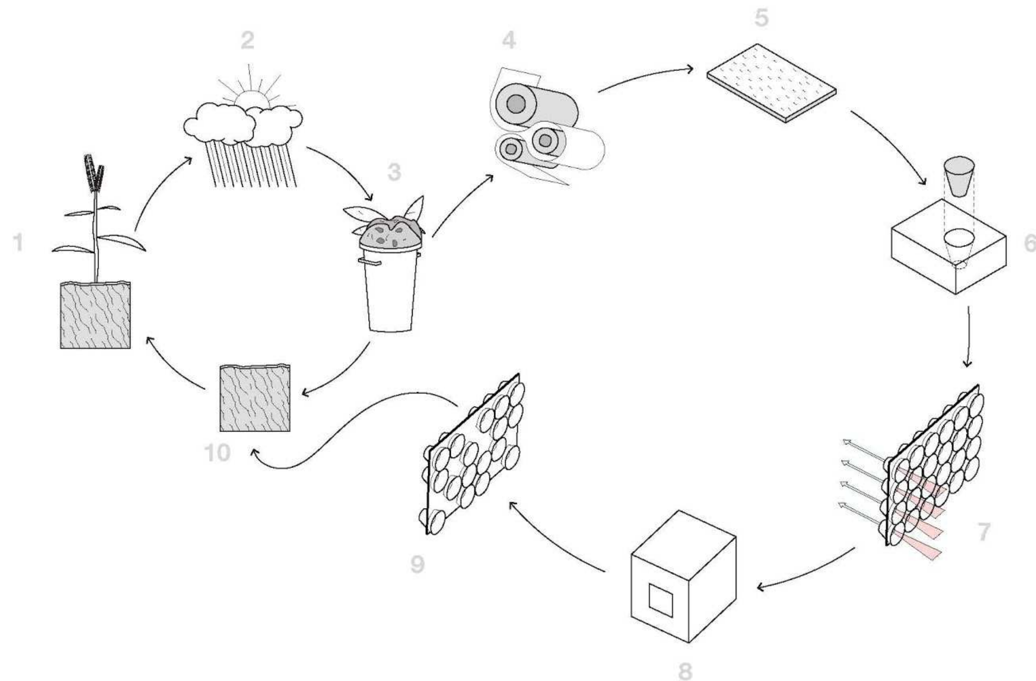
VULNERABLE POPULATIONS & CAUSAL FACTORS | While literature on vulnerability to heat waves in India is largely unavailable, one study in the city of Ahmedabad determined that urban slum households are particularly susceptible to heat-induced morbidity and mortality.[xxiii] Weak Water, Sanitation, and Hygiene infrastructure and crowding are proximate causes that heighten the likelihood of negative health outcomes. The odds of heat-related illnesses also increase by over 50% for slum residents with pre-existing chronic or infectious conditions.[xxiv] Deaths during the 2015 heat wave were reported to concentrate in economically underserved, elderly, outdoor day labor, and homeless populations.[xxv]The nature of home and work environments for slum households also contributes to vulnerability. Most slum residents have limited access to air conditioning; poor internal ventilation and widespread use of heat-trapping building materials such as tin roofs or PVC tarps further impede ability to cool the home.[xxvi] The Ahmedabad study determined that approximately 90% of employed slum residents worked outdoors during heat-wave prone summer months, often engaging in construction or heavy labor that escalates likelihood of heat stress.[xxvii] Such daily wage laborers are not empowered to advocate for water breaks or seek respite from the heat, which increases the need to eventually scale-up Green Screen into a portable tent.

EXISTING STRATEGIES & LIMITATIONS | Nationally, the Indian Meteorological Department has committed to provide expanded heat forecasts to 300 cities.[xxviii] The National Disaster Management Authority has released "Guidelines for Preparation of Acton Plan-Prevention and Management of Heat Wave." This plan focuses on early warning systems, capacity building programs for health care professionals, dissemination of public awareness messaging, collaboration with civil society to improve temporary shelters and water delivery systems.[xxix] As of 2017, 11 states and 17 cities in India have adopted Heat Action Plans. The first to do so was Ahmedabad after its 2010 heat wave. The Ahmedabad Municipal Corporation (AMC) has now mapped areas with high risk populations, designated public cooling stations, and instituted a system for media-generated heat wave alerts.[xxx] The 2017 plan introduces a "cool roofs" initiative to install tiled covering or paint more than 3,000 roofs in slum communities white.[xxxi] AMC has worked closely with the Indian Institute of Public Health, PHFI, Natural Resources Defense Council, and Mt. Sinai School of Medicine to develop its Health Action Plan.[xxxii] While these current initiatives prioritize awareness messaging and behavior change, there is no focus on risk alleviation for daily wage laborers, availability of water supply or cooling spaces in slum communities, or innovation in housing design to reflect solar energy or reduce internal temperatures. Despite progress in implementing policy change surrounding heat wave protocols, high mortality rates persisted during the 2017 heat wave. Evidently, there is a critical need for a product that can contribute to resilience building within vulnerable slum communities in urban centers such as New Delhi.

PROPOSED SOLUTION

1. wheat
2. atmosphere
3. dump/burn agricultural waste
4. biopulp production
5. biopulp material
6. thermoform mold
7. green screen
8. residential infill installation
9. deterioration
10. product composting

OVERVIEW |



- **Identification of Problem:** *Heat-island effect in New Delhi in the summer worsened by heatwaves increasing in strength and frequency / urban air pollution in the winter caused by controlled burning of waste products to prepare for new planting*

- **Intervention on Practices:** *Eliminate the need to burn agricultural waste by generating a product that uses "stubble" as a building material*

- **Addressing Intractable Issues:** *Realizing the potential for biopulp (a paper-like product made from agricultural waste), Green Screen uses the science known as Bernoulli's principle to funnel and cool air*

- **Means for Implementation:** *The biopulp material is made rigid through thermo-molding and can withstand outdoor use through waterproof and fireproof and fireproof coating. Design will be scaled in the following ways:*
    - <u>Window-sized Unit</u> – *Modular units of portable size that can be installed in walls of informal settlements (half of Delhi's population, 9 million people)*
        - <u>Wind Cowls</u> – *An addition attached to wall units that increases effectiveness at the roof level to maximize temperature change*
    - <u>Tent-sized Unit</u> – *A larger iteration of the screen technology that marketed toward day laborers and mobile populations – designed as a self-supporting 'a-frame'*
    - <u>Wall-sized Unit</u> – *A full-scale wall that could be used for larger constructions with appropriate supports*

SOLUTION IN DETAIL | Green Screen is a non-electrical, modular "air conditioning" panel made from agricultural waste that has been converted into biopulp. In our product, conical shapes along a fixed-dimension panel funnel hot air into small openings to create a cooling effect (fig 1). This takes advantage of the hot and dry summer winds or "Loo" that are experienced along the Indo-Gangetic Plain. The solution considers the planetary scope of human activity by merging waste maintenance - an agricultural issue - with air-pollution reductions - a global issue - with slum improvements - an urban issue. Green Screen simultaneously addresses the need for better climatic comfort and air-quality through an integrated approach operating at different scales and over different timeframes.

