

# Mobile Phones in India: Mapping across the Formal/ Informal Divide

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for The Digital Empowerment Foundation  
Delhi, India



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# Mobile Phones in India: Mapping across the Formal/ Informal Divide

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*The mobile phone is the most disruptive device to come to India in modern times. It disturbs more people and relationships than the printing press, the watch or the automobile, though it has the qualities of all three. Like the printing press, it allows people to communicate their ideas; but unlike the press, literacy is not necessary, and hundreds of millions of people can disseminate any idea they like from their mobile phone. Like the watch, the mobile phone can be used to enforce discipline about punctuality, but it gives its owner so many more possibilities than simply the ability not to be late for an employer's deadline or to enforce timeliness on others. Like the automobile, the mobile phone allows communication over distance; but unlike the automobile, mobile phones are cheap and do not occupy the space of a large cowshed. An automobile allows a few people to travel considerable distances; a mobile phone allows any number of people to communicate with others almost anywhere in the world.*

**Robin Jeffrey and Assa Doron.**

**“Celling India: Exploring a Society's Embrace  
of the Mobile Phone.”**

## Executive Summary

**T**his study addresses the following questions: can mapping the full and extended life of the mobile phone in India help improve awareness and lead to more informed decision-making at all levels (consumer, businesses large and small, government)? Is the longer than world-average life-span of the Indian mobile phone a sign of a healthy and robust economy and society? How does the long life-span manifest itself in Indian society? Can constructive re-use extend the life of mobile phones before they reach the industrial recyclers?

Previous research has raised awareness about the manufacturing and marketing of mobile phones, so our study will primarily focus on what happens in both the formal and the informal e-waste economies, where things get more messy and less black and white. The study combines primary, first-hand field research (a) in the informal business spaces of Gaffar Market, Nehru Place Market, Chandni Chowk, Seelampur and Mustafabad in Delhi and Manish Market and Saki Naka in Mumbai. These places are known for the second hand market, the repair and refurbishment market, copycat and counterfeit imported phones and e-waste recycling; and (b) interviews with the Government and e-waste authorities, telecoms and e-waste industry reps, NGOs working in the environmental and empowerment fields, academics and research with secondary research (relevant papers, legislation, articles, blogs, websites and videos) and a survey of available statistical information.

The informal and formal economies in India are not mutually exclusive domains or discreet economies. Our study highlights how both these sectors are enmeshed and interdependent on many levels, they nevertheless sometimes complement and sometimes compete with each other; sometimes filling each other's gaps and sometimes creating redundancies; sometimes coexisting seamlessly and, at others, seamfully.

Our study also revealed that it is not just the multi-national telecoms and e-waste recyclers that participate in global flows of trade, technology and commerce. The informal economy is sizeable and contributes to the long life-span of the mobile phone in India. The formal, industrialised e-waste recycling industry cannot presently compete with the illegal informal sector, provide a livelihood for hundreds of thousands of households nationwide. While the debate continues on eliminating the informal e-waste sector entirely. On the other hand, formalizing the informal, or incorporating the informal into the formal sector, may be a more realistic and complementary approach to the mobile phone industry and could transform the e-waste industry into a viable, efficient and environmentally friendly industry, according to the proponents of the approach.

# Introduction

## The Back Story

Knowing that the average lifespan of a mobile phone in India is significantly longer than in the west: 6 to 8 years, compared to 22 months, respectively (Entner 2012:2) and that this country has a reputation for a well established grey market in second hand phones and electronic waste. The original motivation for the study was to create an accurate life cycle of the mobile phone in this country by tracking actual mobile phone usage and collecting primary and original information.

## Precedents

GPS tracking, mapping and locative media have been used by environmentalists, activists, artists and others to track the illegal international trade of e-waste and map the global flows of transnational production in the era of globalization.

- Greenpeace used GPS tracking to uncover illegal trade in e-waste from Hampshire, England to Nigeria (Greenpeace 2012)<sup>1</sup>.
- The Environmental Investigation Agency also used GPS to track the illegal flow of e-waste from Surrey and Norfolk, England to Nigeria and Ghana (Wasley 2012)<sup>2</sup>.
- The MILK project tracked and mapped milk from the cow's udder in Latvia to the dinner table in the Netherlands to reveal the unified agricultural markets in the European Union (Polak 2012)<sup>3</sup>.

## Constraints of this study

The explanatory nature of this study asks for a longitudinal study approach. For example it would take 6 to 8 years to collect data on the locations of number of mobile phones (with GPS tracking device). Due to insufficient time and lack of resources this report has approached two strategic decisions to limit the scope of the study:

- This report focuses on what happens downstream of the lifespan of mobile phones, where things get more complex and less black and white: the second hand market, the repair and refurbishment market, copycat and counterfeit im-

<sup>1</sup> <http://www.greenpeace.org/international/photosvideos/photo-stories/following-the-e-waste-trail/>

<sup>2</sup> [www.guardian.co.uk/environment/2011/may/16/uk-ewaste-dumped-ghana](http://www.guardian.co.uk/environment/2011/may/16/uk-ewaste-dumped-ghana)

<sup>3</sup> <http://milkproject.net/en/index.html>

ported phones and e-waste recycling – in both the formal and the informal e-waste economies sectors. We have collected primary data directly from people who work with mobile phones in India on a daily basis.

- This report has analysed on existing secondary research in the field (papers, articles, reports, empowerment initiatives).

### **Objectives and Research Questions**

This report is done in order to analyse all factors affecting the life cycle of Indian mobile phones. As consumers, it is easy to compartmentalize, being conscious of possessions such as mobile phones for only the period that we own them. These days, rapid technological development, planned obsolescence and the increasing popularity of smart phones make that period of ownership shorter than ever. Is the longer than world-average life-span of the Indian mobile phone a sign of a healthy and robust economy and society? How does the long life-span manifest itself in Indian society? Can constructive re-use extend the life of mobile phones before they reach the industrial recyclers?. This report captures a complete picture of factors affecting in buying, selling and e-waste of mobile phones.

Globalization, furthermore, can make the processes of off-shore production invisible and, as a result, out-of-sight tends to be out-of-mind. Can mapping the full life of the mobile phone help make the invisible visible, improve awareness and lead to more informed decision-making at all levels (consumer, large and small businesses, government)? Thus, incorporating consumer's choice, in day-to-day mobile business strategies, this report highlights the impact of e-waste culture.

### **The Digital Empowerment Foundation (DEF)**

In 2011, the Digital Empowerment Foundation (DEF), in conjunction with the Association for Progressive Communications (APC) published *ICTs and Environmental Sustainability: Mapping national policy contexts, India Baseline Study, a horizontal study* of the environmental policy framework of ICTs in India in 2010 and 2011, a time when awareness of environmental concerns around ICTs nascent and the Government had released its draft e-waste Rules for comment. According to the introduction:

By and large, there is no prior consolidated study in India of any sorts to measure the policy trends in relation to environmental sustainability, climate change and ICTs. This study attempts to address this. It also considers key aspects of the role of stakeholders – public, private, civil society and academia (DEF and ACT 12).

At the time of the study, there was no unified national level Government policy regarding the environmental fallout of ICTs or any industry-wide policy. This study is intended to build on the foundation built by that earlier study, but narrow the focus from e-waste in general to the mobile phone in particular and

deepen the scope of study from the end-of-life issue of e-recycling to the full and complex life-span of the mobile phone in Indian society.

**Organization of this report**

This report is organized in a number of sections. The first after the introduction will describe our research methodology. The second, third and fourth will provide background and context: the importance of the mobile phone in India, the growth of telephony and India’s mobile phone culture. The fifth section will be dedicated to the issues and regulations of e-waste and the potential for recycling industry transformation and the implications thereof. The sixth section will summarize our field research findings in Seelampur, Mustafabad, Gaffar Market and Nehru Place Market in the Delhi area and Manish Market and Saki Naka in Mumbai. The final section will summarize our conclusions regarding the mobile phone, the relationship between the formal and informal economies in India and the implications for formalizing the informal economy.

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## Methodology

Our study included first hand field research and interviews of a range of stakeholders combined with a review of published material, available both in print and online.

Secondary research included international reports (eg. United Nations reports), Indian Government regulations (eg. e-waste Rules and Guidelines), peer-reviewed papers by specialists in the field, magazine articles, stakeholder websites and blogs, opinion-pieces and videos.

Interviews and field research were carried out over four weeks from mid-June to mid-July of 2012 in the Delhi region and Pune and Mumbai in Maharashtra. Interviews with Government officials, telecom representatives, NGOs and researchers were carried out in person. However a few meetings took place over the phone. We travelled to Pune, Mumbai and Delhi to make first person field observations and conduct interviews with local residents and informal sector business owners in their own locality. In these cases, a translator was used so that interviews could be undertaken in the interviewee's first language.

The following broad groups of stakeholders were interviewed:

- Government and authorities having jurisdiction.
- NGOs and social enterprise organisations involved with advocacy and empowerment.
- Telecom and e-waste industry.
- The informal sector, including mobile phone repair shops, second hand shops and e-waste handlers.
- Academics and researchers.

See Box 1 below for additional details.

We also surveyed available statistical information and did our best to combine and correlate data from different sources in order to create as complete a picture as possible. This task posed a number of challenges, which are described in more detail below.

## Stakeholders interviewed

Box number 1

We focussed on the following groups of stakeholders

- **Bold names represent people and organizations that we meetings with face-to-face or over the phone**
- **Light names represent people we approached but were unable to connect with for one reason or another**

Government & Authorities	NGOs, Social enterprise	Industry	Informal Sector	Academic
• <b>CPCB, Anand Kumar</b>	• <b>Toxic Links, Delhi, Priti Mahesh</b>	• <b>Nokia, Pranshu Singhal<sup>1</sup></b>	• <b>E-Front Line Recycling Pvt Ltd, Mumbai</b>	• <b>Assa Doron, Australian National University</b>
• <b>Delhi Dept of Environment (re. Eco-Clubs), Dr. BC Sabata</b>	• <b>GIZ, Delhi, Dr. Ashish Chaturvedi</b>	• <b>Samsung<sup>1</sup></b>	• <b>China-made phone shop, across from Manesh Mkt, Mumbai</b>	• <b>Nimmi Rangaswamy, Microsoft Tech. for Emerg. Mkts</b>
• <b>Dept of IT, Ministry of Comm &amp; IT, Dr. Sandip Chatterjee</b>	• <b>SMS One, Pune</b>	• <b>Micromax<sup>1</sup></b>	• <b>Mobile phone recycler, Seelampur, Delhi</b>	
• <b>MoEF</b>	• <b>Anil Bhandwalkar, Community Newsletter mgr., Pune</b>	• <b>Tata<sup>1</sup></b>	• <b>3 e-scrap collectors, separators in Mustafabad, Delhi</b>	
• <b>Min. of Science &amp; Technology</b>	• <b>over 20 people in Keshavanagar community, Pune</b>	• <b>Philips<sup>1</sup></b>	• <b>6 Mobile repair shops in Nehru Place Market, Delhi</b>	
• <b>DPCC</b>	• <b>RML, Maharashtra, Rantej Singh</b>	• <b>ICA<sup>1</sup></b>	• <b>7 Second hand mobile shops in Gaffar Mkt, Delhi</b>	
• <b>Karnataka State Pollution Control Bd.</b>	• <b>Aarogya, Pune</b>	• <b>Acer<sup>1</sup></b>		
	• <b>Aarti Patil, school principal, Pune</b>	• <b>Eco-Reco, Mumbai, Anuj Maheshwari<sup>2</sup></b>		
	• <b>EKO Services, Anupam Varghese</b>	• <b>Envirocom, Delhi, Anil Sagar<sup>2</sup></b>		
	• <b>Sarathi, Pune, Shankar Kalmani</b>	• <b>Anonymous industry body<sup>2</sup></b>		
	• <b>Vote Report</b>	• <b>TES-AMM<sup>2</sup></b>		
	• <b>Greenpeace</b>	• <b>Attero<sup>2</sup></b>		
	• <b>Chintan</b>	• <b>E-Parisaraa<sup>2</sup></b>		
		• <b>Earthsense<sup>2</sup></b>		
		• <b>SMS Recycling<sup>2</sup></b>		
		• <b>E-waste India<sup>2</sup></b>		
		• <b>Telecom<sup>1</sup></b>		

## Importance of the Mobile Phone in India

### Why focus on the mobile phone:

We chose to focus on the mobile phone in India, as opposed to other forms of Information and Communication Technologies (ICTs) and electronic waste (e-waste) for a number of reasons:

- To highlight the telephony revolution in the last 25 years in India: In fact, market penetration and growth of mobile phones has outstripped that of either the personal computer or the Internet in India (see below). Mobile phones still represent the fastest growing sector of the electronics industry and, with only 33% of the second largest population in the world still refrain (or more because of the multiple phone ownership phenomenon), the biggest opportunity for future growth.

- For many Indians, the mobile phone is far more practical than Internet connectivity via a personal computer (see below).

