

# EXTENDING THE LIFE CYCLE OF UNDER-UTILIZED URBAN SCRAP THROUGH SUSTAINABLE DESIGN APPROACH

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The desire of urban population to acquire better products has led to under utilization of in-use products and household goods like clothes, shoes, bags, etc, which finally turn into a usable waste. At one end, disposal of such scrap with incomplete product life cycle is now becoming a herculean task for the urban local bodies in India and on the other; there is a large population that is actually in need of these products to meet their basic requirements. The first part of paper examines the initiatives taken by some enterprises in India to bridge the gap between the two ends through sustainable design approach. The second part of the paper will be a critical appraisal of modus operandi of the present system being followed by the enterprises for the purpose. The paper, after discussing the challenges and opportunities for such organizations, will finally, concludes with some suggestions to make the system more effective and donor friendly through innovative use of the available technologies.

*Keywords:* Design for Sustainability, System Design, Social Enterprise, Innovation.

## 1. INTRODUCTION

Sustainable design considers environmental, economic and social impacts that are significant throughout the product lifecycle. Economy, Society and Environment are often considered to be the three pillars or triple bottom line of sustainability [1, 2]. According to Colantonio [3], though economic and environmental concerns are generally well defined, the social sphere of sustainable design is less spoken of. The social sphere mainly covers the aspects like understanding and fulfilling personal responsibility, enriching quality of life, health, assuring well-being and happiness, encouraging democratic participation and cooperative behavior [4]. Designers are responsible for the development of products and services which directly influence the society and environment [5]. According to Lewis *et al.* [6], the application of sustainable design can help lessen the lifecycle impacts. In addition, sustainable design approach, in the increasing urban trend of consumerism, can help in extending the life span of the products.

The fast growing industrial sector in India has not only put the economy on the fast track but also fuelled rapid urbanization. On one side, the life of urban population has become more prosperous with easy access to the resources and on the other; the consumerism has crept into the lifestyle of the urban society. The desire of urban population to have more and better, without a thought about the old in-use products, has led to under utilization of products and household goods which finally turn into a usable waste. In the paper, the term “usable waste” is used for those materials that are dumped in the urban

**Table 1.** List of some usable wastes material around us and their alternate uses.

Usable Waste	Reason of Discard	How can be used
Clothes All male and female wears (including the school uniform of kids)	Discolored, torn at some place, got burns, old and worn, Size becomes smaller, got bad and stinky due to long soaking, fungus growth, old fashioned, damages by termites and fungus, permanent stains, zip non functional, un threading of stitches, buttons missing.	<ul style="list-style-type: none"> <li>• Washed, repaired and directly reused.</li> <li>• Damaged clothes used to make smaller dresses.</li> <li>• Unrepeatable dresses cloth and decorative material in the dress used in making bags, purses, toys, greeting cards, decorative craft material etc.</li> <li>• The other integrated materials like zip, hooks and buttons removed and reused.</li> <li>• The residual pieces of clothes used as filler in the toys or making clothes strings that are generally in ladies dresses.</li> </ul>
Old bed sheets, curtains, cotton cloth pieces and “saris”	Old and worn, stains, damaged, discolored	<ul style="list-style-type: none"> <li>• Used as cleaning clothes</li> <li>• The cotton clothes used to make sanitary napkins</li> <li>• Used to make "sujani"(a thick mat of clothes to be put be low bed sheet also used as blanket)</li> <li>• Used to prepare Door Mats</li> <li>• Designed into table covers, TV covers, mobile covers, toolkits/ magazine holders, hot utensil handling gloves, etc.</li> </ul>
Foot wears (Shoes & slippers)	Band broken, sole broken, sole coming out, looks untidy, de shaped in water, become small, some exterior damaged	<ul style="list-style-type: none"> <li>• Most of the cases can be brought in use with bit of repair and treatment and proper pairing.</li> </ul>
Leather accessories (Bags, purse, jackets, belts, etc.)	Chain non functional, color fading, stitches broken, fungus growth in rainy season, out fashioned, pasting removed, lace damaged, wearing at side	<ul style="list-style-type: none"> <li>• Generally can be reused with small repairs</li> </ul>
Old cutlery and kitchen ware	Rusted or obsolete	<ul style="list-style-type: none"> <li>• Reused directly</li> </ul>
School accessories (water bottle, Tiffin boxes, instrument Boxes, etc.)	Tendency to have new materials with new class, small damages, kids longing to have more attractive belongings	<ul style="list-style-type: none"> <li>• Directly reused by the children in rural schools proper cleaning and repairing</li> </ul>
Old Toys	Promotion to new class Broken, some pat missing, replaced by the new ones	<ul style="list-style-type: none"> <li>• Repaired, Broken toy access -ory used in making soft toys</li> </ul>
Partially used stationary	Generally dumped after a few years	<ul style="list-style-type: none"> <li>• Can be made into note books</li> </ul>
Old newspapers and magazines	Mostly of no use after daily use	<ul style="list-style-type: none"> <li>• Can be used for making paper bags</li> </ul>