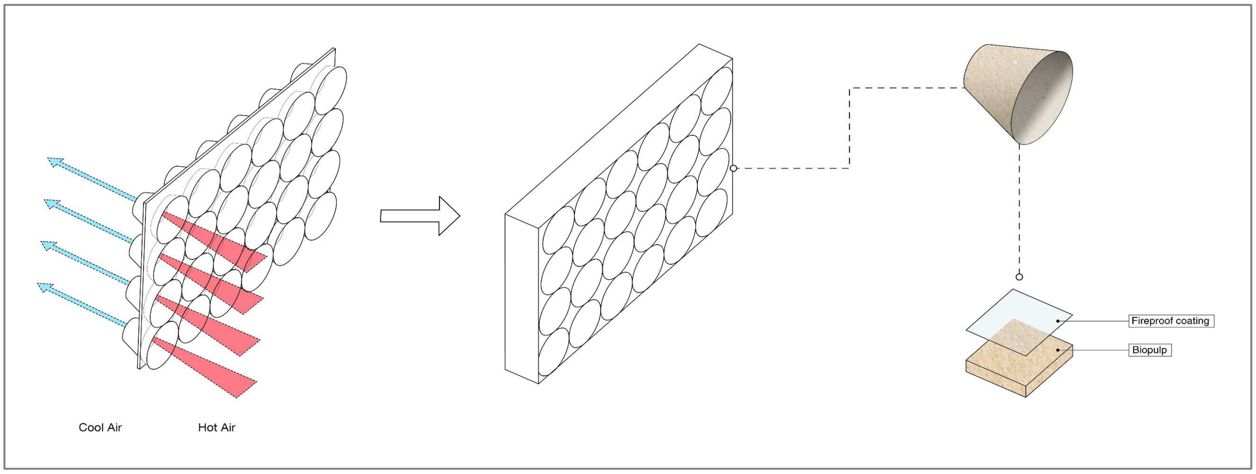


Figure 1. Diagrammatic Representation of Wall Unit with Material Callout

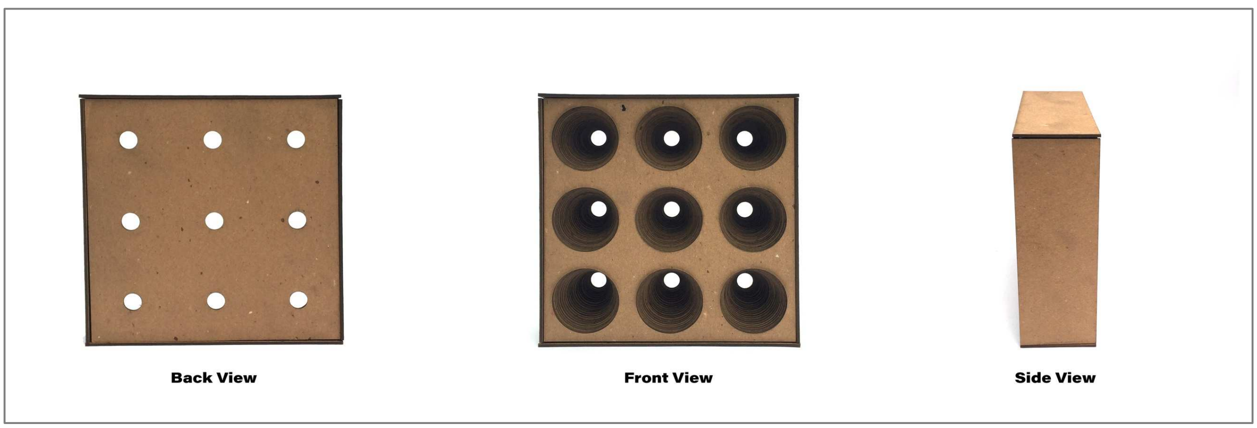


Figure 2. Product Prototype

Green Screen is a vertically integrated solution that identified an ecosystem of related problems and seeks to solve a conjoined issue through a single product. In fact, the product demonstrates urban planning principles of adaptability and flexibility, which occurs at "the intersection of need (often at the level of survival) and of the unexploited potentials of existing infrastructure engenders innovative services."[xxxiii] Green Screen is designed as a scalable venture in which the product will be initially available as individual window-sized units to be installed in existing walls of informal settlements (fig 2a). Subsequently, Green Screen will develop into a larger and portable unit constructed in a tent-like shape (fig 2b) to be used by day-laborers or those who sleep outdoors. A larger version of the paneling will subsequently be developed as at the scale of an entire wall to create pavilion-sized spaces used to cool greater numbers of people (fig 2c). Wind cowls, hooded tubular structures that catch wind at the roof level, are available to be added onto the panel to increase effectiveness of the wall units. To increase the seasonal value of Green Screen during the winter, a panel is inserted in between the conical holes, to block wind flow and precipitation through the product. This product adaptation is beneficial because it prevents to the need to uninstall the screen seasonally.

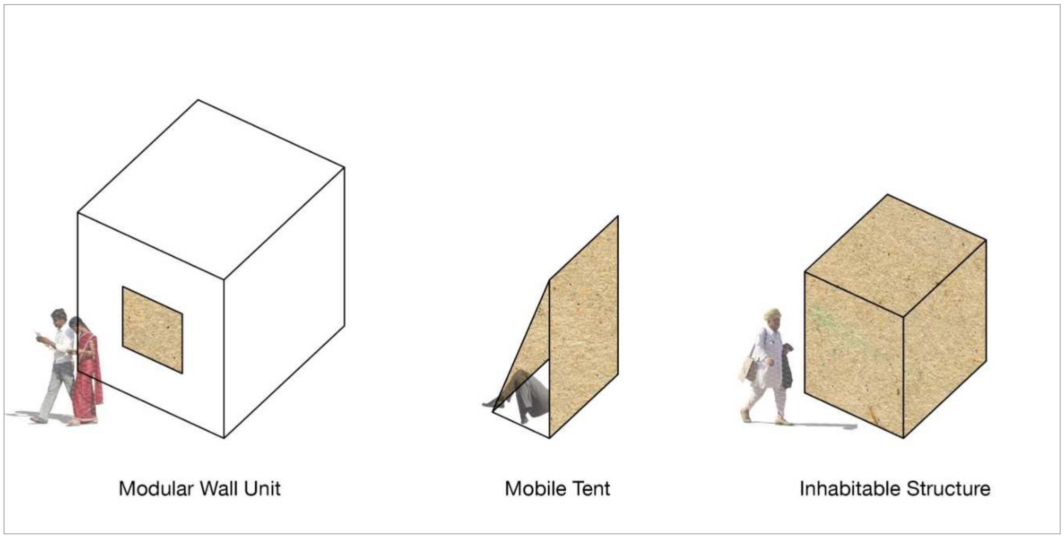


Figure 2 (a, b, c). Icon Representations (L-R) of (**a**) modular wall unit (**b**) mobile tent (**c**) inhabitable structure

In the short term, Green Screen cools those who use it, while providing long-term environmental benefits by incentivizing the sale of agricultural byproducts in lieu of burning. The product also addresses links between biomass burning during the winters, growing mortality due to poor air quality, and hotter summers due to increasing levels of CO_2 in the atmosphere. A benefit of Green Screen is the pragmatic use of a waste product to solve two intractable problems of life in urban India: hot summers and pollution-heavy winters, especially as experienced in New Delhi. Green Screen also has the benefit of being a small-scale, flexible, and reversible solution that would not require large expenditures of capital and infrastructural groundwork that might otherwise halt progress on issues of such insurmountable scale.

Our order of operations for generating Green Screen would begin by establishing connections and partnerships with farmers in proximity to New Delhi. Wheat pulp would be collected at the end of the season and transported to facilities already equipped with pulp manufacturing equipment that could generate clean biopulp to be subsequently molded into the forms required by the air conditioning screen units. The Green Screens would then be loaded into trucks and distributed at strategic locations throughout the city in areas adjacent to slum communities. We intend to look for distributional partners who may wish to collaborate and subsidize the production and distribution of the product. We would also plan to conduct community trials and demonstration prototyping to convey the desirability, ease of use, and effectiveness of Green Screen before large-scale production and distribution. This solution potentially circumvents the need for major institutional or governmental partnership.

EVIDENCE FOR EFFECTIVENESS OF DESIGN | Understanding Bernoulli's principle – the idea that the faster air moves, the lower its pressure – we suggest that screen systems could be oriented towards sources of wind with the fewest obstructions possible. The speed of wind and its lowered pressure would force air through the screens and into domestic spaces. This hypothesis is backed by a coupling of Bernoulli's principle with the ideal gas law, which states that temperature in a constant volume of gas is directly proportional to a change in pressure. Formula: (pV = kNT), where:

> *P* is the pressure
> *V* is the volume
> *N* is the number of gas molecules
> *k* is the Boltzmann constant (1.381×10^{-23} J·K^{-1} in SI units)
> *T* is the absolute temperature

The influx of faster, cooler air would cause hot air to be pushed out of the structures thereby reducing interior temperatures. As proof-of-concept, precedents such as the BedZed building in London uses a wind cowl strategy that not only pulls fresh air into the building but also pulls hot air out through a method of heat exchange when air goes from high-pressure to low-pressure (fig 3).