- The mobile has had a bigger impact on all levels of Indian society than the personal computer and the Internet combined. Affordable and seemingly ubiquitous, even below the poverty line (BPL), in just a few years it has given people unprecedented access to information and to each other, spawned an entire industry of formal and informal sector support service entrepreneurs and in some cases changed the balance of power between the powerless and the gatekeepers. As Robin Jeffrey and Assa Doron described it in “Celling India”:

... new workforces of manufacturers, technicians, tower builders, distributors, agents, marketers, salespeople, repairers, recyclers and second-hand dealers take shape. And even poor people can own cell phones. At the base of the pyramid, we hear stories of fishermen and farmers, rickshaw drivers and vegetable sellers, making ‘missed calls’, taking pictures, checking prices, downloading screen savers, doing pujas – all with a device that would have mystified most of India before the year 2003. More important, the cell phone appears to arm its owner with possibilities to leap over barriers, not merely of distance but of power. The cell phone does not eradicate power structures, but it can sometimes subvert them.

(Jeffrey 2012: 398)

- The mobile phone’s potential for empowerment, for providing previously unavailable access to information and networks for micro and small enterprises and for improving the lives of people living below the poverty line. See Boxes 2.1 and 2.2 for a short survey of grassroot empowerment and development projects in a range of fields - agriculture, personal banking, democratic rights, and community services, each of which is designed for the mobile phone platform and simple and low-cost handsets.

- Mobile phones have the largest percentage of recyclable precious metals on a per kilogram basis of all electronics equipment and, therefore, represent the greatest potential for conservation.

# Mobile Phones for Empowerment

Box number 2.1

A short survey of Indian empowerment initiatives across a range of sectors of society specifically designed for the mobile phone and targeted to the mobile phone user.

## SMS One Community Newsletter – community information



A super-local community messaging service that delivers local panchayat-level social service messages such as for blood drives and upcoming health clinics as well as more promotional messages to community members who previously had to rely on street corner blackboards like in the photograph above for their information. Here's how it works: a manager builds a subscription base of 1000 to 2500 people within a given community, for whom the service is free of charge. The manager then charges the sender of the messages depending on the type of message and keeps a portion for him or herself as income.

[www.smsone.in](http://www.smsone.in)

## Vote Report India – democratic rights



An example of crowd-sourced crisis mapping using open source Ushihidi and SwiftRiver software, VRI was launched to track election violations during the 2009 general elections. It works by aggregating incoming reports from any citizen on the ground, organizing them in a map-based interface, filtering them and sending relevant information back out to the field. Reports can be made by SMS/text, email or web, but SMS is the most immediate.

VRI empowers by creating transparency and tracking transgressions in real time, not after the fact. It gives people the power to create and disseminate information that is important to them without having to go through the usual gatekeepers (authorities, politicians, media channels).

<http://votereportindia.pbworks.com/w/page/7646284/FrontPage>

### Reuters Market Light (RML) – small scale farming



An initiative of Thomson Reuters, RML makes local and personalized agricultural information available to Indian farmers who previously had to rely on word of mouth or the word of self-interested middlemen and traders. Here’s how it works: for Rs. 99/month or Rs. 999/year a farmer can subscribe via any brand of mobile and any service provider. After selecting which crops they want to receive market news about (from a selection of over 400) and choosing their preferred language of communication out of 8 dialects offered, they will receive approximately 4 messages a day with market and weather information customized to their crops, location and language as well as advice on fertilizers, water, seeds, soil, fire etc.

The objective is to empower farmers to grow crops more effectively and negotiate the best prices at market by giving them access to highly customized and practical information. RML is designed to work on every type of mobile phone starting from the simplest text-based handset because SMS is the preferred medium of communication for small farmers according to Rantej Singh, from RML.

[www.reutersmarketlight.com](http://www.reutersmarketlight.com)

### EKO-Services – personal banking



EKO Services provides basic banking services (deposit, withdrawal and secure money transfer) to the previously unbanked: the poor, the migrant worker, the innumerate and the illiterate. Requiring only touch-tone dial functionality, it is designed to work on the most basic handset, with an interface that is familiar to any prepaid mobile phone user who has ever recharged their mobile. Last year it had over 180,000 users and handled Rs. 400 crore in transactions.

[eko.co.in/index.php](http://eko.co.in/index.php)

<http://www.youtube.com/watch?v=ROGA95ghm-k>

## Growth of Telephony

### Liberalization and opening up of the Indian mobile market – economic policy & regulation

The first mobile phone and internet services were offered in India in 1995, but only in major cities. In the 1990s, India's telecommunications industry underwent a process of liberalization and privatization, which resulted in private and foreign investment and rapid growth, especially in the mobile phone sector. However, the rate of growth rose significantly after the year 2000 as a result of a change in licensing rules that resulted in lower usage rates for the average customer. Today, Indians has access to a wide range of both domestic and foreign made phones and, arguably, the most affordable rate in the world combined with flexible prepaid plans. Due to the size of the population combined with a 77% overall mobile phone penetration rate, India has the second largest mobile phone market in the world (Wikipedia)<sup>4</sup>. At the same time, the number of people without a mobile phone means that the industry still has a way to go to fully develop and reach a 100 plus% saturation point of many other countries in the world.

### Demographic data

Box number 3

Population of India (2011): 1,210,193,422<sup>i</sup>

Number of households in India and average number of people per household (2011): 247 million and 4.9<sup>ii</sup>

Overall sex ratio, males vs. females (2011): 623,724,248 million vs. 586,469,174 million or 1000 vs. 940<sup>iii</sup>

Percentage of people living in urban vs. rural areas: 30% vs. 70%<sup>iv</sup>

Literacy rates, urban vs. rural (2011): 85% vs. 69%<sup>v</sup>

Rural literacy rates, female vs. male (2011): 59% vs. 79%<sup>vi</sup>

Urban literacy rates, female vs. male (2011): 80% vs. 90%<sup>vii</sup>

Children (0 to 6 years of age) (2011): 158,800,000<sup>viii</sup>

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<sup>4</sup> [http://en.wikipedia.org/wiki/Communications\\_in\\_India](http://en.wikipedia.org/wiki/Communications_in_India)

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### Growth of telephony

In 1987, there were 2.7 million phones in India for a population of 730 million people - or a 0.3% penetration. By 1999, four years after the launch of mobile phones in the country, total phone penetration had only grown to 23 million phones for a population of 1 billion people – or approximately a 2% penetration (Jeffrey 2012:399). By May of 2012, total phone penetration stands at 961 million for a population of 1.2 billion – or 80%. Out of that, mobile phone penetration stands at 929 million or 77% (Wikipedia) .

See Boxes 3 and 4 for statistical data regarding the mobile phone in India.

## Mobile Phone Statistics

Box number 4

Percentage of Indian households with mobile phones vs. those with access to toilets: 59% vs. 47% <sup>ix</sup>

Mobile phone subscribers (2012): 929.37 million <sup>x</sup>

POTS telephone subscribers (2012): 31.53 million <sup>xi</sup>

Total internet connections (Dec. 2011): 22.39 million <sup>xii</sup>

Estimated number of internet users (Dec. 2011): 121 million <sup>xiii</sup>

Percentage of households with Internet access (2012): 10.2% <sup>xiv</sup>

Percentage of urban vs. rural households with computers or laptops (2011): 20% vs. 5% <sup>xv</sup>

Overall percentage/number of households with computers or laptops (2011): 9.5%/23.5 million <sup>xvi</sup>

Percentage/number of households that have vs. don't have internet access (2011): 3.1%/7.7 million vs. 6.4%/15.8 million <sup>xvii</sup>

Percentage/number of urban vs. rural households that have internet access (2011): 8.3%/20.5 million vs. 0.7%/1.7 million <sup>xviii</sup>

Percentage/number of urban vs. rural households that have mobile phone (2011): 64.3%/158.8 million vs. 48.0%/118.6 million <sup>xix</sup>

Percentage/number of urban vs. rural households that have landline phone (2011): 6.0%/14.8 million vs. 3.1%/7.7 million <sup>xx</sup>

Percentage/number of urban vs. rural households with both mobile and landline phones (2011): 11.7%/28.9 million vs. 3.3%/8.2 million <sup>xxi</sup>

Percentage of urban vs. rural households with one form of phone service or another (2011): 82.0% vs. 54.4% <sup>xxii</sup>

Therefore, the percentage of urban vs. rural households with no access to any phone service (201

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 Percentage of urban vs. rural households with one form of phone service or another (2011): 82.0% vs. 54.4%<sup>XXII</sup>  
 Therefore, the percentage of urban vs. rural households with no access to any phone service: 18 % vs 45.6% (2011)

<sup>I</sup> Chandramouli, Dr. C., Registrar General & Census Commissioner, India, Ministry of Home Affairs. "Rural Urban Distribution of Population, Census of India, 2011 (Provisional Population Totals). 15 July, 2011. Web. 12 July, 2012. <[http://censusindia.gov.in/2011-prov-results/paper2/data\\_files/india/Rural\\_Urban\\_2011.pdf](http://censusindia.gov.in/2011-prov-results/paper2/data_files/india/Rural_Urban_2011.pdf)>

<sup>II</sup> Chandramouli, Dr. C., Office of the Registrar General, India, Ministry of Home Affairs. "Housing, Household Amenities and Assets - Key Results from Census 2011." Web. 12 July, 2012.

[http://www.google.co.in/url?sa=t&rct=j&q=number%20of%20households%20india%202011&source=web&cd=3&ved=0CFQQFjAC&url=http%3A%2F%2Fcensusindia.gov.in%2F2011census%2Fhlo%2FData%2520sheet%2F00\\_2011\\_Housing%2520India\\_12-3-12\\_Final1.ppt&ei=5Zr-T6q3DMXJrAfpYPHcBg&usq=AFQjCNEYBKWOB9OZxHwPanM8SJ3VOwwHkw&cad=rja](http://www.google.co.in/url?sa=t&rct=j&q=number%20of%20households%20india%202011&source=web&cd=3&ved=0CFQQFjAC&url=http%3A%2F%2Fcensusindia.gov.in%2F2011census%2Fhlo%2FData%2520sheet%2F00_2011_Housing%2520India_12-3-12_Final1.ppt&ei=5Zr-T6q3DMXJrAfpYPHcBg&usq=AFQjCNEYBKWOB9OZxHwPanM8SJ3VOwwHkw&cad=rja)

<sup>III</sup> Wikipedia. "2011 Census of India." Web. 12 July, 2012. <[http://en.wikipedia.org/wiki/2011\\_census\\_of\\_India](http://en.wikipedia.org/wiki/2011_census_of_India)>

<sup>IV</sup> Sharma, Shilpa. "Rural India Calling." Hyderabad, September, 2009. Web. 11 July, 2012. <<http://hci-hyderabad.org/usid2009/callforpapers/papers/Paper-P-00024.pdf>>

<sup>V</sup> Chandramouli, Dr. C., Registrar General & Census Commissioner, India, Ministry of Home Affairs. "Rural Urban Distribution of Population, Census of India, 2011 (Provisional Population Totals). 15 July, 2011. Web. 12 July, 2012. <[http://censusindia.gov.in/2011-prov-results/paper2/data\\_files/india/Rural\\_Urban\\_2011.pdf](http://censusindia.gov.in/2011-prov-results/paper2/data_files/india/Rural_Urban_2011.pdf)>

<sup>VI</sup> Ibid.

VI Ibid.

VII Ibid.

VIII Ibid.

IX Censky, Annalyn. "In India, more cell phones than toilets." CNN Money. 14 March, 2012. Web. 12 July, 2012. <<http://economy.money.cnn.com/2012/03/14/in-india-more-cell-phones-than-toilets/>>

X Wikipedia. "Communications in India." Web. 12 July, 2012. <[http://en.wikipedia.org/wiki/Communications\\_in\\_India](http://en.wikipedia.org/wiki/Communications_in_India)>

XI Ibid.

XII Ibid.

XIII Ibid.

XIV Ibid.

XV Chandramouli, Dr. C., Office of the Registrar General, India, Ministry of Home Affairs. "Housing, Household Amenities and Assets - Key Results from Census 2011." Web. 12 July, 2012. <[http://www.google.co.in/url?sa=t&rct=j&q=number%20of%20households%20india%202011&source=web&cd=3&ved=0CFQQFjAC&url=http%3A%2F%2Fcensusindia.gov.in%2F2011census%2Fhlo%2FData%2520sheet%2F00\\_2011\\_Housing%2520India\\_12-3-12\\_Final1.ppt&ei=5Zr-T6q3DMXJrAfyPHcBg&usg=AFQjCNEYBKWOB9OZxHwPanM8SJ3VOwvHkw&cad=rja](http://www.google.co.in/url?sa=t&rct=j&q=number%20of%20households%20india%202011&source=web&cd=3&ved=0CFQQFjAC&url=http%3A%2F%2Fcensusindia.gov.in%2F2011census%2Fhlo%2FData%2520sheet%2F00_2011_Housing%2520India_12-3-12_Final1.ppt&ei=5Zr-T6q3DMXJrAfyPHcBg&usg=AFQjCNEYBKWOB9OZxHwPanM8SJ3VOwvHkw&cad=rja)>

XVI Ibid.

XVII Ibid.

XVIII Ibid.

XIX Ibid.

XX Ibid.

XXI Ibid.

XXII Ibid.

### **The mobile phone is no longer a luxury**

The mobile phone is so ubiquitous in India because, for most, it has become a necessity of life, no longer than a luxury item for the lucky few and upper classes. It has been widely observed and reported how even relatively poor families have chosen to spend a disproportionate amount of their income on a mobile phone. For example, in “Rural India Calling,” Shilpa Sharma described how mobile phones are considered a necessary investment comparable in importance to other first purchases for the rural poor:

With an average household income of Rs. 4000/- per month, a rural Indian perceives mobile phone as an investment, and not an indulgence. This is an interesting insight which debunks the common perception wherein a mobile phone implies additional expense and thus becomes avoidable. Mobile Phone is fast catching on with a bicycle, radio, alarm clock to be the first durable that a rural Indian is purchasing (Sharma 2009:2).