waste before completion of its full life span, still having potential to be used in the same or different context of use that it is meant for. Table 1 shows some of such usable wastes. This table is developed on the basis of various application of these materials observed during visit to some organizations and also in our day to day life around us.

It is estimated that 20–50 percent of the solid waste generated remains uncollected. Even if collected, municipal solid waste remains a problem in many cities. According to Visvanathan and Glawe [7],

in New Delhi itself, 3,880 tons of garbage is produced per day, yet only 2,420 tons is collected for disposal. This unaccounted waste is also a threat to the other civic systems like transportation and drainage system leading to various health and hygiene problems and serious water logging problems. The garbage collection and disposal has become a herculean task of the local authorities in India.

Besides, quite a significant volume of this garbage is the usable waste that if dumped, takes a longer period to disintegrate and that otherwise can be used. There is not much of work done to initiate the productive use of these materials which could reduce the amount of total urban waste.

Garbage disposal ways are limited whereas urban wastes are continuously increasing. This has raised several serious environmental, social and health issues. In Pune, solid garbage is dumped into wastelands across the urban periphery, though some villages protested against it and may file lawsuit, as also in Bangalore [8]. In Pondicherry, the land fill areas where the waste was dumped have swollen. The fires lit by municipal workers to make room for more waste, have gotten bigger, polluting the atmosphere with toxic gases [9]. Thus, waste disposal is emerging as a prominent problem for authorities as well as the urban residents.

Besides the urban authorities, some social enterprises are also coming forward to address the problem. Social enterprises are basically, social mission driven organizations which apply market-based strategies to achieve a social purpose. Social enterprises are businesses with primarily social objectives that reinvest their surplus in the community rather than seeking to maximize profit [10].

This paper discusses some initiatives taken by the social enterprises (SE) in India that adopt a sustainable approach for using the usable waste and extending the utilizable span of the product life cycle. The system they follow is designed in such a way that it does not only sensitize the society but also ensures people participation in their endeavors besides reducing the urban wastes by motivating people to donate the usable wastes.

The paper is divided into seven sections. After introduction, the methodological part of the study has been discussed. The third part describes some of the alternatives possible for the usable waste and in this context, refers to the initiatives taken by the SE named “Goonj”, taken as an example. This is followed by the critical appraisal of their modus operandi from the point of view of sustainability. Fifth part highlights the present challenges faced by the SE and the opportunities in this field followed by the suggestions for innovative usage of present technologies and strategies. The sixth part proposes a system that would that may improve the collection and inventory process by use of internet and mobile technology. The paper finally concludes with direction of future studies.

## **2. METHOD**

This is a conceptual paper that is discussion based in nature. The scientific bases of the paper are three. Firstly, we base our paper on literature on sustainability and SE. We also draw on the experience from previous research done regarding system design. Thirdly, we base it on the information we got from the visit of the enterprise “Goonj”, New Delhi and presentation of the Founder Director of the organization followed by an interactive session in January, 2010. This information is being presented below as a reference for the SEs working in the similar fields providing them a base to explore such ventures with a sustainable approach.

This paper also serves as a reference for the designers who need to design the products and systems for similar enterprises, adopting a sustainable approach with due consideration on technological aspects. The main focus is on analyzing and synthesizing the past experience in order to provide a fair knowledge about operation of such enterprises to open for new opportunities in similar domains.