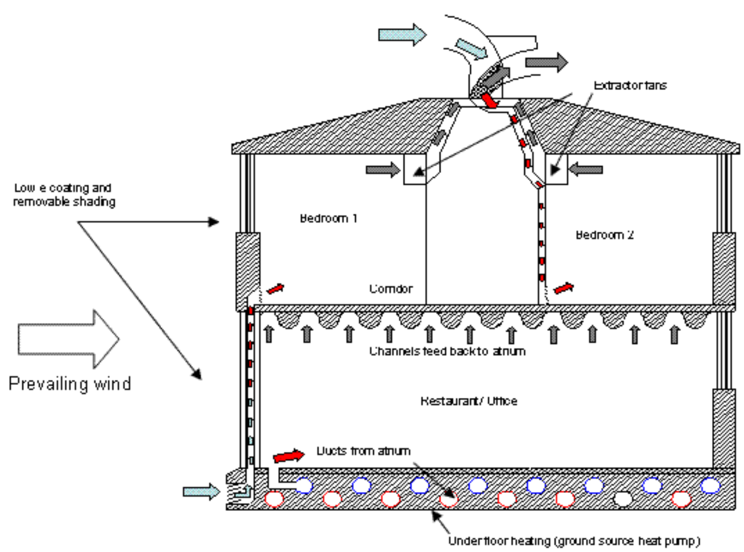


Figure 3. Cooling Strategy of BedZED Building, London – using roof cowls

Analyzing the wind patterns of New Delhi, we are aware of a northwestern prevalence of arriving wind patterns (see fig 4 below). Prototyping will be a critical component of product development for Green Screen; as we describe in the section to follow, we will conduct a number of laboratory-based and in situ tests to capture heat effects with design modification.

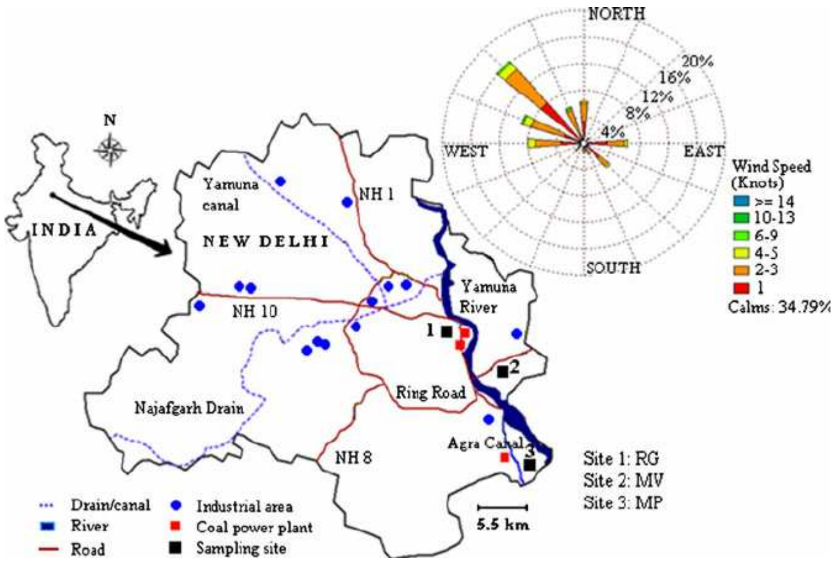


Figure 4. Wind Rose of New Delhi (majority of winds come from the NW)

HOW IT'S MADE | Wheat straw, or what remains of the wheat plant after the grain has been collected, is akin to more desirable types of silage, but without practical application. Wheat byproduct is proven to be a successful material for thermomolded durable paper products, such as food containers, plates, cups, silverware, canisters, and toothbrushes. To use agricultural byproducts as paper material, such Green Screen, lignocellulose-degrading enzymes are inserted during the stages of pulp manufacturing. The introduction of these enzymes makes the material resilient with resistance to moisture penetration, grease accumulation, and cuts or punctures. While the product would require manufacturing facilities, it would be cheap to produce using the biomass pulp, and could be assembled quickly. Moreover, we would try to leverage existing paper pulping facilities as potential shared facilities. The product would also be light, allowing for easy delivery and, when required, transportation.

The process for harvesting fibrous materials into pulp can be achieved traditionally, through chemical or mechanical methods. With a primary interest in separating cellulose fibers, the chemical process is low-yield with significant waste treatment and recycling costs, but produces extremely high strength pulp; mechanical pulp processing has lower costs, but the pulp produced is of lesser quality.[xxxiv] Thus, the process of pulping is often an aggregation of mechanical, chemi-mechanical, and chemical pulping methods. Biopulping is a new strategy that employs research into mycology to utilized fungi as agents in pulping process. Evidence suggests that, at least in the production of pulp from wood, biopulping methods used in advance of chemical pulping strategies creates improved properties to the pulp materials, with better penetration of cooking liquor (an agent in chemical pulping) and lower lignin content, as well as being more responsive to beating and with a higher tensile strength.[xxxv]

EMPOWERING THE VULNERABLE | As climate change has become a major concern for the world's population, dangers of high-temperatures are increasingly urgent in equatorial regions. With 24 of the world's 31 megacities (urban areas with populations of 10 million or more as of 2016) being located in what the UN deems the "less developed global South," the needs to address climate concerns in regions with a predominance of informal settlements is crucial. Building on this notion, we foresee an ability for "elastic" urban principles of flexibility, adaptability, and reversibility to be applied to concerns of cooling and air-quality, especially as needed in Delhi during the summer.

Green Screen combines principles of urban planning for evolving cities with prototyping strategies that maximize product efficiency and minimize cost. As a wind screen, our design is culturally attuned to the historic screen systems of the Indian subcontinent and Southeast Asia overall. Not only will our modular wall units be sustainable, but they can also biodegrade on site. This is particularly beneficial in auto-generated communities where "spaces are not stable; spaces get consumed, reinterpreted, and recycled." From farm, to factory, to slum, our product leverages a type of formal infrastructure (existing industrial manufacturing) to enable the success and proliferation of the informal, kinetic city.[1]

CURRENT INITIATIVES | Understanding that 2017 is being cited as the worst year in decades for air pollution in Delhi, we see an extreme urgency for the implementation of our product and solution.[xxxvi] As the extent of current solutions is limited to shredding crop residues in lieu of burning, usually involving expensive machinery, we see further incentive for our product, which would allow farmers to profit from what is often regarded as a nuisance.[xxxvii] If burning were supplanted by a profit-generating mechanism for wheat or rice straw, it would disrupt current practices.

Seeking precedent for our product and an implementation plan, we look to companies like REMATERIALS' ModRoof tile system (made from recycled packaging and currently being tested in Ahmedabad) or the United States Department of Energy's Cool Roof Initiative (using special white pigments on roofs to reflect sunlight and reduce temperature and energy needs), or The Living's biobricks (made from fungal mycology acting over a substrate of pulverized corn husks). The aforementioned initiatives, however, are limited in utility, prohibitively expensive, and/or provide a product with an extremely limited lifespan.

Instead, we wish to build on an existing framework for producing products with biopulp in India – companies like Shunya Alternatives, making smaller household items like plates and toothbrushes, Save Globe of Bengaluru (cutlery made from wheat flower and sugar), or Anahata of Mumbai (creating silverware from betel and palm leaves) – which showcase a range of alternatives, though nothing on the scale of Green Screen in attempting to tackle multiple problems. We see economic advantage in adopting existing supply chains and processing facilities

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[1]Precedent for this type of design innovation is the work of Japanese architect and 2014 Pritzker Prize winner, Shigeru Ban. Ban developed a paper pulp aggregate that was both waterproof and fire resistant. Contributing the Japanese pavilion at Expo 2000 in Hannover, Germany, Ban sought to create a temporary structure that would be made with completely recyclable materials, thus demonstrating feasibility of construction without excesses of industrial waste. In 2001, Ban worked in Bhuj, India to create homes with walls of cardboard tubing and split bamboo and cane mat roofs.

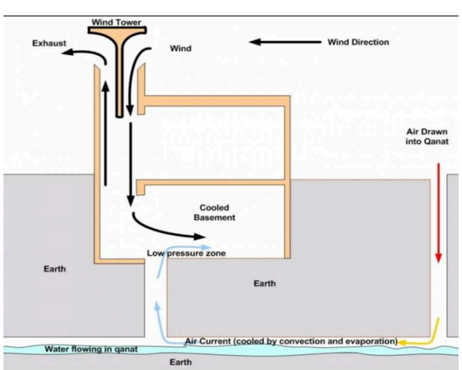
for biopulp in manufacturing our product. In a 2005 study for Central Pulp and Paper Research Institute (CPPRI) of India, it was noted that recycled agricultural waste alternatives were obvious sources for future paper production in a country where virgin paper sources are increasingly rare; at the time agro-residue was approximately 49 million tons (wheat straw: 22 million tons, rice straw: 15 million tons, bagasse: 10 million tons, and jute, mesta, kenaf: 2 million tons).[xxxviii]

TARGETED MARKETS, FUTURE OUTCOMES | Our product addresses two key markets in India: residents of auto-generated informal communities and agricultural workers living outside city lines. Slum dwellers are impacted most greatly by the cooling capabilities of the product, whether used as a mobile screen for day laborers to transport to work or "building patch" on *kutcha* housing. The product is also targeted towards agro-business in India. By using natural byproducts of agricultural waste in biopulp manufacturing, our solution allows profit to be from the sale of waste.