2011 census data also revealed that more households in India have mobile phones than toilets, something that made for sensational headlines at the time, but highlighted how important the mobile phone had become even for people below the poverty line:

New data from the country's 2011 census shows 59% of Indian households have a mobile phone. Only 47% have a toilet on the premises (and that includes pit latrines that don't use running water) (Censky 2012)<sup>6</sup>.

See Box 5 for examples of what the mobile phones gives access to and which tools, equipment and gadgets is replaces.

For many people, the mobile phone provides their first experience of access to institutions, experts, networks, information, tools, entertainment, household goods and gadgets. See Box 5.

### **Mobile phone vs. the Internet – infrastructure and technology**

Unlike in the west, in India, the mobile phone has enjoyed more popularity and deeper reception than either the personal computer or the Internet ever did. In fact, many people skipped over both the land-line phone and the internet right to the mobile phone, experiencing it as their first experience with ICTs. There are a number of reasons for this:

- Historically, rural areas in India have not been well served by Internet service providers.
- Uninterrupted electrical power supply and internet service are not reliable in most parts of the country including the metros, but especially in rural areas. By contrast, even a few hours of power supply per day is enough to charge a mobile phone for 24/7 access.

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<sup>6</sup> <http://economy.money.cnn.com/2012/03/14/in-india-more-cell-phones-than-toilets/>

- Until very recently, in India, Internet transmission speed was very slow and bandwidth very narrow.
- Mobile phones are very simple and less daunting to use compared to computers and the internet, especially for the innumerate and illiterate or people who simply don't speak English, the *lingua franca*<sup>7</sup> of the Internet.
- Compared to the cost of a mobile phone, computer hardware costs are high and present a barrier to entry for many. By contrast, mobile phones have become increasingly affordable.
- Internet subscription rates were expensive and many people were afraid to get locked into long term contractual commitments. By contrast, mobile plans are low-cost and prepaid recharging makes things flexible.
- Smart phones and 3G have made mobiles more popular than ever.
- Lastly, mobile phones are mobile, to state the obvious. Their small size means that they are convenient, flexible and go wherever you go. Geo-locative technologies, furthermore, mean they can customize content to suit the user's location.

Vigneswara Ilavarasan and Mark Levy studied mobile phone use by over 500 micro-entrepreneurs in Mumbai and concluded, in "ICTs and Urban Microenterprises," that there is a critical relationship between mobile phone use and business success for micro-entrepreneurs. Few of the business people they studied used computers or the Internet for business purposes – an example which reinforces the relative importance of the mobile phone to the Internet in India:

Nearly everyone who owned or managed a microenterprise - regardless of sex – had a mobile phone. Levels of PC ownership and usage at home and work were low. Few micro-entrepreneurs frequented Internet cafés for business purposes.

(Ilavarasan and Levy 2012:1)

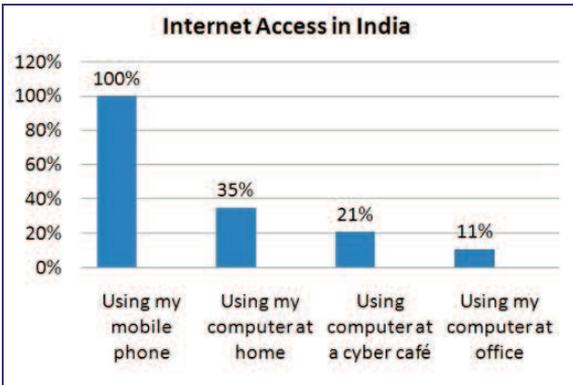
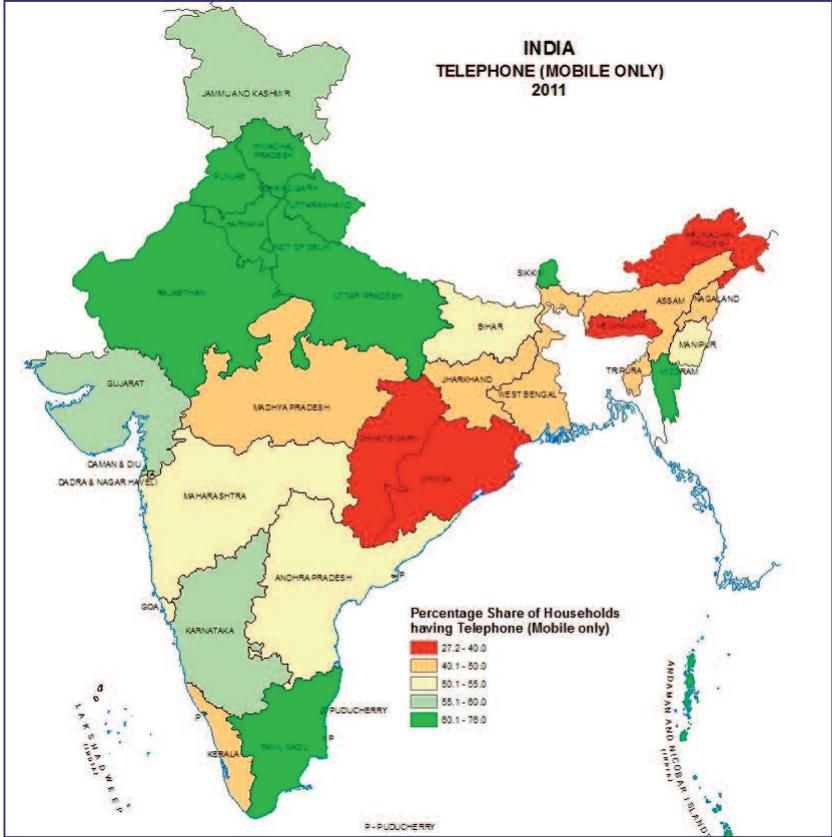
As a result, in India the mobile phone – not the internet - has become ubiquitous.

See Box six for a comparison of mobile phone, computer and internet penetration. One note: it is important to understand that gross penetration numbers for mobiles and Internet access cannot be compared apples-to-apples. The first refers to the overall number of mobile phone subscriptions and the second refers to the overall number of Internet subscriptions. But the difference lies in the fact that in a typical household, a number of mobiles may be owned by different people. In fact one person may have several phones but one Internet service will be shared by all.

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<sup>7</sup> [http://en.wikipedia.org/wiki/Lingua\\_franca](http://en.wikipedia.org/wiki/Lingua_franca)

# Mobile Phone vs. the Internet



Mobile internet users in India is increasing everyday. Tanuj Lakhina from IndiaSocialIn surveyed that 100% of the respondents of the survey use Internet on the mobile phone. This could be attributed to the fact that majority of the users are located in metropolitan cities. Followed by 35% who use Internet on their computers at home, 21% on a computer at a cyber cafe while 11% use on a computer at work<sup>8</sup>.

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<sup>8</sup> <http://www.indiasocial.in/flirty-gifts-most-popular-as-virtual-goods-mig33-survey/>

## Mobile Phone Culture

### Mobile Phone Culture

**N**immi Rangaswamy has studied mobile phone ecologies in the slums of Mumbai and Bangalore and identified a number of points in her paper “Cutting Chai, Jugaad and Here Pheri” that are relevant here. She describes the urban ICT landscape or technology-scape in Indian cities as a messy and imperfect combination of pent up desire for everything the mobile phone has to offer (music, movies, networks, source of income, status etc.) combined with unstable and discontinuous infrastructure (internet, electricity, water), dated and sometimes dysfunction ICT hardware, mixed levels of literacy and numeracy and the grey market economy that surrounds the mobile phone as much as it does so many other things. It is what characterizes the imperfect, bottom-up reality of ubiquitous communications in the global south, rather than the flawless vision of seamless connectivity delivered from the top down by Big Telecom [Rangaswamy 2011:562]<sup>9</sup>. She reiterates:

There is overwhelming public evidence of information technology existing in nook mom and pop businesses of (re)selling, (re)assembling, (re)cycling and (re)servicing ICTs. It provokes attention toward the flourishing and ubiquitous non-formal or gray markets in India working with sparse and unstable infrastructural resources, kindled by human endeavor and dynamism. In contrast to the popular UbiComp view of infrastructure as given by corporate entities, infrastructures in low-income or resource constrained environments often involve the work of several actors and networks in filling gaps in more formal infrastructures, channeling information, communication, and basic necessities of everyday life. (Rangaswamy 2011:559)

The resulting counter or informal economy is characterized by the following adaptive strategies:

- Creative and often entrepreneurial workarounds. Rangaswamy identifies three strategies that she calls ‘intermediaries’, but we prefer to simply call them ‘workarounds’: creative and ingenious strategies for getting what you want without paying full price.
  - Cutting Chai: borrowing or sharing strategies to cut costs, e.g. people sharing a double- or triple-SIM card phone (Rangaswamy 2011:557). Note: mobile phones are much better suited to sharing than stationery personal computers and hard-wired Internet service.

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<sup>9</sup> <http://www.springerlink.com/content/w153t472kuo25920/fulltext.pdf?MUD=MP>

- Jugaad: innovative and often low-cost solutions borne out of necessity, e.g. the phone repair ‘ecology’ whereby the life of the mobile phone is extended well beyond the norm, through re-use, repair and the trade in parts (Rangaswamy 2011:558).
  - Here Pheri: grey market, semi-legal practices; getting away with whatever you can (Rangaswamy 2011:559), e.g. deliberately making ‘missed calls’ or ‘dropped calls’ to avoid phone charges, pirated software, counterfeit phones.
- Subversion of authority, the law, intellectual property and the conditions that Big Telecom places on access to communication technology (fees, contracts, limited licenses, conditions, design for incompatibility, forced upgrades etc.).
  - Appropriation of brand name, technology etc.

Even though the urban poor may lack financial capital and the ideal physical infrastructure, the dense urban conditions that they live in are associated with the human and social capital and economies of scale that support and enable the informal economy. For example:

- Dense living conditions create tightly-knit networks of neighbours and contacts to be leveraged by both consumer (e.g. sharing costs) and service-provider.
- High density living creates enough critical mass and competition for a high-volume low-margin business to thrive keeps prices affordable.
- A large population allows many people to specialize in niche services, thereby reducing the training and investment required for each one, but adding up to a fully established network of interdependent services.

### Urban vs. Rural mobile phone patterns

Rural field work was beyond the scope of our research. However, the following information about the urban/rural divide or, to be more accurate, the shrinking urban/rural divide, can be found in secondary sources:

- Many people in rural areas skipped landline phone technology and went straight from no phone service to mobile. “Most of Rural India skipped the landline telecommunication and internet age and leapt straight to adopt mobile telephony” (Sharma 2009:1). For many, furthermore, mobiles offered their first exposure to digital technology of any kind.
- According to their 2009 study of rural mobile users, the most popular phone in rural areas of India was the Nokia 1100, a simple, inexpensive but very robust text-based handset. But rural consumer patterns are changing due to marketing, better availability of 3G service that can support bandwidth-needy video and audio, smart phones and a general process of maturity. The urban buyer may still be more likely to gravitate to major name brand products and be willing to

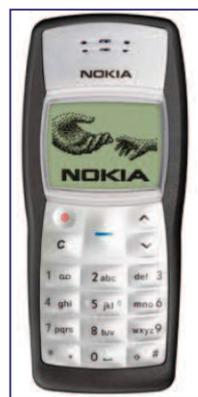


Figure 1: Nokia 1100 Series phone: still the most popular in rural areas

pay a premium for the label, but today's rural customer desires the same features but, being more motivated by price and pragmatic value, is less likely to pay as much as their urban cousins. A 2011 Gfk Nielson survey reported the following average mobile phone prices for rural, urban and metro (i.e. India's largest cities) customers:

Rural subscribers, however, are more price sensitive ... A rural customer spends 2,000 to buy a mobile phone while an urban customer would spend up to 3,000, the study found. This gap widens in metros where customers buy a cellphone for 3,500 on an average. (Aulakh 2011)<sup>10</sup>

Thus copycat buying is more prevalent in rural areas:

With regard to the rural customer, while television may put him in touch with several new brands and products, he may still continue to buy 'copycat' brands. The demand in rural India is less predictable than in mature markets. The parallel 'copycat' brands market dishes out low-quality, low-price products and thus meets the price-value equation of a large chunk of the rural customers. (Shriam 2011)<sup>11</sup>.

- When it comes to mobile phones, the traditional urban/rural divide is blurring and the markets are becoming seamlessly continuous (Sharma 2009). Due to size of rural middle class, the fact that most families have at least one child working in non-agricultural sectors, the penetration of televisions and rural people's exposure to aggressive television marketing for mobile phones (ibid). A seamless integration of rural and urban markets is already under way. The rural economy may, therefore, increasingly become inter-dependent rather than insulated from the rest of the economy. (Shriram 2011)

Shilpa Sharma warns against overgeneralising the contemporary rural market, which is diverse and heterogeneous. "Rural does not mean farming!" and "Rural does not mean poor!" (Sharma 2009:4). In fact, the rural middle class is significant.

Nevertheless, a number of demographic factors have created barriers to entry for rural people. In general, the rural literacy and numeracy rates are lower than urban ones. Furthermore, fewer people in rural India speak English, the international language of the Internet but are familiar with English letters and numbers on a standard mobile phone or keypad.