## **3. INITIATIVES TAKEN BY “GOONJ”: A REFERENCE**

“Goonj” is a SE, started in 1998, with a unique waste management system of its kind addressing the problem of urban sector and the need of rural sector simultaneously. It is channelizing more than 40,000 kg of usable wastes every month. It has its own offices in seven cities and voluntary set-ups in few

other cities. Implementation in different parts of 21 states, working with over 300 volunteers and 150 partner groups including Indian Army, Ashoka Fellows, social activists, Panchayats etc. Mentioned below are some of the initiatives of the enterprise namely – *School to School*, *Just a piece of cloth*, *Vastra Samman*, *Rahat Flood*, *Rahat Winter* and *Cloth for work*.

### **3.1. Just a piece of cloth**

The effort is designed to address one of the most important yet taboo, basic need of the village & slum women i.e. need of sanitary napkin for the essential biological processes of menses, using old clothes as a resource. Considering the poor economic condition of the rural masses, struggling for fulfillment of their basic needs, a sanitary napkin is the last thing that one can think of. The use of washable and reusable cloth for napkin, a material most village women are familiar and comfortable with, is a viable option.

### **3.2. Vastra Samman**

In this initiative, the discarded clothes are made fit for reuse and distributed to the needy and poor rural population free of cost, reaching even most remote and far flung areas. The beneficiaries can reallocate their meager resources for other basic needs like food, health and shelter.

### **3.3. School to school — an initiative connecting urban school kids to their counterpart in slums and villages**

'School to School' aims to bridge the gap of resources, moving it from where it's a waste to where it is precious. The concept is simple yet powerful in influencing education trends in rural/slum India. It asks the urban school kids and the parents for is their waste material i.e. old school uniforms, bags and plastic accessories, partially used stationeries, etc, which they discard anyway each year as the kids go to the new classes.

### **3.4. Rahat Floods & Rahat Winters**

In the last few years, the SE has annually been initiating 'Rahat-Floods' to collect relief material for the lacs of victims in Assam, Bihar & West Bengal during floods. Before every winter, the SE actively initiates "Rahat Winters", its winter campaign, as a response to a recurrent but often ignored problem for the underprivileged, providing them with warm clothes and blankets.

### **3.5. Cloth for work**

The SE has successfully transformed cloth giving from a charitable act into a development activity with this initiative. Under this initiative, the organization collaborates with other partner groups working in remote rural areas to motivate people of a village to identify community issues like road repair, plantation, cleanliness drive etc, collectively work on the issues and get clothes/ material as motivation for work.

## **4. HOW SUSTAINABLE IS THE SE ITSELF**

Though the enterprise is doing good work in the social sector, we need to ascertain if the enterprise as a whole is a sustainable endeavor or not. Hence we have to look into the environmental as well as economical aspects related to functioning of the enterprise.

### **4.1. System of operations adopted**

Basically, "Goonj" plays a role of a medium between the donor and the receiver. The material is sourced and sent out based on the request by the local grassroots organization operating in rural areas. The SE

has a strong network of more than 300 volunteers, works with corporate houses, schools, transporters, resident welfare associations, neighborhood communities and local grassroots organizations.

Putting the activities in a sequential order, the operations carried out are as following:

- Awareness is spread through the Internet, campaigns, street plays, pamphlets and participation in various forums.
- Sourcing and generation of materials takes place through collection camps in big neighborhoods with the help of Resident Welfare Associations (RWA), educational institutions, corporate offices, etc.
- The material transported to the processing centers where a few staffs are involved along with hired people, to do the sorting, washing and repairing.
- Monitoring is done to small but critical issues to ensure full utilization of the products e.g. pairing and lacing of shoes, providing strings for the pajamas, etc.
- Quality checks are also undertaken for the material that is dispatched. The material before being sent out comes to a central storehouse where final sorting and inspection takes place.
- The materials are then dispatched to their destined organizations for distribution.
- A strong feedback system is followed where detailed reports are required from the organizations including acknowledgement from the beneficiaries and visual proof.