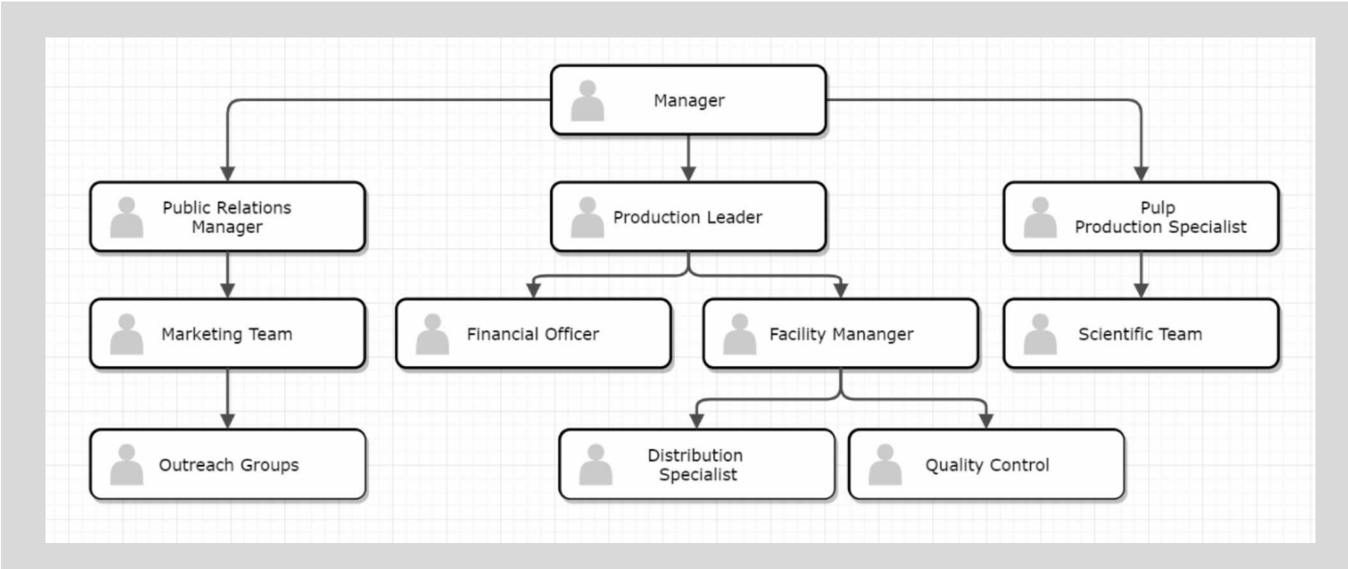
The portability, low-cost, and long-term environmental advantages of our product present the opportunity to translate the solution to broader contexts. Specifically, we hope our product could be used as a type of portable screen system or shelter solution (when scaled up) for refugees in hot, sub-tropical regions. We envision that the advent of modular architectural units that rely on biopulp materials could also allow for other innovative applications for the use of this material and an affordable, readily available, biodegradable solution to the development of megacities in the global south and the need for solutions that are elastic, kinetic, and part of the DNA of the region.

Our team plans to work with technical advisors at **MIT's Department of Material Science and Engineering** to create a mathematical model to simulate the real-life functionality of our product design. Based on wind and temperature data over the last decade, the model will simulate existing conditions in an urban slum in New Delhi, and predict the drop in ambient indoor temperature attainable with Green Screen'.

1. **Prototypes for Geometric Optimization**: Prototypes will be constructed with similar materials (such as board or card stock) to create a series of contoured iterations that optimize the size and shape of conical geometry based on Bernoulli's principle. Alterations may need to be made to the design, perhaps incorporating modular unit additions, such as the wind cowl, in order to draw air circulation into interior space from the roof (see the call-out box below for further description).[xxxixxl]
2. **Prototypes for Biopulp Application** Once satisfactory designs have been settled upon, prototyping will begin using actual biopulp generated from agricultural waste. Simultaneously, we will look to laminated wood products like glulam and cross-laminated timber (CLT) for precedent in creating waterproofing and fireproofing layers. Currently, we envision this layer to be a simple weather-safe wax product or a thin layer of plastic (as similar to those found in hot-beverage cups).
    a. **Lab Testing:** Laboratory tests will involve replicating real-life wind and temperature conditions in small spaces to measure the overall effect.
    b. **Field Testing**: Pilot testing will be conducted in the summer of 2018 in the slums Kandu, Basti, and Manitola in Southern Delhi. A selected group of households will receive the product at no charge. The houses testing the product will be randomly selected using qualitative sampling techniques from locations within the slum that differ in material construction, size, and elevation. Installation assistance and a demonstration on proper use and placement of product will be provided alongside a helpline number. Digital room thermometers will be placed in all the houses with the product and in 'control' households that are similar in composition and location to the tested houses but will not contain the product. Weekly telephonic feedback will be taken from pilot participants, enabling us to quickly address design and utilization issues related to the product. Placing working prototypes in the field before launch will provide us with a head-start in promoting and marketing the final product. At the end of summer, we will confirm our final product design.
3. **Potential Modification to Design:** Taking a cue from the traditional Persian design of the wind tower, our team may prototype a dual screen/cowl unit that functions in partnership with cool water in stored in subterranean reservoirs to generate significant ambient cooling. These reservoirs store cool night air, which can be drawn upward into the home during the day via pressure gradient generated by the cowl. The screen will exaggerate this pressure effect for air circulation. Feasibility of installation and affordability of product for this markedly more complex and invasive structure will need to be determined.



STRUCTURE & MANAGEMENT



Structure

Our organization will be incorporated as an LLP (Limited Liability Partnership). Governed by India's Limited Liability Partnership Act of 2008, the liability of at least one member is unlimited while all other members have limited liability, restricted to the extent of their contributions to the LLP.[xli] By law, Green Screen will be able to operate autonomously in-country sans prior approval given that one of our founders is an Indian citizen and we will have a New Delhi-based permanent address.[xlii] However, the Indian Companies Act enforces that all annual accounts of foreign companies, such as Green Screen, be made available on public record and subject to frequent audits.[xliii] Additionally, as an American-based company, Green Screen is required to form a joint partnership with an Indian Partner, which in our case will be TATA Social Enterprise.[xliv]

Because the implementation of Green Screen involves an array of individual actors and communities, we plan to engage a diverse set of advisers, ranging from technical experts and business authorities to specialists in the field who are knowledgeable about our target community and their unique needs. In the start-up phase for Green Screen, our board will consist of the five core team members, responsible for voting on all issues and overseeing all operations. A proposed structure for our future, expanded management team is outlined in the chart above. We plan to recruit staff from the communities in which we sell our product so as to generate local employment opportunities and reinvest in the local population via wage earnings.

Our Team and Board Members

Gina Ciancone: Currently a Masters student in Architecture and Urban Planning at the Harvard Graduate School of Design. Her work and research are rooted to ongoing investigations in manufactured landscapes, policy-making, and the effects of architectural form on urban economic structures.

Vladimir Gintoff: Currently studying Architecture and Urban Planning at Harvard Graduate School of Design. Design interests include infrastructure, ecological urbanism, and the development of creative capital in cities.
Priya Patel: Currently a Master in Public Health student at the Harvard School of Public Health, specializing in global health, with several years of experience working in slum communities in Nepal and India.
Ramya Pinnamaneni: Currently a Master in Public Health student at the Harvard School of Public Health, concentrating in global health, with 3 years of experience as a physician in New Delhi government hospitals.
Alex Robinson: Currently a Master of Public Health student at the Harvard School of Public Health, specializing in global health, with experience working in slum communities in Delhi and Pune, India.