If the traditional lifespan of an Indian mobile phone is six to eight years, this does not hold equally for the urban and rural customer. It has been suggested that the turnaround time of the typical urban phone may already be more like a year or two, as it is in the west, lowering the overall country-wide average lifespan to four to five years (Toxics Link). This is purely anecdotal ev-

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<sup>10</sup> [http://articles.economicstimes.indiatimes.com/2011-01-27/news/28425299\\_1\\_mobile-handsets-rural-areas-mobile-phones](http://articles.economicstimes.indiatimes.com/2011-01-27/news/28425299_1_mobile-handsets-rural-areas-mobile-phones)

<sup>11</sup> <http://www.thehindubusinessline.com/opinion/article2729299.ece>

idence and needs to be verified.

On a separate note, a number of people indicated that rural people were more receptive to environmental messaging around recycling of e-waste than urban people, perhaps because the way their day-to-day lives are connected to, and dependent on, the environment (Pranshu Singhal, Nokia).

### **Female vs. male, youth vs. adult**

Field research regarding differences between male and female mobile phone users was also beyond the scope of this study. A few points that came to light in the course of other interviews, secondary research or the survey of statistical data, however, are worth mentioning. The 2011 Indian Census data suggest that the gender divide is narrowing when it comes to access the ICTs, but it is at the BPL, where a family's resources are stretched most thin, then the gender divide is most pronounced and has the most implications. Ayesha Zainudeen has observed that in poor households that can only afford one mobile phone, it is typically the husband who gets to use it most.

The larger issue is that most women at the (rural) BOP don't often make the decision about getting connected, especially in Pakistan, India and Bangladesh. Often when there is only one mobile in the house, it is used and carried by the male of the household; once households are able to afford a second connection, women tend to get connected. ... Perhaps more importantly than designing products which target women, telcos need to design ones that will make it more affordable for a poor family to get two phones at the same time – because the first one will almost certainly always go to the male (husband). Only once they can afford the second phone is there a chance of it going to the female (wife). (Zainudeen 2011)<sup>12</sup>

We had similar observations elsewhere: that often when a family does buy a second phone, the husband gets the new one and the wife gets the hand-me-down. While that statement has a ring of truth about it, the information that we collected in Pune suggested a different phenomenon - an age divide:

- Admittedly a very small study group, we asked five men who in their family had the newest or what they perceived as the best phones - them or their wives - and found that there was no pattern. In fact, several indicated that their children actually had the newest and best phones, which points to another important demographic aspect of mobile phone culture in India: the mobile phone as part of youth culture. The insights from two of the second-hand salesmen in Gaffar Market reinforces this phenomenon. They each volunteered that there was a certain group of university-age, middle-class, urban males who frequented their stores to buy the latest mobile phone, regardless of brand, only to return a few weeks later to flip them for different ones: an example of urban male youth commodity fetishism that now surrounds the mobile phone for some.

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<sup>12</sup> <http://lirneasia.net/2011/02/gender-divide-in-mobile-is-there-more-to-it>

- Youth, furthermore, are typically early adaptors of new technology and new features and for them, therefore, a full-feature phone is very important. Adults, by contrast, often lean toward simpler phones or use fewer features.

### Multiple mobile phone ownership, long life span

Much more so than in the west, it is very common in India to own more than one phone or to own a dual-SIM card phone. By December 2009, it was already reported that the average Indian mobile owner had 1.8 phones (Stevensn 2012) and this rate has probably increased since then. Popular in emerging markets and with people BPL, dual SIM card phones permit a person to have more than one phone service or to take advantage of two different rate plans. They also allow two people to share one piece of hardware, thus lowering the cost of mobile access (Chipchase 2010).



*Fig. 1: Manisha Luniya, a travel agent in Keshavanagar, Maharashtra, proudly displays her 4 working phones*

- Ajay Garg, a computer engineering student in Pune, for example, used three different mobile phones (two Samsungs and a Nokia), each with a different service provider (Tata Docomo, AirTel and Reliance). That way, if he was some place that wasn't served by one provider he would still have mobile phone service by using a different phone.

As we have said above, the average life span of a mobile phone is significantly longer in India than in the west. According to "International Comparisons: The Handset Replacement Cycle," in 2010, the average life span of a phone in India was just under 8 years, down from 12 years in 2008, compared to 22 months in the USA and the UK (Entner 2011:2).

- Ajay Garg, the Pune student, still uses the first phone he'd ever owned – a simple Samsung text-based phone which he had been given in 2006 (six years and going strong).
- Aarti Patil, a school principal in Pune, also uses two phones, one for work and one for personal use (Motorola and iPhone 4S respectively). Additionally, she has 4 working phones at home complete with chargers, which she doesn't use – an example of people's reluctance to dispose of their old mobiles.
- Another reason that the Indian mobile phone lifespan is so long is the tendency to repair, refurbish, re-purpose and re-use mobile phones. Many business owners at Gaffar and Nehru Place Markets remarked about how phones

will get repaired and re-sold repeatedly until it is simply impossible to repair them again. This has two added benefits: it extends the useful life of the product and keeps it out of the waste/recycling stage as long as possible and it increases access and availability of lower cost second-hand products for people who can't afford new.

### **Mobile phone recycling culture**

Mobile phone recycling rates are very low in India (only 35% of mobile phones get recycled in either the formal or informal economy) for a number of reasons:

- The tendency to stash old mobiles in a desk drawer rather than dispose them off, just in case. This phenomenon is even more prevalent for the mobile than other types of ICT equipment due to their small size.
  - The expectation of getting something, even Rs. 100, for a dead phone, reinforces the habit of holding on to them or selling them to the local kabadiwala rather than taking them to a recycling collection centre.
  - The practice of repairing and re-repairing phones as many times as possible, until they can't be used any more, rather than buying new. Based on our evidence from Gaffar and Nehru Place Markets, this ingrained habit is changing, especially for the urban mobile phone owners.
  - There is little or no awareness of environmental issues related to recycling mobile phones..
-

# E-waste

## Statistics

In 2007, the Manufacturers' Association for Information Technology (MAIT) along with GTZ (now GIZ) conducted the first and only comprehensive survey of e-waste in the country and published the results as “MAIT-GTZ e-Waste Assessment Study.” Still frequently referenced five years later, the study is an important source of data but much in need of an update given the growth and changes in the electronics and e-waste industries.

Box number 7

### E-waste statistics

E-waste generated in India's top ten cities (2011): over 45,000 metric tonnes [Anne: make sure this is not 2007 figure]

Number of micro- and small-entrepreneur e-waste operators in India's metros (Anne: year): 3,000<sup>xxiii</sup>

Approximate number of formal e-waste handling companies registered under the new E-waste Rules, across India and in the NCR (2012): 75 and 4<sup>xxiv</sup>

Number of e-waste handling companies permitted by the new E-waste Rules within Delhi limits: 0<sup>xxv</sup>

Number of people employed in the informal e-waste sector in the NCR alone: over 25,000<sup>xxvi</sup>

Volume of e-waste generated in India, projected by MAIT 2007 study (2011): 470,000 MT<sup>xxvii</sup>

Estimated volume of e-waste generated in India, (2012): 800,000 MT [Anne: why doesn't this jive w/ stat above?]<sup>xxviii</sup>

Percentage of e-waste that gets recycled by either formal or informal: 35%<sup>xxix</sup>

Estimated percentage of e-waste currently recycled in the informal sector vs. that in formal sector (2011): 95% vs. 5%<sup>xxx</sup>

Therefore, volume of e-waste recycled by the informal vs. formal sector, based on numbers above (2012): 266,000 MT vs. 14,000 MT.

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Therefore, volume of e-waste recycled by the informal vs. formal sector, based on numbers above (2012): 266,000 MT vs. 14,000 MT.

Establishing accurate and current statistical data for the e-waste industry poses a number of challenges:

- The lack of current data and the reliance on 2007 and 2005 data.
- The difficulty is correlating data from different sources that may be based on different assumptions or definitions. For example, published figures for the annual volume of e-waste can vary considerably, possibly because (a) one is a per annum number and the other is cumulative and/or (b) of a lack of common ground regarding the definition of 'e-waste'. For example, in some places, it may be limited to ICTs, but in others, it could include everything right up to appliances, automobile and medical equipment.
- In the current circumstances, people are starved for current data until another comprehensive countrywide survey is done and it is easy for errors to compound and propagate. For example, the e-waste by city data in the Box eight comes from Sandip Chatterjee's "E-waste in India" paper, which was published in 2007. Chatterjee has confirmed that it is 2005 data. However, we found the same data in another location represented as 2011 data. In all cases, the numbers are staggeringly large, so the impact is the same, but in the latter case, the actual numbers must be out of scale.
- Annual industry growth is substantial. Therefore, correlating data one year, or even six months, apart can be inaccurate
- It is more difficult to get quantifiable data regarding the informal sector than the formal sector

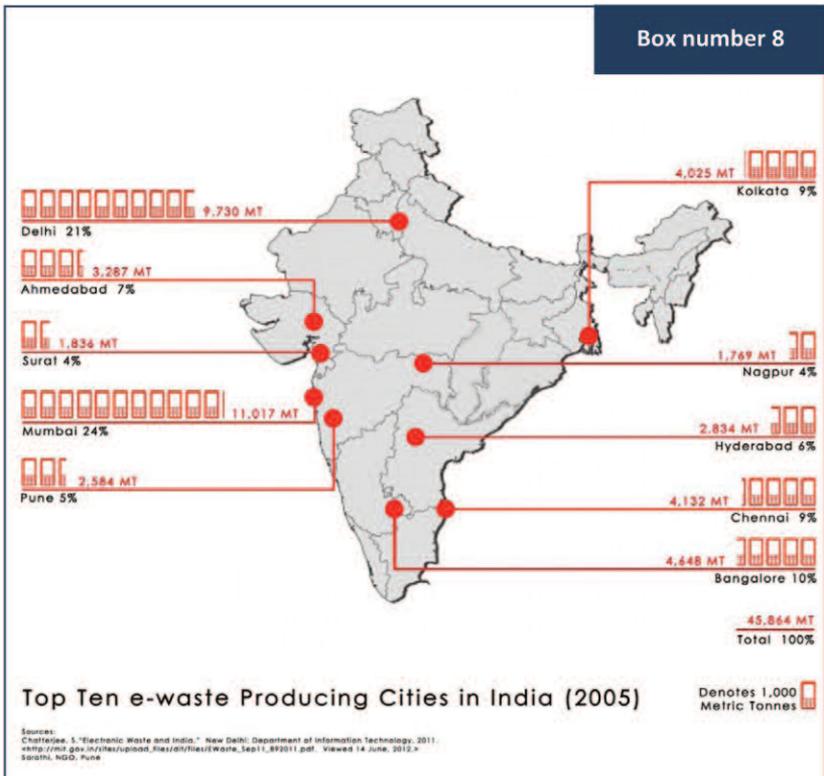
We have done our best to collect, correlate and vet the e-waste statistics in Box 7.

A well-known statistic from the MAIT-GTZ study is that 95% of e-waste "is segregated, dismantled and recycled in the informal sector based in urban slums" (MAIT 2007:1). See Box number 9. It is common, however, to find this statistic misrepresented in recycling industry-related sources to suggest that 95% of e-waste in India is not recycled in any fashion, ignoring the recycling work of the informal sector. For example, the following three quotes come from two e-waste recycling companies and an association of chambers of commerce, respectively, and, therefore, represent the point of view of the emergent recycling industry:

With the growth in the IT sector in India, responsible and secure disposal of IT assets has been a cause for concern for a long time. Currently, only 5 percent of the e-waste generated in India is recycled, and this is way below the global standards. (Dataserve 2012)<sup>13</sup>

Less than 5% of India's total Electronic waste is recycled observed in a study done on World Environment Day. (Atterobay 2012)

Barely 4.5% of India's e-waste gets recycled ... Less than five per cent of India's total electronic waste (e-waste) gets recycled due to absence of proper infrastructure. (Assocham 2012)



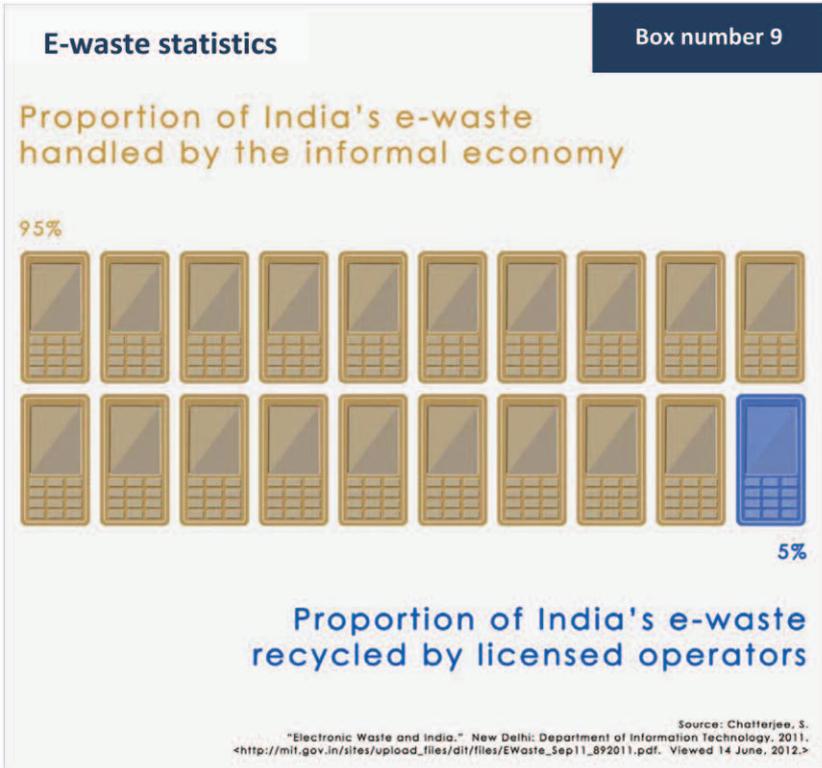
### Informal e-waste recycling practices

Like most other forms of household and consumer waste in India, electronic waste has traditionally been handled by the informal and unregulated sector of

<sup>13</sup> [http://www.dataserv-group.com/about/news\\_EN.html](http://www.dataserv-group.com/about/news_EN.html)

the economy, consisting of a well-established network of specialized niche operators operating from the local neighbourhood level up to the regional, national and even international level, consisting of:

- Local rag-pickers who collect and sort household waste at the neighbourhood or even building level and separate out the e-waste. These operations are typically handled by family or individual businesses that would classify as micro-enterprises, or smaller (if a category exists). These operators were beyond the scope of our first-hand field research.