To ensure that the clothes and other material don't go waste (e.g. if a man get a female wear or a kids wear, it's a waste for him and vice versa), data like sex ratio, age groups, prevailing clothing practices of beneficiary village is asked from the requesting organization, and accordingly the material is provided to them.

#### 4.2. Sustainable Manufacturing

Sustainable manufacturing is defined as the creation of manufactured products that use processes that minimize negative environmental impacts, conserve energy and natural resources, are safe for employees, communities, and consumers and are economically sound [11]. It also considers the reduction in waste at various stages of product life cycle. Most of the products from the usable wastes are prepared and distributed keeping in mind the minute considerations of the intended users, having scarcity of resources and limited means of fulfilling their basic needs. Since the products fit closely into their requirement, and also fulfil their scarcity of the basic but crucial needs, they value the material given to them and use them fully. Moreover, in the rural sector, the culture of using things unlike urban culture is such that maximum usage is obtained from any material being used in number of different ways. For instance, clothes when get beyond the repair and wear stage, they are made into floor cleaner, dry dust cleaner, hot utensil holder, bed mats, foot mats, etc. and it is used their until it is worn out and reduced to shreds. Hence urban discarded material going to the rural sector is absorbed and dissipated in their various uses and hence the waste produced at the other end is reduced to minimum. Figure 1 illustrates how the initiatives reduce the urban waste.

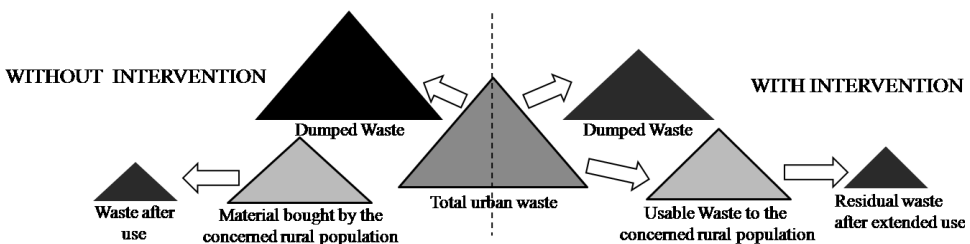


Figure 1. Waste reduction with help of the initiatives.

### **4.3. The Environmental Aspect**

Besides doing sorting and repairing, different utility goods, many products like soft toys, bags, purses, mats, greeting cards are made using mainly the waste materials that can't be reused. At the processing centre, the manufacturing process is mainly labor intensive. This reduces the amount of such materials in the urban waste that otherwise take longer time to decompose adding up to the environmental problems. The resources they ask for are basic i.e. significant amount of water that goes into washing, power required for lighting and other motorized sewing machines. There is an indirect usage of fuel owing to large scale transportation of the materials through various points. It also promotes development activities at the village level which includes plantation of trees. Thus, the system of operation indicates that it has least adverse effect on the environment.

### **4.4. The Social Aspect**

The organization functions taking the excess form prosperous part of the society on the one side, and providing it to needy section of the society on the other. By providing poor under developed, remote villages with the resources from better developed and wealthier regions, the SE is attempting to reduce the regional imbalance to an extent.

Since once the basic need of clothing is met, the poor can use their meager incomes to meet other needs of food, health and shelter, it is trying to mitigate the inequality in income distribution.

In initiative like School to School, the urban children are sensitized to conditions and hardships of their counterpart in the slums and rural areas motivating them to help the underprivileged. Thus it is helping to fill up the gap between two parts of the society by reducing the disparities. The efforts of SE for the society indicate its sustainable approach.

### **4.5. The Economical Aspect**

The enterprise has two ways approaches to meet their financial requirements. On one side, it tries to raise money through its various fund generating activities and on the other, it adopts various innovative low cost involving methods to minimize its expenses. There are several sources that contribute to its funds which includes-donation from the individuals (mainly), funding from the corporate, self generated income through sale of the products manufactured from the waste materials. Export surplus used for raising funds by selling through stalls or promoting among volunteers. Unusable material is converted into products for urban markets to raise resources. The huge prize money that is won by the organization also goes into its funds. There is no contribution coming from the Government. Their major expense includes the salaries of the people employed, transportation and inventory costs of the materials.