Advisers

MIT Engineering Department: Sujay Bagi, Research Assistant (Tata Fellow), Román Group (ChemE - Heterogeneous Catalysis)
Local Sponsor: TATA Social Enterprise, the TATA Group's mentorship program for social enterprises
Harvard Faculty: Tarun Khanna, the Jorge Paulo Lemann Professor at the Harvard Business School, where he investigates the drivers of entrepreneurship in emerging markets as means of economic and social development; Rahul Mehrotra, Professor of Urban Design and Planning at the Harvard Graduate School of Design, where he lectures extensively on issues relating to urban planning in India

TIMELINE FOR IMPLEMENTATION

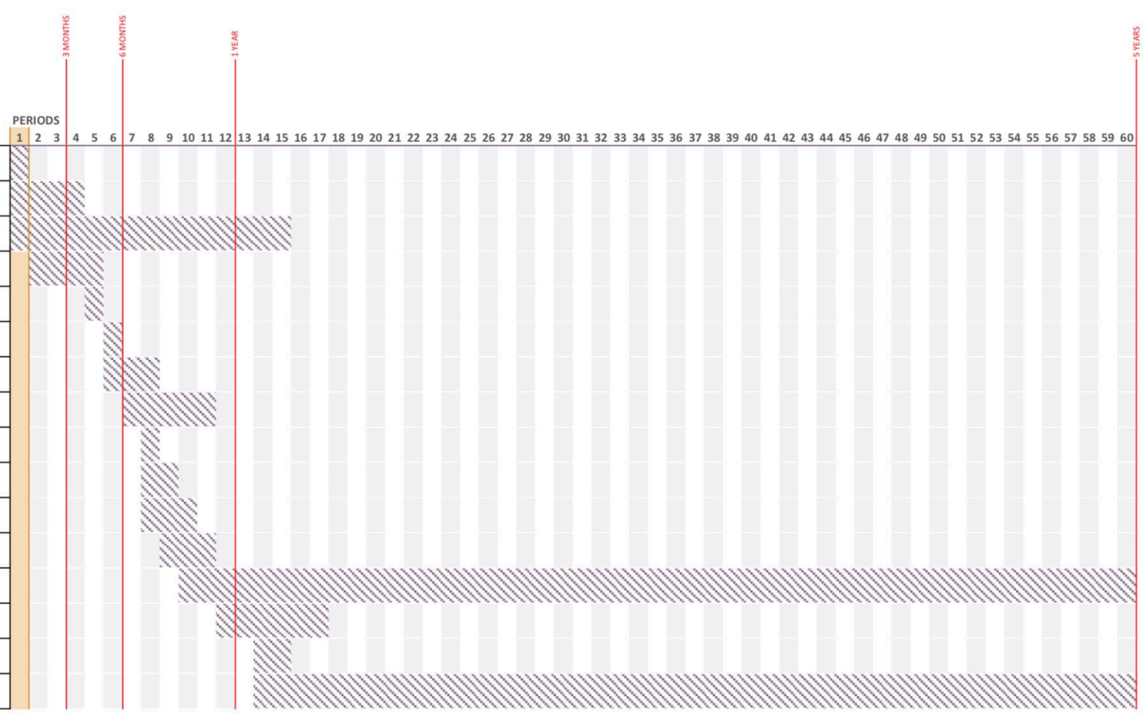
Our immediate priority is to secure funding from foundation grants and other agencies to cover start-up costs and our prototyping expenses. We plan to prototype and evaluate the product over the summer of 2018 (March-June). This prototype and testing phase is expected to last around 3-4 months. Simultaneously legal work, field research, and the registration process will be initiated. Production is planned to start within six months of successful prototyping. This will enable us to procure wheat stubble at the end of the crop season in October/November 2018.

Concurrently, we plan to continue fundraising, apply for small-scale industry registration, acquire warehouse space, and order production equipment. During the initial warehouse set-up, a recruitment drive will be commenced to hire and train project managers, accountants and approximately 50 contract workers. We expect to deliver our product to the market by summer 2019. Marketing campaigns will be initiated prior to product roll out.

With the summer of 2019 in progress, the product will be monitored and evaluated. In subsequent years, we will focus on growing our user base and expanding our program as needed. In the short-term, Green Screen will focus on establishing a sustainable revenue flow, and expanding our operations, services and staff as we see fit based on the growth we are experiencing. In the long term, Green Screen will establish a presence across India and in other major cities with similar weather phenomenon.

Project Timeline

ACTIVITY	PLAN START (Feb 2018)	PLAN DURATION (months)
Prototype Design and Manufacturing	1	1
Market Research	1	4
Fundraising	1	15
Test prototype	2	4
Finalize product design	5	1
Design Manufacturing process	6	1
Apply for registration- licensing	6	3
Recrutiment Drive and training	7	5
Acquire rental warehouse/ space	8	1
Order production equipment	8	2
Order components/ Procure stubble	8	3
Install production equipment	9	3
Manufacturing	10	60
Marketing Campaigns	12	6
Product Launch	14	2
Monitoring and Evaluation	14	60



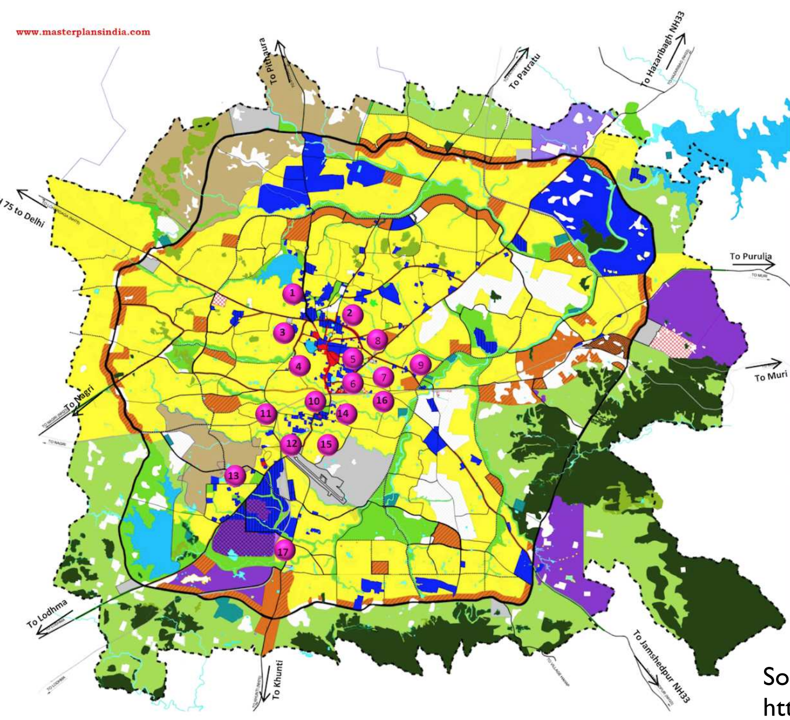
MARKETING STRATEGY

Our marketing strategy focuses on reaching clients for whom air conditioning units or other means of heat relief are too expensive, and/or for whom government-sponsored cooling centers are often inaccessible. In looking specifically to our target consumer base, New Delhi has a population of 18 million, of which 9 million are believed to be slum residents according to the city's Human Development Report.[xlv] To achieve success in securing buy-in for both product design and utility, we plan to conduct market research through product pilot testing and ongoing feedback solicitation. We also plan to partner with a local marketing agency, key organizational stakeholders, and farmers in addition to working with corporate sponsors and foundations to tap into their field-based knowledge and secure ties with slum communities.

Market

There is a total of 6,343 officially documented slums in Delhi, of which approximately 29% of slums contain 20-60 households and 71% of slums hold more than 60 households.[xlvi] The average household size in a slum is 4.7 family members.[xlvii] More than 59% of slum households do not have access to electricity for household use.[xlviii] Only half of all slums in the city are situated within at least 1 kilometer to the nearest government hospital.[xlix] 73% of slum households have access to telephone services, of which 63.5% possess cell phones.[l] 53% of slum households have access to banking services in their community, 3% have access to the internet, and the literacy rate is 77%.[li] New Delhi's urban slum dwellers earn an average income of $103 per month. [lii] A map outlining the location of major slums in the city is included below for reference.