- A network of *kabadiwalahs* and increasingly large scrap-dealers who buy up and aggregate the e-waste from neighbourhoods across the city and transport it to the slum areas where e-waste recycling is carried out. This work was also beyond the scope of our first hand field research.
- Separators who disassemble computers, mobile phones and other EEE goods so that re-usable parts (chips, microphones, picture tubes etc.) can be channelled to re-sellers and repairers in different markets in Delhi. Printed circuit boards (PCBs) and chips, a.k.a integrated circuits that contain precious and

semi-precious metals can be channelled to the material extractors and the other recyclable materials (plastic, glass, aluminium, copper wire etc.) can be channelled to the appropriate recycler or dealer. This work is typically carried out by micro or small enterprises occupying 'gadowns' in slum areas such as Seelampur and Mustafabad in East Delhi and Kurla, Kamathipura and Saki Naka in Andheri, Mumbai and can involve a range of activities from delicate testing and disassembly of working parts to cruder activities such as smashing monitors to remove the aluminium gaskets, stripping the wrapping from copper wire or heating circuit boards over open flame to soften the solder and then hammering off re-usable parts such as speakers, capacitors, chips etc. Monitors, if working, are re-sold to second hand dealers and refurbishes; if found not working, they are smashed up so that metal gaskets and parts can be recovered.

- We did interview a number of micro and small enterprises involved in this work in Seelampur, Mustafabad and Saki Naka. See Field Research Findings section below.

- Material extractors who remove the gold, copper, nickel and platinum from the PCBs and chips. This is the most harmful stage of the process – both for the environment and the workers (see below). Copper, for example, is extracted from circuit boards with a combination of acid baths and manual processes. Most of the recyclers we interviewed in Mustafabad and Seelampur in east Delhi indicated that the material extraction work generated from Delhi's e-waste takes place in Moradabad, U.P. One recycler, however, indicated that he did his own extraction work in Seelampur, though he would not tell us where or how.

- Dealers who buy up re-usable parts and materials to be re-sold to the repair and refurbishment market in India or manufacturers abroad – proof of the global flow of e-scrap, even in the informal sector (see Seelampur description below).



*Fig. 2: Stripping plastic wrap from copper wire, Dharavi, Mumbai*

### **Environmental and health concerns with informal e-waste recycling practices**

We were not given access to material extraction work in progress and were not allowed to video-record recyclers in Mustafabad or Seelampur. Chintan (a

Delhi-based NGO active in the e-waste sector), in partnership with The Silicon Valley Toxic Coalition (SVTC) and IMAK (India), however, have captured these operations in a revealing film called “Citizens at Risk,” which gives a good window into material extraction processes and labour conditions in the informal sector. Sandip Chatterjee’s “E-waste in India” is another good source of detailed information regarding the ills of the informal e-waste industry.

The environmental concerns associated with informal e-waste recycling are as follows:

- Heating lead solder on PSBs exposes workers to toxic gases and flame retardants that burn the eyes and lungs.
- The fumes from burning waste and chemical baths are released directly into the air without treatment and, thereby, contribute to air pollution.
- Waste liquid from acid baths and washes are dumped straight into the ground, thereby polluting the soil and ground water.
- Whatever can’t be recycled is simply burned and left, thereby creating toxic and unregulated landfill that will become the problem of future generations who unearth it.
- Material recovery in the informal sector is less efficient than the formal for two reasons: (a) informal recyclers focus on recovering the most valuable materials such as gold, silver copper, nickel and aluminium, but ignore zinc, cadmium, tantalum, palladium etc. (Chatterjee, 2012, “Electronic Waste and India”) and (b) material recovery rates in the informal sector are reported to be significantly lower than in the industrialized recycling sector where material extraction processes are more mechanized and controlled. For example, Sandip Chatterjee, of DoEIT, indicated that gold extraction in the informal sector has an efficiency rate of about 10% compared to 90% to 99.9% by industrialized recyclers.

The health and safety concerns are as follows:

- Exposure to toxic materials with no means of protection, such as lead, which damages the nervous system, cadmium, which damages the kidneys, mercury, which damages both the nervous system and kidneys.
- Acid baths used to extract metal from PCBs expose the workers to burn and hydrochloric acid fumes.
- Smashing monitors and picture tubes expose workers to flying glass and lead powder.



*Fig. 3: Young boy smashing parts to recover semi-precious metal*

- Workers typically have no protective clothing such as safety boots, shields, gloves or eye wear.
- Locating recycling operations that emit so much pollution in the immediate proximity of dense residential areas puts neighbours at risk from secondary exposure.
- Child labour are put to work in the informal sector.

The Government designed the new e-waste Rules to address these environmental and health and safety concerns.

### **Formal e-waste industry**

Until a few years ago, there was no formal or industrialized recycling infrastructure in the country. Today, opinion varies as to how many official-sector recyclers there are. Anand Kumar, at the Central Pollution Control Board (CPCB), indicated that approximately 75 recycling companies have been registered to date across India, including four in the National Capital Region (none are located in Delhi itself because recycling plants are not permitted within residential areas). On the other hand, Sandip Chatterjee, with DoEIT, indicated that there were only really three recyclers in the country. In either case, the industry is still relatively immature and it is early days for the new Rules. Therefore, it remains to be seen how many companies and which business models survive in the emerging e-recycling environment. In the meantime, the following trends can be observed:

- Companies are refining their business models and learning from experience. Eco-Reco<sup>14</sup>, a relatively well established Mumbai-based recycling company, experimented for twelve months with its own recycling centres in strategic locations across Mumbai at a cost of Rs. 10,000 , but managed to collect less than 100 kg of waste with a value of less than Rs. 2,000. As a result, they abandoned that model, but continue to collect waste received at their head office collection centre. They would prefer, however, to not be involved in collection activities at all and to leave them to the informal sector that, after all, is so effective at it anyway. This way, Eco-Reco could focus on what it does best: high-volume industrialized recycling (Anuj Maheshwari).
- Industrial recyclers cannot compete with informal waste collectors for number of reasons: informal collectors are ubiquitous and they have very well established networks in place for household, building and neighbourhood-level collection and, therefore, offer the most convenient option for the public; formal recyclers have higher overhead costs and cannot compete on the price they will pay the consumer with the informal waste collectors. As a result, the informal collectors currently have a stranglehold on the supply of source materials and industrial recyclers tend to operate at a fraction of capacity due to difficulties sourcing enough volume (Ratnaker 2012).

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<sup>14</sup> [www.ecoreco.com](http://www.ecoreco.com)

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- As a result of difficulties sourcing waste materials, the formal recyclers tend to operate below capacity. Some recyclers try to fill the gap by importing e-waste from foreign countries – typically from the global north and west (see below) (ibid).
- Many recyclers have entered the Indian market recently, including foreign investors, or just exist on paper. It remains to be seen how many continue to operate after a year or two.
- In general, industrialised recycling is more fully mechanised in the west than in India, where some companies use cheap manual labour, particularly at the early stages of segregation and disassembly, to reduce costs and capital investment (Chatterjee interview).

Industrial recycling involves a series of progressive stages to disassemble, reduce and separate materials (Chatterjee, “Sustainable Electronic Waste Management and Recycling Process” 2012:28):

- Collection of post-consumer waste from individuals, households and corporations.
- Disassembly and separation of product into its various parts and removal of hazardous substances such as batteries.
- Material separation involves shredding and granulation to reduce the PCBs to increasingly small sized units followed by a series of separation processes: magnetic separation to separate the magnetic metals, eddy-current separation to separate aluminium and electrostatic separation to separate the plastic.
- Metal recovery involves thermal, chemical or metallurgical methods.

There is still no end-to-end e-waste recycler in India today, according to Sandip Chatterjee, with DoEIT (Chatterjee interview). As a result, the final stages of processing and extraction are carried out in facilities in other countries.

Few formal recyclers are operating in India. The processes followed in formal sector are mainly limited to the segregation, dismantling of e-waste till the size reduction stage of printed circuit boards (PCBs). A shredder is employed for PCBs size reduction. The pre-processed PCB is exported to smelting refineries in developed countries for further recovery of precious metals like copper, silver, gold, aluminum, palladium, tantalum, ruthenium, platinum etc. and also treating the slag by-product in an eco-friendly manner. The end-to-end solution of e-waste recycling is still not available in India. (Chatterjee, 2012, “Growing e-Waste in India”)

### Importing e-waste from overseas

Developed countries are prohibited from dumping their e-waste in developing countries according to the Basel Convention. Nevertheless, many tonnes of foreign e-waste have made their way into this country under the pretext of donations or as a state-sanctioned way to support India’s fledgling e-waste industry. For industrial recyclers operating below capacity because they cannot compete with the unofficial sector when it comes to sourcing domestic waste, processing imported e-waste is seen as a way to top up their production volume and improve viability in a difficult market. In this country, permission to import e-waste is granted by the Ministry of Environment and Forests (MoEF) on a case-by-case basis. In 2009, the Ministry gave Attero Pvt Ltd permission to import 8,000 MT of e-waste in order to support the e-waste industry, according to Priti Mahesh of Toxics Link (Ratnaker 2012). The MAIT-GIZ survey reported that in 2007, 50,000 MT of e-waste was imported from overseas. We do not know whether imports have increased or decreased since then.

Unofficial sector	Official sector
<ul style="list-style-type: none"> <li>▪ Fully manual operation</li> <li>▪ Little or no health and safety provisions for workers</li> <li>▪ Typically located in dense residential slums</li> <li>▪ Uses child labour</li> <li>▪ Many (but not all) contractors in the recycling chain operate on an entrepreneurial basis, controlling price, network supply chain etc.</li> <li>▪ Operates at high volume</li> <li>▪ Minimal paperwork, returns and audits</li> <li>▪ More cost-effective material collection</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mechanised process</li> <li>▪ Higher safety standards</li> <li>▪ Not permitted in residential zones</li> <li>▪ No child labour</li> <li>▪ Jobs are monotonous factory jobs that wouldn’t necessarily appeal to, or take advantage of the talents of, people previously employed in the unofficial sector</li> <li>▪ Currently operates well below capacity</li> <li>▪ More paperwork means higher expenses</li> <li>▪ Less cost-effective collection</li> </ul>

### New e-waste handling rules

Before the new E-waste (Management and Handling) Rules, 2011 (the Rules) were drafted, the e-waste industry in India was unregulated and approximately 95% of India’s e-waste was processed by the informal economy using relatively primitive manual techniques with little or no consideration for environmental protection or the health and safety of the workers. Few Government departments or corporations had e-waste policies or led by example. Among the general public, furthermore, there was little to no awareness of recycling and environmental issues related to consumer electronics.

Officially coming into effect on May 1st, 2012, the Rules were released twelve months earlier in order to give the industry time to adjust and get their approvals in place. The Implementation of E-Waste Rules 2011 Guidelines (the Guidelines), is a support document to the Rules and has been issued in draft

form with the final version expected to be released any day. See Box 10 for a summary for a summary of the Rules and the Guidelines

## The new E-waste Rules, 2011

Box number 10

### The Rules

In effect since the 1st of May, 2012, the new *e-waste (Management and Handling) Rules* (the Rules) establish environmentally responsible standards of practice for the handling of five types of electronic and electrical equipment – all types of ICTS (mobile phones, landline phones, computers etc.), washing machines, air-conditioners and televisions – from manufacturing stage through to disposal at the end-of-life stage. Note, the Rules do not apply to other types of e-waste: eg. ceiling fans, VCRs, motors, medical electric equipment etc. The Rules are intended to apply to all parties involved in the chain of custody of EEE: eg. producers, consumers, bulk consumers, collection centres, dismantlers and recyclers.

According to the Application section, the Rules do not apply to batteries and radioactive materials, which are regulated elsewhere, or to micro- and small-enterprises (MoEF 27). Although it does not say so explicitly in the Rules, the Government has since indicated that this last exception is intended to apply only to producers (i.e. manufacturers). To be sure, this is consistent with the intent of the Rules because, otherwise, if an exception applied to micro- and small-enterprise e-waste handlers in the informal economy, it would defeat the purpose of the Rules in the first place. However, we have seen the exception re-published without the Government's clarification and heard it said on the streets of Mustafabad enough times to believe that it may be a source of confusion, if not a future challenge to the Rules. Also, it is unclear to us whether repair shops and refurbishers would be classified as Producers or not.