As for its second approach i.e. cost saving, it has collaboration with a transport company that carries out the transportation job at a reduced rate owing to its volume and the cause it is working for. For packaging, the gunny bags are used which are easily and cheaply available anywhere. The corporate having ties with it, conduct the collections drives in their premises and send it to processing centre at their own cost. The NGOs, who partner with it, have to take the material to the distribution site and conduct the event of distribution at their own cost. These are some of the measures taken to sustain themselves financially. Though a lot is still to be done to mitigate the financial dependence on the outer source through exploration of new avenues of fund generation, making it more self reliant.

## **5. THE CHALLENGES FACED BY THE SE**

### **5.1. General awareness and Branding**

By observing the functioning of “Goonj”, it can be inferred that since any SE is based on participation of the people from the society, the awareness about the enterprise is very essential. People have varied perceptions about SEs or NGOs. Unless the people know about the type of work that is carried out by the enterprise or the impact it is creating, there would be less participation. On the contrary, if the

people can trust, they would not only participate physically (volunteering) and materially (donating) but also help in spreading its message to others. Even buying the product of the enterprise depends upon the awareness about it. The intention to buy cannot occur unless brand awareness has occurred [12, 13]. Presently, the main mode of creating awareness is by word of mouth which, though reliable, is very slow process.

### 5.1.1. Challenges

In the fast moving life of the cities, the people have become so busy and self centered that they hardly have much of time to socialize in person. In this scenario, the word of mouth communication is not so effective and has very limited scope. Hence, the enterprise is losing its potential work force and donors which are necessary for its fast growth.

### 5.1.2. Opportunity

A large number of people today socialize through internet. However busy people may be, they are connected to media (film and television). Through internet they not only connected to people around but also with people across the globe. Hence internet can play a vital role in spreading the messages across large number of people. Besides having its own website, publicizing the initiatives through the media will be useful. The two can prove to be the important tools in bringing out a progressive change.

### 5.1.3. Suggestion

Spreading general awareness about enterprise through internet and through film and TV media will help creating a brand and have positive mass impact, encouraging a greater participation -physical and material.

## 5.2. Income generation

Income generation is the most important activity of a SE required for its existence. An enterprise requires money for its various activities right from paying wages to the employees to making provisions for maintenance and working of various assets owned by the enterprise. Regular in flow of funds is the biggest necessity for any enterprise.

### 5.2.1. Challenge

Many SEs fail in the long run in spite of good initiatives taken by them, just because they are not economically self-reliant; since depending on the external funds is not a sustainable practice. In case of “Goonj” as well, this is area of concern as their major contribution comes from sources which are external. The biggest challenge is how to generate sufficient funds by itself so as to reduce the dependency on the external funds.

### 5.2.2. Opportunity

The SEs have to try different avenues of self income generation. This situation actually asks for innovation at each and every step, starting from designing a new product range to streamlining the system to redesigning the marketing strategy. This will not only make the SE self reliant, but also generate new employment opportunities.

### 5.2.3. Suggestion

Applying innovation at product design and marketing stages will have positive effect on the income generation and also create new employment opportunities.

## 6. INNOVATIVE USAGE OF THE PRESENT TECHNOLOGIES AND STRATEGIES

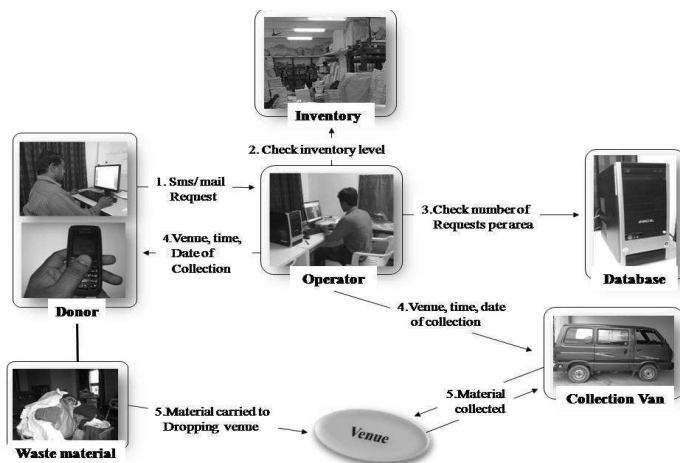
As the awareness about SE grows, more and more people start contributing to the cause. At present, “Goonj” is processing more than 40 tons of cloths per month which reaches from the different corners of country. This means truck loads of material reaching the processing centre per month which is creating big inventory problem for the enterprise as they have to hire premises just for keeping this bulk of materials. Besides, it s also amounts to huge cost incurred on the transportation of the material. In fact, the SE is already framing a state model system where the material collected from the State is processed and redistributed within the state. This would reduce the transportation and inventory cost significantly.