Marketing Plan



SR. NO	LOCATION OF MAJOR SLUM
1	Hatam Basti
2	Karam Toli
3	Madhukum Mahua Toli
4	Purani Ranchi Adawasi Area
5	Islam Nagar, Ali Nagar, Dom Toli
6	Gangu Toli
7	Kathar Toli
8	Bhatti Toli
9	Sirom Toli
10	Kadru Basti
11	Dibdhi
12	Kathar Kocha, Madhu Kocha
13	Jagganath Basti
14	Kasai Maholla, Mochi Maholla
15	Manitola
16	Bada Ghara
17	Nayak Basti

Source: http://download.masterplansindia.com/maps/jharkhand/ranchi/ranchi-major-slums-location.jpg

Our marketing plan will consist of two phases. Phase I will commence prior to year 1 production and will focus on piloting free product prototypes to test in select households, to determine product suitability, feasibility, and usefulness. Modular panels will be piloted in 30 households within the three slums of Kandu, Basti, and Manitola. These slums have been chosen based on existing community ties and geographic location, as slums in Southern New Delhi are reported to have the lowest levels of access to electricity[liii]. Through our local organizational partners, as well as via community outreach, we will identify volunteers willing to have the modular panels installed in their homes for our pilot phase. Regular interviews will be conducted by our outreach team to solicit feedback, initially once per week in the first month post-installation, and then subsequently once per month for the duration of piloting. Additionally, the quality control team will regularly record internal household temperatures to track effectiveness of our prototyped product designs in producing intended cooling effects. This will allow us to rapidly identify both successes and challenges with our product so that it can be improved upon prior to launch. Similar prototyping will be conducted six months prior to the release of each new scale-up product, such as the tent structure.

Phase II of the marketing plan will begin in year 1, at which time our team will engage an experienced agency to develop culturally appropriate advertisements for display in targeted slums. Advertising tactics common to the Indian context will be employed, focusing on billboards, posters, and door-to-door flyer distribution by recruited and compensated community members. Additionally, we will hold community demonstrations of product installation by local stakeholders in the evenings, accompanied by raffles and giveaways to incentivize attendance by residents. We hope that by establishing a presence within the communities and engaging local residents as spokespeople, we will secure confidence in our product and spur greater uptake through word-of-mouth advertising. A telephone hotline set up by the quality control team will allow us to conduct further market research and continue to invest in product improvement for our consumer base.

Competition and Collaborative Landscape

Currently, Indian organizations such as Centre for Science and Environment attempt to combat climate change and heat waves, yet none offer an affordable and electricity-free product specifically designed for cooling. ModRoof, a company manufacturing modular roofing systems, provides a costly solution requiring entire roof replacement for effectiveness. Green Screen is minimally invasive, recycles waste as a building product, and empowers local residents by combining functionality with aesthetics. While governments across India are attempting to create standardized heat wave protocols, only a few are taking action at the community level by offering relief via solutions such as cooling centers. The government of Ahmedabad in Gujarat, India developed a Heat Health Action Plan to train citizens and health workers on heat stress; however, no device for household cooling has been made available.[liv] Given our critical mission and novel solution, we do not view other companies in this space as competitors but rather as collaborators with whom we can exchange best practices.

STRATEGIC PARTNERS | We will engage the USAID-UC Berkeley Global Development Initiative, UNLTD India, and Lakshmi Mittal South Asia Institute for resource support and knowledge exchange

Monitoring and Evaluation

Project evaluation will be based on the number of installations performed per month, effectiveness of modular panels in producing intended cooling effect, and level of customer satisfaction. It will be completed in two phases, with phase 1 measuring the feasibility, efficiency, and effectiveness of the product before it is sold. The Distribution Specialist and Quality Control Manager will be responsible for evaluating these metrics through tests in both a laboratory setting and in the field during the pilot phase, basing measure of success upon lowered temperature recordings through use of modular panels.

Phase 2 will be led by our Product Manager and will capture user satisfaction through multiple feedback mechanisms. As our market research has shown that 73% of slum residents have telephones, with 63% having access to cell phones, we will provide a toll-free telephone number during installation that allows customers to connect with our Quality Control team. They will be able to provide feedback about the installation process, product performance, maintenance, or any other concerns. As not all households have access to telephones, we will also send Quality Control team members into the field for home visits following initial installation phase and then again at months 3, 6, and 12; customers will also be asked to participate in an optional user satisfaction survey for the purposes of service improvement. Questions regarding their satisfaction with the production, ease of use, effectiveness, and pricing will be asked. Additionally, we will ask how they have heard about our product to gain insight into marketing tactics. These feedback mechanisms will allow us to monitor and evaluate the success of the product and gain insight into how we can continuously improve the experience for the user.

Outcome Goal 1: Measure efficiency and effectiveness of product

Objective	Responsible	Timeline	Evaluation Measure
Measure efficiency and effectiveness of product in the field	Distribution Specialist and Quality Control Manager	By September 2019	Lab tests and field tests, success measured through temperature recordings

Outcome Goal 2: Measure user satisfaction

Objective	Responsible	Timeline	Evaluation Measure
Measure user satisfaction	Product Manager	By September 2019, December 2019, March 2020	Focus groups, surveys, interviews, feedback mechanisms

FINANCIAL ANALYSIS

COST BREAKDOWN |

The following costs are calculated based on the assumption of a Year 1 program designed to manufacture and bring to market 4,200 screens in the first year. Production will be scaled up in Years 2-5.

Initial fixed asset requirements will range in total from $114,943.00 to $266,943.00 in Year 1, depending on whether Green Screen procures warehouse space north of New Delhi or opts to share a facility with an existing paper production or biopulping company. Equipment costs will encompass belt conveyors, drying silos, ventilation systems, bleaching, and metal thermoform molds, at an estimated $35,355.00 in the first year. Agricultural stubble harvesting, packaging, and transportation to the production site will total approximately $23,200.00 for the first year.

To facilitate incorporation of this limited liability company and cultivate a market for the product, we will invest approximately $40,400.00 in start-up expenses. This amount will contribute to legal fees and licensing, as well as marketing costs around design and reproduction work by contracted partner *Principle at Ad* agency. This does not include estimated costs for Year 0 community prototype testing, for which we plan to apply for the Lakshmi Mittal South Asia Institute Seed for Change grant to underwrite production, installation, and evaluation.

Pilot product direct costs cover estimates for raw material inputs and manufactured outputs, as well as labor. We have estimated fees to farmers for agricultural stubble based on an analysis of the current market for such a waste product. Our offering will present a 233% profit to the farmers. Estimated Year 1 costs to purchase this stubble will total less than $150.00. The modular screens themselves, with waterproof sealant to ensure protection against monsoon rains, will cost $21,000.00 per year to manufacture a total of 4,200 boards. Manufacturing costs per unit will hopefully decrease as we scale production. Labor costs cover training and tailored workshops, as well as full time monthly salaries for the following positions: program manager, outreach manager, office manager, accountant, and 50 contract workers for machinery operation. Compensation at each level will meet wage standards outlined by the New Delhi Labour Department, with total Year 1 labor costs estimated at $173,565.00.

See Appendices 1 and 2, attached, for full descriptions of startup capital expenses, fixed asset requirements, and pilot product direct costs.

SOURCES OF FINANCING |

The following graphic illustrates our general funding mix as we shift from Year 1 through to Year 5:

UNRESTRICTED FUNDS

SHORT-TERM

General Fundraising	**Core Financing**
Short-term: 1-2 years *Relatively Unrestricted* - Ford Foundation; Tata Social Enterprise Challenge	*Medium- to long-term*: 3-5 years *Relatively Unrestricted* - Sale of Screens - Profit capture from sale of agricultural stubble
Product Funding	**Program Funding**
Short- to medium-term: 1-3 years Relatively Restricted - Draper Richards Kaplan Foundation; USAID; UnLtd	*Medium- to long-term*: 3-5 years Relatively Restricted - Alcoa Corporate Sponsorship