The new Rules give Producers two primary responsibilities:

- They impose limits on the amount of hazardous materials that can go into the manufacture of electronic equipment, in line with the EU's RoHS Directive, whether manufactured domestically or imported to the country. Interestingly, these limits do not come into effect until May of 2014.
- In accordance with the principal of Extended Producer Responsibility (EPR), the Producer's - or manufacturer's - responsibility does not end

when their product leaves the factory or is purchased by the consumer, but extends to the end of its life-span and beyond, to the post-consumer stage. The Producer, therefore, is responsible for organizing Collection Centres and paying for the recycling of its own products once they have reached the end of their useful life as well as for ensuring that any dismantling and recycling is carried out in environmentally sound ways by companies registered under the Rules. The Producer is also responsible for channeling its own post-industrial e-waste to approved e-waste companies.

According to the Rules, all parties in the chain of custody between Producer and Recycler – except the Consumer and Bulk Consumer – are required to be registered with the State Pollution Control (SPCB) Board or Pollution Control Committee (PCC) as the case may be and apply for renewal every two or five years. They are also required to keep records of e-waste handled and submit annual audits to the authorities (MoEF 29-31, 34). Bulk Consumers are required to keep records of e-waste generated by them.

The Rules are silent on the issue of importing e-waste from overseas. Currently, permission is required by the MoEF to do so and applications are considered on a case by case basis.

### The Guidelines

The Implementation of E-Waste Rules 2011 Guidelines (the Guidelines) are more detailed and descriptive than the Rules and are intended to describe minimum standards for the management, handling and disposal of e-waste. Descriptive in nature, they are not mandatory and do not consistently establish quantitative specifications and targets, either prescriptive or performance-based.

The Guidelines provide background information about the context of the new Rules and describe the form compliance could take for each stakeholder in the recycling chain.

In at least one case, the Guidelines favour large companies over small.

XXIII Chatterjee, Dr. Sandip. “Electronic Waste and India.” Department of Information Technology, Government of India. Web. 10 July, 2012. <[http://mit.gov.in/sites/upload\\_files/dit/files/EWaste\\_Sep11\\_892011.pdf](http://mit.gov.in/sites/upload_files/dit/files/EWaste_Sep11_892011.pdf)>

XXIV Anand Kumar, Central Pollution Control Board

XXV Ibid.

XXVI Silicon Valley Toxics Coalition (SVTC), Chintan (India), and Arjun Bhagat/IMAK. “Citizens at Risk.” Video. Web. 10 July, 2012. <<http://vimeo.com/5009068>>

XXVII “About E-waste,” Eco-Reco quoting MAIT study. <http://www.ecoreco.com/pdf/about-e-waste.pdf>

XXVIII Average of values given by Sandip Chatterjee, Department of Department of Electronics & Information Technology, Ministry of Communication & Information Technology and by “About E-waste.” <<http://www.ecoreco.com/pdf/about-e-waste.pdf>>

XXIX Chatterjee, Dr. Sandip. “Electronic Waste and India.” Department of Information Technology, Government of India. Web. 10 July, 2012. <[http://mit.gov.in/sites/upload\\_files/dit/files/EWaste\\_Sep11\\_892011.pdf](http://mit.gov.in/sites/upload_files/dit/files/EWaste_Sep11_892011.pdf)>

### Concerns with the new e-waste Rules

Over the course of the study we heard and read a variety of concerns from environmentalists, the mobile phone industry, government officials and people currently working in the informal sector concerning the new Rules. For example:

- A lack of transparency regarding both applications and audits. Therefore, applications could be processed subjectively and rules could be abused to take advantage of the poor and marginalized. (Priti Mahesh, Toxics Link etc.)
- A lack of quantifiable targets and specification makes compliance vague and could lead to loopholes (Toxics Link). For example, it is too easy for telecoms to put a recycling policy online where few people are likely to see it anyway, set up a few collection boxes where they already have a store or service centre, claim they have done everything they are obliged to and blame the public if not enough is collected. The lack of quantifiable targets, while building flexibility into the system, does leave the Rules open to abuse (Pranshu Singhal, Nokia).
- Strictly speaking, the Rules require producers who operate in more than one market (e.g. a telecom with sales centres across the country) to get authorization in each and every State. This results in duplication, redundancy and added expenses (anonymous telecom industry body).
- The amount of paperwork required for compliance is an added expense and a barrier for entry into the formal market for existing small informal sector operators.
- The complexity of the approval process could discourage the formalization of the informal sector (GIZ).
- The Rules and Guidelines are designed to apply equally to all recyclers, large and small, industrial or the newly formalized. There are no provisions, incentives or compliance alternatives, for example, tailored to suit the needs of the existing informal sector recycler and to encourage them to move into the formal sector.

- In at least one instance, the Guidelines explicitly favour larger collectors and recyclers over smaller ones.
- We found anecdotal evidence that some existing informal recyclers are experiencing frustration, resulting in costs and delays, with the registration and approvals process and a lack of constructive communication from the authorities.
- As stated above, the exception in the Rules for micro and small enterprise operators has resulted in widespread confusion, particularly for small operators.
- The Government has not dedicated enough resources to properly process the applications and audits required by the Rules or to properly enforce them (Toxics Link).
- Rules alone are not enough to transform the e-waste industry. A self-sustaining and market-driven model is required to bring the informal sector on board (Chatterjee interview).
- The MoEF has turned a blind eye to the informal sector because it doesn't show up on their official records (Chatterjee interview).
- The Rules are just for show. They are hollow (anonymous NGO and various informal business owners).
- The Rules that restrict the amount of restricted hazardous substances that can go into mobile phones and computers don't come into effect until 2014 – two years after the e-waste rules. Was the delay necessary? (GIZ, Toxics Link etc.)

### **Progress to date**

It is early days yet and the new e-waste Rules have just come into effect. Many Government ministries and departments have adopted new e-waste policies requiring them to channel their e-waste to registered recyclers. A number of telecom companies have embraced environmentally sound recycling policy and made significant strides in the right direction, some even including the informal sector, but many others have not. There is little evidence, however, that the average household consumer is changing their mindset or behaviour when it comes to recycling their e-waste. The following suggestions were made by our various interviewees to improve environmentally friendly recycling. Not surprisingly, they represent a variety of perspectives:

- Incentives are required to encourage people to (a) recycle more of their old electronics, rather than stashing them in the desk drawer and (b) recycle by environmentally preferable options rather than selling to the local kabadiwala for Rs. 50 or 100.
- The Telecom companies' systems of Collection Centres has to be more convenient to compete with the informal sector that collects at the household and neighbourhood level. They need to be easier to find, closer to reach and brand-neutral.
- A widespread and multi-dimensional public education campaign is required to really improve awareness of everyone's environmental responsibilities.
- More critical mass is needed amongst the public and business in general to generate some momentum and make change.

- More critical mass is needed amongst the public and business in general to generate some momentum and make change.
  - A deposit system at the time of purchase, would encourage consumers to return their old mobile phone handsets to the manufacturer when they buy a new one.
  - An Advanced Recycling Fee (ARF) system whereby a fee is included in the purchase price of a mobile phone or computer could be used to pay for environmentally sound recycling facilities.
  - A market-driven and economically and socially sustainable business model is required for real market transformation.
  - Tax breaks or other Government incentives would help the fledgling recycling industry compete with the informal sector.
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# Field Research

## Second hand, refurbishment, repair market

This section addresses the second hand, refurbishment, re-use, repair and counterfeit market in the informal sector. In general, these services are offered through a large and well-established infrastructure of markets or hotspots specializing in computers, mobile phones or one type of electronics or another, comprising of micro-enterprise store front businesses, along with their associated networks of connections, parts suppliers, sales reps, dealers, middlemen and scrap collectors. Each shop offers its own combination of complementary services: repairs, second hand phone sales, sales of low-cost or counterfeit 'China-made' phones, sales of SIM cards, batteries and phone accessories, unlocking, software updates and talk-time recharging. Some, but not all, target particular classes of customers.

### Gaffar Market, Delhi

Located in west Delhi in Karol Bagh, Gaffar Market is located in a mixed neighbourhood consisting of Sikh, Hindu and Muslim communities. Gaffar Market is known for mobile phone sales and service and sales of a range of counterfeit products. It also has a reputation for laundering stolen property, which made many business people nervous about talking to us or letting us photograph anything, in case we were the authorities.

● By one vendor's (Rahul Vinod) estimate, there are 15 to 20 repair shops and between 200 and 250 mobile shops of one kind or another in Gaffar Market. This concentration creates a critical mass that attracts a high volume of customers who can find a much wider range of products and service options than at any particular name-brand manufacturer's store or service centre. Though customer interviews were beyond the scope of our study, it has been reported elsewhere that customers prefer the face-to-face contact of the market to the major manufacturer's customer service agents and service centres (Sarika 2012). Rahul Vinod, also indicated that customers come to him because they get frustrated with manufacturers' warranty restrictions.



Fig. 4: Gaffar Market, Delhi

- Pedestrian streets are flanked by rows of small vendors shops, which house the larger businesses. Side walk space in front of most shops is rented out to other smaller dealers who typically sit behind the individual display cases often three feet wide. Businesses may or may not have names on display. Repairs are done on the spot.

Volume of business:

- In business for 14 years, Rahul Vinod's repair business is based out of a counter and display case in front of another person's store. He repairs an average of 20 phones per day, charging Rs. 50 and up.

- Rajish Kumar has been in business for 2 to 3 years. He buys and sells second hand phones from two display cases in front of a toy store. In a typical week, he has 8 to 10 sales ranging from Rs. 2,000 for a Nokia or Samsung that would cost Rs. 4,000 for new or up to Rs. 6,000 for a second hand smart phone.

- Harpreet Singh, of Singh Mobile, by contrast, operates out of a larger store (approximately 9ft x 18ft) for which he pays Rs. 1,10,000 per month rent and caters to higher-end buyers looking for second hand iPhones, Blackberries and Samsung smart phones. He does not sell Chinese phones or lower end phones. In a typical week, he sells 30 to 50 phones at the Rs. 4,000 to Rs. 6,000 price point. Singh started with a small display case in front of a store, but over the years he was able to move up to a small shop and then to his current shop. According to him, rent for side walk space in front of a shop is Rs. 35,000 per month.

- Inderjit Singh, of Lucky Electronics, a 15 year veteran of the mobile and electronics business, sells new and second hand Indian phones out of a medium sized shop. In a typical week, he sells 30 new phones starting from Rs. 1,500 for a simple Nokia and 30 used phones ranging from Rs. 1,000 for a simple Nokia to Rs. 35,000 for a 'nearly-new' Apple iPhone 4S that would retail new for Rs. 42,000 or more. He doesn't buy and sell Chinese because he doesn't trust them.

### **Manish Market, Mumbai**

Located in south Mumbai, Manish Market is a well-known market for Chinese-made and counterfeit mobile phones and accessories. A four storey building reportedly crowded with mobile phone retail and wholesale shops with the usual smaller display-case businesses located in front (Henshall 2012), the building was gutted by fire in November of 2011 and was in the process of being repaired when we visited. Photos and stories in online blogs, however, give a sense of what the market used to be like. It still remains to be seen what the building becomes in the future. Stuart Henshall, for example, describes the products he saw on sale as very unfamiliar brands, second hand or counterfeit: "For the most part the phones are very "foreign" here. They aren't "name" brands. Where one sees name brands they are either "second hand trade-ins" or "fakes". Samir's blog "Manish Market, Mumbai – Wholesale Market for China Products" also provides a good description of retail vs. wholesale operations and phone prices.

When we visited, a small, temporary-looking market under blue tarpaulins was in operation across the road. In Shop #9 we were shown the following 'China-made' phones:

- A 'Sumsmug' Samsung Galaxy S2 lookalike with a Rs. 2,800 asking price (see photo below)
- A Ken Xin Da mobile with a Rs. 900 asking price
- We asked the owner how long China-made phones would last and his answer gives an idea of their reputation for quality: maybe it would last a year, he said, maybe till tonight.

### **Nehru Place Market, Delhi**

Claiming to be Asia's largest computer hardware market, Nehru Place is located in the lower two levels of a 6 to 9 story storey commercial building complex in south Delhi and is the place to find all kinds of computers equipment including laptops, towers, monitors, printers, peripherals, mobile phones and all related software, accessories and services. According to business owners' estimates there are around 300 shops total at Nehru Place, including 30 shops mobile phone shops and up-to 50 repair shops.



*Fig. 5: Nehru Place Electronics Market, Delhi*

Like at Gaffar Market, it was difficult to take photographs and videotaping was impossible.

Businesses typically occupied 50 to 80 sq. ft spaces with service counters in front for dealing with customers and displays, stock or workspace for repairs behind. Other smaller businesses work out of smaller display cases or cardboard boxes on the side walk in front. Still other hawkers mill about trying to entice pedestrians to buy this or that.