Besides, there are other related problems. One of them is the problem relating the collection of the material from the donors which actually is the major limitation of the collection drives. The materials are generally collected through collection drives but it is quite possible that many interested people don’t have much to contribute at that point of time. On the contrary, drives cannot be conducted often, as per availability of materials with the donors. This limitation can be overcome by effective incorporation of technology i.e. making use of internet and mobile services can solve the problem giving more flexibility and convenience to the donors.

Figure 2 shows how collection can be effectively done with proper usage of internet and mobile technologies in the present system.

- Step 1: A donor can simply SMS the type and quantity of materials to be donated, along with the locality. A request can also be posted on the website of the organization.
- Step 2: The system sends acknowledgement through mail and SMS informing that the dropping point (generally fixed for a particular locality) date and time will be intimated soon.
- Step 3-4: After a week time, depending upon the number of entries from a location and quantity of material to be collected and level of the inventory at the processing centre, the date and time of collection are messaged or sent to the respective mails of the donors.
- Step 5: The schedule is also provided to the collection van that reaches the given venue at given date and the time slot as per the schedule.

Hence people of a locality come to that venue and drop their material at the collection van which moves to the next venue on the list after the time slot is over. If there are few entries from a locality, it



**Figure 2.** Suggested System Design for collection of usable waste material incorporating internet & Mobile technology.



can be given a later date by the operator. This way, they are not only giving convenience to the donors but also controlling the inventory and simultaneously, ensuring in flow of material throughout the year.

The above suggested system will only be effective, if the many people know the enterprise and also aware about the ways of donating. So we need to create a brand for the enterprise and also make them aware of the different donation methods. This is only possible by spreading the message through all known channels.

Designing a range of innovative products out of the available materials can also be done along with tie-ups with the various units (marketing handicraft and other handmade items in the urban markets) for selling of these products, for e.g. Industree. The products may not be only limited to clothing items or but may include some other easy to make items or crafts like wooden work, embroidery work, edibles etc. This will help it generate more funds and get better visibility.

Although the inclusion of new strategy and usage of information technology appears to be very interesting, there could challenges in including them. First, the whole expansion and change over asks for a big capital investment and it would be real tough challenge to raise fund for this when self generated fund is insufficient. In addition, ties with other partners, keeping all the interest of one's company will be difficult to achieve.

## **7. CONCLUSION**

In this paper, we have discussed two ideas that are essential for sustainable existence of SEs, taking an example of practices at "Goonj". Firstly, the SE having made acquaintance among the masses would progress faster. Since, the very essence of the SE is cooperation and participation of the society and a significant part of the urban population socializes through internet and use picture and television media, they can be used for creating awareness.

Secondly, creating new alternatives of independent income generation is essential for sustainable existence of the SE. In order to generate income by self, strategies of applying innovative practices in product and service design and marketing has promising scope. A key aspect regarding the innovative practices is redesigning of the present system by incorporating effective use of technologies such as information technology. Involvement of technology at SE is an aspect that requires to be studied.

There are several possibilities of future work emerging from this paper. The first step will be to consider the suggestion put forward in the paper for the further qualitative and quantitative analysis. The concept of innovation being applied at the system level in SE requires further exploration in terms of theoretical and empirical aspects.

Solving urban problem does not mean that one has to approach the problem urban centrically. If we give due consideration to needs of the rural sector, we are likely to find long term and better solutions for an urban problem. It suggests that there is a large scope of future work for a designer, exploring a system that has urban and rural as its integral parts, determining possibilities of symbiosis between the two, ascertaining the gaps that hinders this symbiosis, and bridging these gaps through design intervention.

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