LONG-TERM

RESTRICTED FUNDS

Over the initial five-year period, sources of financing will total $649,500.00. In particular, Green Screen will capitalize on partnerships with organizations like UnLtd India and Tata to develop our early-stage venture and refine product design for maximum social impact. A funder such as Ford Foundation will provide an initial investment to cover startup and operating costs during the pilot phase in Year 1. Ford has recently announced that it will allocate $1 billion of its endowment to mission-related investments over a ten-year period; Green Screen will apply through the open submission process for financing through the Equitable Development group, given its focus on natural resource conservation and climate change.[lv] We estimate that we will be able to secure approximately $80,000.00 in funding during Year 1, and renewable investments of sizes $75,000.00 and $50,000.00 during Years 2 and 3, respectively. We will also apply for Year 1 funding through the Tata Social Enterprise Challenge. Through this forum, Tata Corporation invites social entrepreneurs across India with either proof of concept or early stage venture to engage in mentorship support and concept incubation, while providing unrestricted cash grants.[lvi] Finally, we will seek to secure $300,000.00 in seed capital over Years 1-3 from the Draper Richards Kaplan Foundation, a global venture philanthropy firm which acts as institutional investor in early stage, high impact social enterprises.[lvii]

As we shift from Year 1 pilot phase, we will focus on securing product-specific funding to underwrite the ongoing cost of production and product refinement. We will seek out relatively restricted financing from institutional donor agencies, such as USAID, to finance manufacturing and the perfection of processes including agricultural waste collection, processing, molding, and waterproofing. Our aim is to capture a total amount of $5,000.00 in financing for Year 1, to be scaled back as we progress through years 2 to 5. We are particularly interested in the type of financing USAID's Development Impact Lab has provided to UC Berkeley's Global Development Initiatives. This $20 million cooperative focused on development engineering is offering Development Impact Lab Explore Spring grants, with the potential for increased funding and more intensive partnership.[lviii] UnLtd India is an additional product-specific funder we are considering, as it offers seed funding and a structured incubation program to support entrepreneurial endeavors in product testing and scale up.

Our funding mix will shift significantly in Years 3-5. We will aim to rely less on grant and seed financing, shifting into our core financing model of long-term profit generation from the sale of products. This will be supplemented by corporate sponsorship. Our goal is to shift from donor dependency to the self-financing of operations over time. Based on similar products made from compressed agricultural residue, such as enviroboards, we estimate that 1 ton of stubble will yield 29 boards measuring 3'x8'. Comparable construction material was studied as a pricing reference for the $80 retail value of the boards. If product volume increases with demand and we can achieve a leaner production process, our goal is to reduce the cost per screen over time. This initial price point has been determined to be necessary based on operating expenses and feasible based on the average income of the target market. Research has shown that the average per household income in Delhi slums is 6,660 rupees per month, or approximately $1,233.00 USD annually.[lix] Our pricing places the product at $5.00 USD per square foot, but costs will be offset for some households by energy- and health-saving potential of the new material. We are considering a partnership with a local microfinance institution, such as SEWA Bank, to develop flexible payment installation plans to ensure that screens are affordable to our customer base at a cost that doesn't induce catastrophic spending.

In the long run, profits from the sale of screens for home installation will be reinvested into the production process. This reinvestment, coupled with an influx of financing from USAID or other institutional donor will enable our team to enhance our offerings by introducing screens designed for use by day laborers. We will also use profits to underwrite the cost of stand-alone screen structures. These adapted forms will be provided free of cost to street-bound and migrating populations without permanent sources of shelter. From Year 3-5, production mix will shift from 100% home paneling to 80% paneling, 10% field use screening, and 10% dual-use shelter/heat relief screens. Along with the introduction of this new product mix, we will institute a tiered pricing scheme. Wage earners purchasing screens for home use will be charged $80.00 per screen; screens intended for use by day laborers will cost approximately $20-$40.00, and adapted screens dual use by homeless populations will be provided free of charge.

Finally, profit generated in Years 3-5 will be supplemented by program funding procured through corporate sponsorship. These funds will most likely be relatively restricted, but can be invaluable in ensuring sustainability of our production model. We are considering Alcoa as a potential private sector partner given their global image as a materials expert. Through its Foundation, Alcoa considers sponsorship related to climate change; specifically, it funds organizations which seek to deliver sustainable solutions for climate change mitigation and management to vulnerable communities worldwide.[lx] We anticipate securing $50,000.00 in Years 3 and 4, followed by $30,000.00 in Year 5. Corporate sponsorship will be directed towards ongoing marketing campaigns, market penetration efforts, design manipulation, and manufacturing.

APPENDIX I- SUMMARY, EXPENSES

	1 Month			3 Months		
Type	Expense	Profit	Subtotal	Expense	Profit	Subtotal
Initial Investments	$ -	$ -	$ -	$ -	$ -	$ -
Scenario A: Fixed Asset Requirements (Rental of Private Warehouse)	$ 33,734	$ -	$ (33,734)	$ 70,492	$ -	$ (70,492)
Scenario B: Fixed Asset Requirements (Sharing Warehouse)	$ 21,734	$ -	$ (21,734)	$ 34,492	$ -	$ (34,492)
Start-Up Expenses	$ 21,800	$ -	$ (21,800)	$ 25,400	$ -	$ (25,400)
Product Costs	$ 17,285	$ 24,000	$ (6,715)	$ 43,387	$ 72,000	$ 28,614
Scenario A Grand Total			**$ (62,249)**			**$ (67,279)**
Scenario B Grand Total			**$ (50,249)**			**$ (31,279)**

6 Month			1 Year			5 Years		
Expense	Profit	Subtotal	Expense	Profit	Subtotal	Expense	Profit	Subtotal
$ -	$ -	$ -	$ -	$192,500	$ 192,500	$ -	$ 649,500	$ 649,500
$ 135,629	$ -	$ (135,629)	$ 266,943	$ -	$ (266,943)	$ 1,256,255	$ 53,592	$ (1,202,663)
$ 63,629	$ -	$ (63,629)	$ 114,943	$ -	$ (114,943)	$ 536,255	$ 205,592	$ (330,663)
$ 31,600	$ -	$ (31,600)	$ 40,400	$ -	$ (40,400)	$ 40,400	$ -	$ -
$ 84,773	$ 144,000	$ 59,227	$ 167,565	$ 336,000	$ 168,435	$ 829,906	$ 1,872,000	$ 1,042,094
		$ (108,002)			**$ 53,592**			**$ 488,931**
		$ (36,002)			**$ 205,592**			**$ 1,360,931**

APPENDIX 2- ITEMIZED COST BREAKDOWN

		Research (USD)			
		Precedent Pricing of Analagous Studies		1 Month	
1	**Fixed Asset Requirements**				
1a	Land			N/A	
1b	Buildings				
1b.1	*Rental Fee (50,000 sf warehouse outside Delhi)*	avg. $16,000 USD / month		$	16,000
1b.2	*Electricity*				
1b.3	*Rental Fee (shared space with Times of India newspaper)*	assuming 1/4 cost of rental fee for independent warehouse space		$	4,000
1b.4	*Potential Savings by Sharing Space with Times of India*			$	12,000
1c	Equipment				
1c.1	*Belt conyevors (moves material between silos)*				
1c.2	*Drying Silo (1 unit, 15,000 ton capacity)*	$	2,200	$	2,200
1c.3	*Silo (1 unit, 15,000 ton capacity)*	$	2,200	$	2,200
1c.4	*Ventilation System for Silos (300-volt)*	$	955	$	955
1c.5	*Bleaching (chlorine dioxide + calcium hypochlorite)*				
1c.6	*Metal Thermoform Mold (Custom, 1 mold per 1,000 uses)*	$	10,000	$	10,000
1d	Stubble Transportation (Field to Facotry)				
1d.1	*Packaging & Handling (est. hours needed from contract laborer)*		3	$	699
1d.2	*Vehicle*	N/A *(factored into 1d.4)*		N/A	
1d.3	*Fuel*	N/A *(factored into 1d.4)*		N/A	
1d.4	*Transportation per ton (avg. distance from Delhi to crop = 80km)*	$	160	$	1,680
	SUBTOTAL, Renting Independent Warehouse			**$**	**33,734**
	SUBTOTAL, Sharing Space with Times of India			**$**	**21,734**
2	**Start-Up Expenses**				
2a	Legal Fees	Legal Services		$	10,000
2a.1	*Legal Liability*				
2b	Licensing	Patent Price		$	10,000
2c	Marketing				
2c.1	*Design Work (Hourly Rate for Principle at Ad Agency)*	$	200	$	800
2c.2	*Reproduction Work (Hourly Rate for Principle at Ad Agency)*	$	200	$	-
2c.3	*Trial Period / Testimonial*			$	1,000
	SUBTOTAL			**$**	**21,800**
3	**Pilot Product Direct Costs**				
3a	Materials				
3a.1	***Current*** *Farmer Fees for Agricultural Stubble*	$0.30 USD / 1 ton stubble (2017)			
	Total annual stubble burned in Punjab (2005)	4,315.35 km^2			
	Total annual availability of agricultural stubble in India (2004)	49,000,000 tons			
	Initial Purchase Amount at Current Purchase Rate	50 tons / month		$	15
3a.2	***Competitive*** *Farmer Fees for Agricultural Stubble (233% profit for farmers)*	$1 USD / 1 ton stubble			
	Initial Purchase Amount at Competitive Purchase Rate (tons / month) - to be scaled up monthly	10.5		$	11
	Profit Made by Farmers	(Competitive Rate - Current Rate)		$	(5)