- Mohammed Nadim works at Tele Care and repairs and unlocks phones. He has an average of 5 to 7 customers per day. Repair prices vary with the work done and the phone brand. He says that most of his business is from walk-up customers, rather than corporations, with Blackberries and other high-end phones. He learned his craft from observation, rather than any formal education.
- Rajesh Kumar of JMD Communications sells new Micromax Indian made phones and accessories and repairs all models of phones, except Chinese-made ones because it is too difficult to get parts. He estimates 5 to 10 repairs per month ranging from Rs. 100 to Rs. 3,000. Like other repair shop owners, sales of new and relatively inexpensive Micromax phones compliment his repair business because he can offer his customers a new phone if the repair is going to be

too expensive. Micromax phones range from Rs. 1,300 for an X series model to Rs. 7,000 for a Q Series smart phone and are popular among people who don't want to pay full price for the major name brands.

- Sonu, from Sonu Mobile, repairs mobile phones (but not Chinese brands) and sells mobile phone accessories. He says he doesn't have to do anything to attract customers because the Nehru Place hub draws them in.

- Rohit, from Om Sai Ram Communication also repairs phones and sells accessories out of a 6ft x 11ft shop where one repair person and three other staff work. He repairs 5 to 6 phones per day or 25 to 30 per week, charging from Rs. 100 to Rs. 6,000. The higher price would be for all new motherboard and chip for a smart phone. He offers a one-month warranty on his work. The only repairs he does to Chinese-made phones are for simple components such as the audio or charger jack because, otherwise, he can't get parts.

- Sonu Vaswani, of RN Mobile, repairs mobiles and sells new Chinese-made phones and new mobile accessories. He handles 70 to 80 repairs per week (a larger volume than most of the other people interviewed) charging between Rs. 200 and Rs. 2,000 each. They offer a 2 to 4 day testing warranty on both repairs and new phones. He sells a new Chinese Kovtra N17s for Rs. 1,200 and a new counterfeit iPhone 4 for Rs. 6,000 (a real one would cost over Rs. 40,000).



*Fig. 6: Nehru Place, attracts thousands of customers on a busy Saturday afternoon*

## **Second hand and repair markets in general**

From the perspective of the business operators interviewed at Gaffar Market, the market opposite Manish Market and Nehru Place Market, the following generalizations can be made about current trends in the second hand, repair, refurbishment, import and counterfeit mobile phone markets:

- Nearly all the second hand and repair shop owners thought business was down and blamed the ready availability of low cost new mobiles - including Indian-made brands, but especially Chinese imports and knock-offs – that made it unaffordable to repair. Tilak Kumarvaswani, a repair shop owner in Nehru Place for the past 12 years, for example, indicated that he now had about 20 customers per month, down from 100 previously and, as a result, was considering getting out of business. Indian brands such as Micromax, Spice and Karbonn cater to those who want to boast all the features of a smartphone, but can't afford the cost and may not be as concerned about quality or longevity. Counterfeited phones, by nature, cater toward people who aspire for the latest and greatest brands regardless of actual quality. At the upper end of the price spectrum (e.g. real Blackberries and iPhones), some repair businesses reported that business was steady or even increasing because of the high cost of phone replacement (Samir at Tele

Care). Several repairers also complained that manufacturers' warranty repair restrictions were unfair and were taking a bit out of their business, limiting it to only post-warranty repairs. In future, if mobile phone life-spans continue to shrink to something closer to a standard one or two year warranty, then the informal repair shops may find their business shrinking even further.

- In general, there is no direct relationship between who (what class of customer) populated the second hand market as opposed to the repair market or the new low-cost phone market as they served people of all stripes. Two exceptions were noted, however, by a number of businesses at Nehru Place Market and Gaffar Market: (a) not surprisingly, only the relatively wealthy can afford high-end new phones such as Blackberries, iPhones and Samsung smart phones (i.e. real ones, not fakes) and (b) a certain class of young, college-going men like to own the newest model phone (regardless of brand) and flip it for another as soon as something else is released. As a result, they sometimes sell and replace their phones every few weeks (Harpreet Singh and Inderjit Singh).

- Increasingly rapid product development by the name brand telecom manufacturers was making it increasingly difficult for repair shops to keep up with technology (Mr. Kumarvaswani, High Tech Computers). This was putting a strain on business.

- None of the business operators asked indicated that they thought internet sales were having any impact on their business, positive or negative.

- Consumers were adopting a throw-away culture (Mr. Kumarvaswani, High Tech Computers).

- The desire for feature-phones was driving a shift toward low-cost manufacturers (Micromax, Karbonn, Spice etc.)

### **Awareness of new e-waste Rules in the second hand and repair shops**

We asked the business operators at Gaffar Market and Nehru Place Market if they were aware of the Government's new e-waste Handling Rules and, if so, how they thought they would influence them. In general:

- There was little awareness of new e-waste Rules

- Most didn't think the rules would affect their operations

- Most repair shops tried to re-use all spare parts. In some cases they sold their e-waste to an e-scrap dealer, but in most cases they said there wasn't enough volume to sell and, therefore, they just through it out with the garbage (in all likelihood, the e-scrap would then be separated by the kabadiwalas from there).

### **Seelampur**

Seelampur is a dense urban slum area in east Delhi east of the Yamuna River, consisting of random two and three storey attached brick and concrete buildings with shops or 'godowns' (no-frills industrial work spaces or warehouses) at street level and homes and offices above. Some roads are paved, others not. We met the following small enterprise company of 8 years that we will not name:

- Specializing in mobile phone recycling, this recycling company is the largest e-waste recycler in the area, according to its owner. Employing 20 to 30 people, it occupies a godown on one of the side streets, where we met the owner, but also works out of two other locations in the area. Before starting his recycling business, the owner had a repair business where he built his all-important network of company connections before leverage them for his new recycling business. Recycling, he says, is much more profitable than the repair business. Average monthly profits are Rs. 50,000 to Rs. 60,000 after expenses.



Fig. 7: Seelampur, East Delhi

● The owner tells us that every part of the mobile phone gets recycled in one way or another and nothing goes to waste – a claim that speaks to the effectiveness of the unofficial e-waste sector (at least in terms of simple volume or material recovery rates).

- With respect to the new e-waste Rules, he says that he has been trying to get his approvals in place for a year and is frustrated that he has been unable to get the No Objective Certificate (NOC) that he needs. Also, he says he is frustrated with the authorities because they won't communicate with him about the status of his application or whether there is something wrong that he could correct. As a result, he feels in the dark and unable to move forward with his plans to move out of his current mixed residential neighbourhood into a commercial area where he's found property for a new facility. From his perspective, the government is only granting approvals to large industrial companies.



Fig. 8: Printed circuit board from a mobile phone

- To reiterate, everything is recycled, but the PCBs and the chips (ICs) are the most valuable. All working parts are removed and re-sold in bulk to buyers. A condenser (i.e. capacitor), for example, yields 10 paise; a microphone Rs. 4; PSBs Rs. 15 and up depending on the make and the features. Chips can be sold for Rs. 4 each in India. He prefers to sell to China, however, because he can get Rs. 80 and up there.

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- Unlike most other recycling operations in the area, this company also extracts gold from the PSBs, however, the owner was not willing to let us see how or where. The owner says that he can recover 10 milligrams of gold from one kilogram of PCBs (at a conservative current price of Rs. 85,000 per gram that comes to Rs. 850 worth of gold from 1 kg of PCBs)<sup>15</sup>.
- The owner is concerned that if a lot of large industrial companies are approved, then he may start to have trouble sourcing raw material.

### Mustafabad

Just 8 km north of Seelampur, Mustafabad is a largely Muslim slum area. In Gali no. 2, the buildings are 2 and 3 storeys with gadowns at street level similar to Seelampur. Wider than the lane we visited in Seelampur, Gali no. 2 is lined with monitors and picture tubes being packed into styrofoam, large piles of discarded plastic monitor bodies, other computer debris and flats of styrofoam packaging. We spoke with three recycling micro-enterprises whose operations were much simpler, small scale and less profitable than the one in Seelampur:

- The first was a one person operation. He buys computer towers from independent kabadiwalas and disassembles them to sell the scrap iron and steel and sellable parts, in turn, to dealers. What he can't sell, he burns. With no contracts either on the supply or demand side, he buys and sells when and if the material is available. He said that most e-scrap dealers in Mustafabad outsource PCBs and chips to Moradabad, UP, for extraction of metals.
- The second, a neighbour, also deals in iron and steel scrap, but not from computers. He thought that there were 200 to 300 small e-scrap shops in

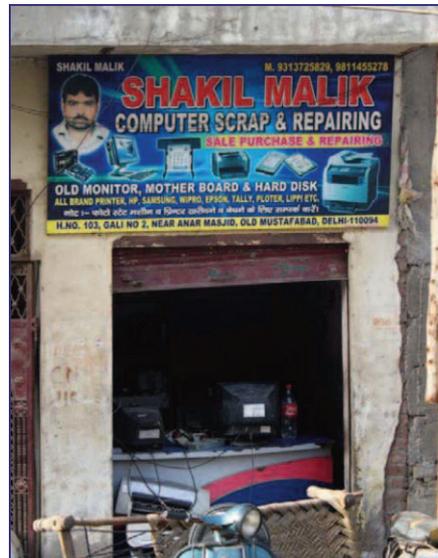


Fig. 9: Typical e-scrap and computer repair business occupying a no-frills 'go-down' in Mustafabad, Delhi

<sup>15</sup> <http://www.marketonmobile.com/Gold-Price-2012/July>

Mustafabad, but reiterated that no one there does metal extraction work anymore. They just couldn't make it profitable. Regarding registration under the new e-waste Rules, he said no one in Mustafabad has their approvals and suggested that they'd been told by government officials that their operations were too small to require them.

- Another one-person business-owner in a neighbouring godown had been in the e-waste business for 10 years, but before that had a confectionery store in UP. He recycles computers and mobile phones and also sends PCBs and chips to Moradabad for metal extraction. Sometimes, he simply buys scrap and parts and flips them to another buyer for a profit. For example, he can buy Nokia chips for Rs. 20 and sell them to someone else for Rs. 27 without any value added work. He also reiterated that there were 200 to 300 e-scrap recyclers in Mustafabad and that registration under the new e-waste Rules was not required for him.

Immediately next door others were busy sorting and packing picture tubes from computer monitors – something that speaks to how specialized many of these operations are: each forming one node in a complex network of collectors, dismantlers, buyers, aggregators, recyclers, transporters, extractors, re-sellers, repairers and refurbishers.

### **Saki Naka, Mumbai**

A slum area located in Andheri, north-east of the Mumbai airport, Saki Naka is built up of one and two storey buildings with corrugated metal roofs either side of mostly dirt roads. It is a home for many different types of recycling operations (metal, wood, plastic etc.) but 'Tin No. Khadi' (Hill number 3), in particular, is known as a hotspot for computer recycling. We did not, however, find any dealers there who specialized in mobile phones.

- The business that we visited had been in business for ten to fifteen years and buys computer towers and parts from scrap dealers and separators in the area. They have 10 to 15 employees ranging from technicians to labourers and salespeople who test, disassemble, carry and sort incoming material. Parts and equipment that work are mostly sold to individual buyers. When we were there, for example, a computer engineer was buying a motherboard. Parts that don't work are sold to e-scrap dealers.

- The sales person estimated that there were approximately 100 similar shops in the area.

- With respect to the new e-waste Rules, the sales person was aware of them in general, but his initial opinion was that such laws were irrelevant. He then suggested that, at some point in the future, they would join forces with other small recycling operators to try to get the necessary license.

- This was a relatively organized shop with sales counter in front and storage and other operations behind. Other godowns and shops were much smaller in size. In some, men or boys squatted separating copper and brass parts. In others, e-scrap was simply piled in a mess.