		Financial Projections (USD)			
		3 Month	6 Month	1 Year	5 Year
1	**Fixed Asset Requirements**				
1a	Land	N/A	N/A	N/A	N/A
1b	Buildings				
1b.1	*Rental Fee (50,000 sf warehouse outside Delhi)*	$ 48,000	$ 96,000	$ 200,000	$ 960,000
1b.2	*Electricity*				
1b.3	*Rental Fee (shared space with Times of India newspaper)*	$ 12,000	$ 24,000	$ 48,000	$ 240,000
1b.4	*Potential Savings by Sharing Space with Times of India*	$ 36,000	$ 72,000	$ 152,000	$ 720,000
1c	Equipment				
1c.1	*Belt conyevors (moves material between silos)*				
1c.2	*Drying Silo (1 unit, 15,000 ton capacity)*	$ 2,200	$ 2,200	$ 2,200	$ 2,200
1c.3	*Silo (1 unit, 15,000 ton capacity)*	$ 2,200	$ 2,200	$ 2,200	$ 2,200
1c.4	*Ventilation System for Silos (300-volt)*	$ 955	$ 955	$ 955	$ 955
1c.5	*Bleaching (chlorine dioxide + calcium hypochlorite)*				
1c.6	*Metal Thermoform Mold (Custom, 1 mold per 1,000 uses)*	$ 10,000	$ 20,000	$ 30,000	$ 120,000
1d	Stubble Transportation (Field to Facotry)				
1d.1	*Packaging & Handling (est. hours needed from contract laborer)*	$ 2,097	$ 4,194	$ 8,388	$ 41,940
1d.2	*Vehicle*	N/A	N/A	N/A	N/A
1d.3	*Fuel*	N/A	N/A	N/A	N/A
1d.4	*Transportation per ton (avg. distance from Delhi to crop = 80km)*	$ 5,040	$ 10,080	$ 23,200	$ 128,960
	SUBTOTAL, Renting Independent Warehouse	**$ 70,492**	**$ 135,629**	**$ 266,943**	**$ 1,256,255**
	SUBTOTAL, Sharing Space with Times of India	**$ 34,492**	**$ 63,629**	**$ 114,943**	**$ 536,255**
2	**Start-Up Expenses**				
2a	Legal Fees	$ 10,000	$ 10,000	$ 10,000	$ 10,000
2a.1	*Legal Liability*				
2b	Licensing	$ 10,000	$ 10,000	$ 10,000	$ 10,000
2c	Marketing				
2c.1	*Design Work (Hourly Rate for Principle at Ad Agency)*	$ 2,400	$ 4,800	$ 4,800	$ 4,800
2c.2	*Reproduction Work (Hourly Rate for Principle at Ad Agency)*	$ -	$ 800	$ 9,600	$ 9,600
2c.3	*Trial Period / Testimonial*	$ 3,000	$ 6,000	$ 6,000	$ 6,000
	SUBTOTAL	**$ 25,400**	**$ 31,600**	**$ 40,400**	**$ 40,400**
3	**Pilot Product Direct Costs**				
3a	Materials				
3a.1	***Current** Farmer Fees for Agricultural Stubble*				
	Total annual stubble burned in Punjab (2005)				
	Total annual availability of agricultural stubble in India (2004)				
	Initial Purchase Amount at Current Purchase Rate	$ 45	$ 90	$ 180	$ 900
3a.2	***Competitive** Farmer Fees for Agricultural Stubble (233% profit for farmers)*				
	Initial Purchase Amount at Competitive Purchase Rate (tons / month) - to be scaled up monthly	$ 32	$ 63	$ 145	$ 806
	Profit Made by Farmers	$ (14)	$ (27)	$ (35)	$ (94)

		Research (USD)	
		Precedent Pricing of Analagous Studies	1 Month
3a.3	*Mathematical/Statistical Modeling to test sizing*		
3b	Screen		
	*Enviroboard **Manufacturing** Cost (3'x8'x2")*	USD $5.00 / board	
	*Enviroboard **Retail** Cost (3'x8'x2")*	USD $50.00 / board	
	*Enviroboard **Profit***	USD $45.000 / board	
	Waterproof sealent		
	*Screen **Manufacturing** Cost (per board)*	$ 5	$ 1,500
	*Screen **Retail** Cost (per board)*	$ 80	$ 24,000
	*Number of Screens **[1 ton stubble = 29 boards]***		300
	Labor		
	Training	Initial Fee Only	$ 1,000
	Workshop Costs	Initial Fee Only	$ 1,000
	Program Manager Salary (full-time, per month)	$ 280	
	2	$ 560	$ 560
	Outreach Manager Salary (full-time, per month)	$ 275	
	2	$ 550	$ 550
	Office Manager Salary (full-time, per month)	$ 250	
	5	$ 1,250	$ 1,250
	Accountant Salary (full-time, per month)	$ 275	
	1	$ 275	$ 275
	Contract Worker (full-time, per month)	$ 233	
	50	$ 11,650	$ 11,650
	SUBTOTAL		**$ 17,785**
	Sources of Initial Investment		
	Fundraising		
	Ford Foundation Climate Change Mission-Related Investment		$ -
	Tata Social Enterprise Challenge		$ -
	USAID-UC Berkeley Global Development Initiative		$ -
	UnLtd India Seed Grant		$ -
	Alcoa Corporate Partnership		$ -
	Draper Richards Kaplan Foundation Unrestricted Capital Grant		$ -
	SUBTOTAL		**$ -**

			Financial Projections (USD)							
			3 Month		6 Month		1 Year		5 Year	
3a.3	*Mathematical/Statistical Modeling to test sizing*									
3b	Screen									
	*Enviroboard **Manufacturing** Cost (3'x8'x2")*									
	*Enviroboard **Retail** Cost (3'x8'x2")*									
	*Enviroboard **Profit***									
	Waterproof sealent									
	*Screen **Manufacturing** Cost (per board)*		$	4,500	$	9,000	$	21,000	$	117,000
	*Screen **Retail** Cost (per board)*		$	72,000	$	144,000	$	336,000	$	1,872,000
	*Number of Screens **[1 ton stubble = 29 boards]***			900		1,800		4,200		23,400
	Labor									
	Training		$	1,000	$	1,000	$	1,000	$	1,000
	Workshop Costs		$	1,000	$	1,000	$	1,000	$	1,000
	Program Manager Salary (full-time, per month)									
		2	$	1,680	$	3,360	$	6,720	$	33,600
	Outreach Manager Salary (full-time, per month)									
		2	$	1,650	$	3,300	$	6,600	$	33,000
	Office Manager Salary (full-time, per month)									
		5	$	3,750	$	7,500	$	15,000	$	75,000
	Accountant Salary (full-time, per month)									
		1	$	825	$	1,650	$	3,300	$	16,500
	Contract Worker (full-time, per month)									
		50	$	34,950	$	69,900	$	139,800	$	699,000
	SUBTOTAL		**$**	**44,887**	**$**	**87,773**	**$**	**173,565**	**$**	**859,906**
	Sources of Initial Investment									
	Fundraising									
	Ford Foundation Climate Change Mission-Related Investment		$	-	$	-	$	80,000	$	205,000
	Tata Social Enterprise Challenge		$	-	$	-	$	3,000	$	3,000
	USAID-UC Berkeley Global Development Initiative		$	-	$	-	$	5,000	$	10,000
	UnLtd India Seed Grant		$	-	$	-	$	4,500	$	1,500
	Alcoa Corporate Partnership		$	-	$	-	$	-	$	130,000
	Draper Richards Kaplan Foundation Unrestricted Capital Grant		$	-	$	-	$	100,000	$	300,000
	SUBTOTAL		**$**	**-**	**$**	**-**	**$**	**192,500**	**$**	**649,500**

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