Fig. 10: A range of services on offer at permanent shops as well as small display-case based businesses in front



Fig. 11: Chinese made 2- and 3-SIM card phones on sale at Gaffar Market



Fig. 12: At Gaffar Market, sidewalk space in front of the shops is sub-let to small dealers for Rs. 15,000 to 20,000 per month



Fig. 13: Rokeo and Sure brand copycat phones on sale at Nehru Place Market, Delhi



Fig. 15: Suny Ericson fake (left) and unfamiliar China-made brands (centre and right), on sale at Gaffar Market, Delhi



Fig. 14: Unfamiliar 'China-made' brands on sale at street markets



Fig. 16: Typically busy shops at Nehru Place Market offering sales, service or a combination of the two



Fig. 17: Small vendors sell from boxes or display cases in front of larger shops



Fig. 18: Ads for mobile phone repairs, service and accessories crowd the aisles at Nehru Place Market, Delhi



Fig. 19: One of hundreds of mobile phone shops at Nehru Place Market, Delhi



Fig. 20: Computer repairs done in the back of a shop at Nehru Place Market, Delhi

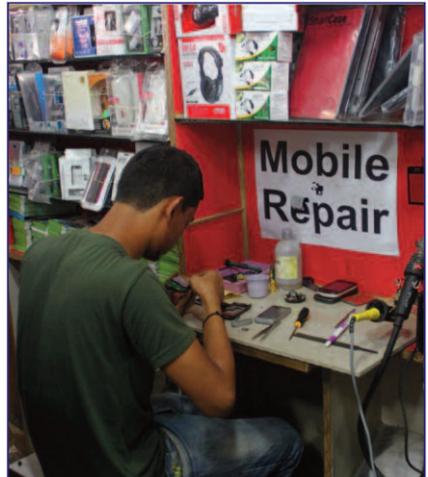


Fig. 21: Repairs are done on the spot at Nehru Place Market, Delhi



Fig. 22: 2,800 'Sumsmug' 2 counterfeit phone for sale in Manish Market, Mumbai



Fig. 24: Computer monitors brought to picture-tube recycler in Mustafabad, Delhi

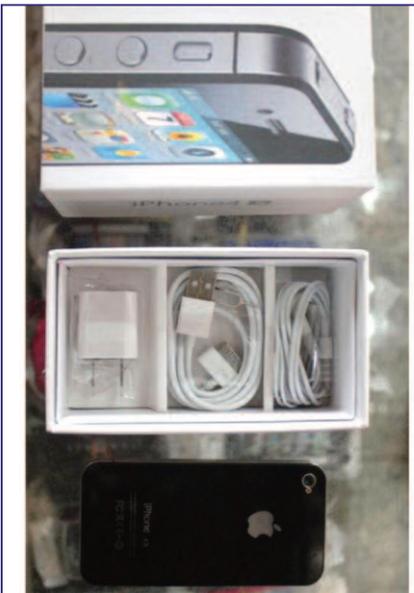


Fig. 23: Counterfeit 'China-made' I'phone 4S complete with convincing



Fig. 25: Monitors being packed for shipment to larger e-scrap dealer, Mustafabad, Delhi



*Fig. 26: Printed circuit boards (PCBs) piled high in the street in Mustafabad, Delhi*



*Fig. 27: After removing the valuable picture tubes, the monitor cases wait to be sold to the plastics recycler*



*Fig. 28: Micro-entrepreneur surrounded by the clutter of his trade in his nofrills recycling shop*

## Conclusions

### Relationship of the formal to the informal markets

The informal and formal economies in India are not mutually exclusive domains or discreet economies. Deeply enmeshed and interdependent on many levels, they nevertheless sometimes complement and sometimes compete with each other; sometimes filling each other's gaps and sometimes creating redundancies; sometimes coexisting seamlessly and, at others, seamlessly. Our study of the mobile phone offered examples of both. At a more micro scale, individual operators in the grey market often operate in a fuzzy zone where the legal and illegal and the formal and informal overlap, fluidly coexisting in both as supply and demand requires.

The study also offered examples of when the informal and formal clash: when regulations don't match reality and the formal and informal compete in the same markets, creating overlaps and redundancies. For example:

- Presently, the new formal e-waste industry is trying to compete with the informal sector, but can't. In general, the informal e-waste sector is mature and ubiquitous and has well established networks of suppliers and contractors at all levels. The telecoms' Collection Centres typically only take back their own product, but the informals don't operate under that restriction. The telecoms also don't have enough critical mass to compete with the convenience and ubiquity of informal sector collectors who operate at the building and neighbourhood level. Because of higher overhead and operating costs, furthermore, the telecoms can't compete with the informals on price for raw e-waste materials and for someone considering recycling their old mobile, this could be a deal-breaker. Many expect to be paid for their product and, naturally, want to shop around for the best price. Lastly, starved of raw material, operating well below capacity and representing only 5% of India's e-waste recycling, industrial recyclers simply don't have enough economy of scale to compete with the informals.
- Because of higher overhead, franchise rules etc., telecom stores and service centres are often too far apart to compete with the ubiquity of the informal vendors.
- Presently, there are two competing repair sectors in the country: the telecom's in-house warranty repair services and the independent informal repair shops, such as in Gaffar and Nehru Place Markets. As we saw, some of the latter believed that manufacturers were trying to 'double-dip' by both selling and repairing mobile phones. In other ways, the telecoms can't compete with the informals in terms of convenience, flexibility and price. The telecoms limit things to their own products, but the informals offer a wide range of products and services: everything from top of the line name brands to imported copycat phones, counterfeits, refurbis, generics and second hand phones. The informal market will buy your old phone, but manufacturers only take back for recycling purposes.

- In some ways, consumer fetishism, fueled by the telecom's own marketing campaigns, has driven a parallel market in counterfeit phones.

Seamful co-existence is often less visible than seamful competition and conflict. Examples of the former include:

- How name-brand mobile phone manufacturers co-exist alongside second-hand dealers, refurbishers and copycat manufacturers, combining to offer a much wider range of price points and options than in more developed countries.
- How the traditional informal waste sector minimised municipalities' waste responsibilities.
- How NGOs leverage second hand, old and no-frills SMS phones that might be near the end of their commercial life for empowerment or social enterprise purposes.

Our study also revealed that it is not just the multi-national telecoms and e-waste recyclers that participate in global flows of trade, technology and commerce. Importers of China-made phones, repair shops that buy parts from China and informal e-waste recyclers that sell scrap PCBs and chips to China prove that it is also possible for small and micro sized informal operators to trade in the global market. Even the industrialized e-waste recyclers that import the west's e-scrap to India are examples of counter-flows to globalization. Nimmi Rangaswamy calls the phenomenon 'post-globalization':

In the last few years, India and a host of southeast Asian countries have emerged as attractive destinations for grey markets or parallel economies. These parallel distribution channels and networks result in new post-globalization flows that re-configure markets, dislocating them from national locations and inserting them into the grid of the global economy. (Rangaswamy 2011:559)

### **Eliminating the informal sector would be a disaster**

The informal economy is sizeable and contributes to the long life-span of the mobile phone in India. The illegal e-waste recycling industry, for example, provides a livelihood for hundreds of thousands of households nationwide. Estimates are that 25,000 people in the National Capital Region alone are employed in it (Silicon Valley Toxics Coalition, Chintan and Arjun Bhagat). While probably unrealistic anyway, eliminating the informal e-waste sector would likely be a social disaster. The informal sector, furthermore, is mature, savvy and well-connected and there is much to be learned from its business models. Eliminating the sector, therefore, would represent a loss of informal business knowledge.

Suggesting that people currently employed in the informal e-waste sector could simply get jobs in the new industrialized e-waste factories is unrealistic for a number of reasons:

- According to Anuj Maheshwari, of Eco-Reco, past efforts to incorporate informal sector workers into formal recycling factory operations have failed

because many of the workers are accustomed to being small business entrepreneurs responsible for making their own business decisions and maintaining their business networks and they don't prefer factory jobs.

- It would likely mean being dislocated from home.

### **Incorporating the informal sector into the formal e-waste sector**

Formalizing the informal, or incorporating the informal into the formal sector, could be a more realistic and complementary approach to the mobile phone industry and could transform the e-waste industry into a viable, efficient and environmentally friendly industry, according to the proponents of this approach. Anuj Maheshwari indicated that collection had proved to be unprofitable and frustrating for Eco-Reco and, as a result, his company would prefer to simply leave it up to existing collectors so that they can focus on what is most profitable for them. Sandip Chatterjee, furthermore, believes that India needs a home-made solution to its e-waste issues: one that realistically addresses the domestic conditions (the size and domination of the informal economy, appropriate technologies, Indian labour costs etc.), incorporates the informal sector into a new e-waste business model and is driven by a viable profit model that is economically sustainable and encourages all parties to participate fully. New laws, he says, are not enough. The only way to discourage damaging recycling practices is to provide an “alternative earning mechanism” (Chatterjee, “Sustainable Electronic Waste Management”<sup>2012: 23</sup>) for the informal society. He proposes:

... an outsourced model where equal participation of the organised and unorganised sector is ensured to make the e-waste management business a profitable one ... In the proposed approach, unorganised operators will concentrate on collection, disassembly, segregation of e-waste, whereas, organised sector will concentrate on processing the PCBs to extract precious metals. (ibid)

Interestingly, his model takes advantage of the following two statistical facts:

- Only 5% of India's e-waste is currently recycled by the formal economy, an often cited statistic, and
- Only 5% of the e-waste by weight, according to Chatterjee, “consists of PCBs/connectors, (that) need high-tech environmentally friendly recycling techniques to manage”<sup>16</sup>. The other 95%, he says, can easily be handled in environmentally sound ways by the informal sector.

If the numbers are correct, the informal sector would concentrate on what it is good at (social networking, collection, disassembly, segregation) and the formal sector could concentrate on what it is really good at (PCB processing and the extraction of precious metals) and neither would lose any of their current market share. Therefore, theoretically, the system would be more efficient, environmentally-friendly and no one would lose their jobs.

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<sup>16</sup> Chatterjee, Dr. Sandip. “Sustainable Electronic Waste Management and Recycling Process.” *American Journal of Environmental Engineering*. 2012, 2(1): 23

Interestingly, the new e-waste Rules and Guidelines only permit the informal sector to participate in collection. The Government, furthermore, has no provisions for any people displaced in the new e-waste Rules lead to industry transformation.

A number of NGOs and micro and small enterprises are working to integrate the informal and formal waste streams or “formalize the informal sector”: GIZ, Chintan, Harit Recyclers and Green E-waste (formerly 4R) in Delhi and Toxics Link in Kolkata. Studying these organizations and initiatives is one of our next steps, below.

### **Risk of short-circuiting the second-hand and refurbished phone market**

The classic 3Rs of the environment are Reduce, Re-use and Recycle with the idea that recycling is the last resort after all efforts to reduce consumption in the first place and re-use materials and products are exhausted. The new e-waste Rules focus entirely on Reduce and Recycle, but ignore Re-use. We believe that Re-use is also important and that the extended life-span of the mobile phone in India, in all it is manifestations, is a good thing. It maximizes the usefulness of the mobile phone and increases accessibility to all income levels of a diverse society. For humans, a long life is an indicator of a healthy life. Shouldn't the same hold true for mobile phones and other consumer products because a throw-away culture is not something to aspire to?

There is a risk that if the new e-waste Rules and other contemporary initiatives designed to transform the e-waste recycling industry really take hold and transform the e-recycling industry, they could significantly change the existing flow of mobile phones from first purchaser directly to the recyclers, thereby bypassing the second-hand, refurbish and re-use markets. This could effectively short-circuit the existing flow of second hand phones in the country and be a loss to many.

### **Qualifications and next steps**

This horizontal study has just scratched the surface of the complex life of the mobile phone in India. In addition to the people and organizations whom we were unable to contact (as identified in Box 1), the following is relevant to the study and also deserves attention:

- Input from the Ministry of Environment and Forests (Dr. Saroj).
- Input from the Ministry of Science and Technology (Dr. Parthasarathy, CEO).
- Input from NGOs and micro and small enterprises working to formalize the informal sector, such as Chintan, GIZ (who are formalizing two companies in Bangalore), Green E- Waste, Harit Recyclers, and Humana People To People (who are taking recycling education to the repair shops).
- Input from the Pollution Control Boards and Pollution Control Committees, as the case may be, regarding resources allocated to the new e-waste Rules, as well as data regarding applications, participation, compliance, materials collected and recycled during the first year(s) of the new e-waste Rules.

- Input from Dr. Geeta Bhatt and the team at Bhaskaracharya College of Applied Science, (Delhi University), who are conducting a study of mobile phone recycling.
- Field research in other recycling hotspots, especially Bangalore State Government, formal/informal recyclers, etc. (because of its progressive approaches).
- Field research regarding material extraction in Moradabad.
- A statistical analysis of patterns of mobile phone usage among Indian sub-groups: urban vs. rural, male vs. female, youth vs. adults, literate and numerate vs. illiterate and innumerate etc.
- A study of whether imports of e-waste are on the rise or decline since the 2007 MAIT-GIZ estimate of 50,000 MT.

A longitudinal study would also help understand the full life of the mobile phones studied, would identify trends and change over time and help better understand cause and effect. Combined with the cross-sectional data, it would give a full understanding of the mobile phone in India, prove or disprove current generalizations and conventional wisdom on the subject and lead to fact-based policy making.

An updated nationwide survey of mobile phones and e-waste in the country is overdue. A bottom-up study based on actual counts in both urban and rural locations would be useful in itself and would also test the accuracy of the obsolescence model used in most surveys to date, whereby production rates are factored by average life-span to estimate forward the amounts of functioning equipment and e-waste for any given year in the future. Such a survey would have to be carried out at the state or national level.

### **Interesting times ahead**

It is an interesting time for the mobile phone in India. The industry is still maturing and penetration rates is likely continue to grow aggressively. The impact of 3G and smart phones will trickle down to increasing numbers of people, changing the way they use their phones. It will be interesting to see whether, and how, the new e-waste Rules and promised public awareness campaigns have changed the recycling industry when the numbers come in from the first year(s) audits. It will also be interesting to see whether the formal and informal waste sectors decide to compete against, or play with, each other.

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# Glossary

ARF	Advanced Recycling Fee: the ARF is charged to the customer at the time of the first purchase of electronic equipment. The money collected is to be used to pay for recycling the equipment at its end of life. In contrast to EPR, it gives the consumer, rather than the manufacture, the responsibility to initially pay for recycling.
APC	Association for Progressive Communications
BAT	Best Available Technology
BPL	Below Poverty Line
CPCB	Central Pollution Control Board
DEF	Digital Empowerment Foundation
DoEIT	Department of Electronics and Information Technology, Ministry of Communication and Information Technology
DPCC	Delhi Pollution Control Committee
Down-cycling	The opposite of Up-cycling, Down-cycling refers to recycling practices that reduce higher and more specialized manufactured equipment to lower grade and less specialized products or crude raw materials. For example, when recycling reduces mobile phones to low grade plastic that then goes into cheap and mass-produced consumer goods.
EEE	Electrical and electronic equipment
EPR	Extended Producer Responsibility: The responsibility for end-of-life recycling of electrical and electronic products lies with the original Producer (eg. manufacturer).
E-waste	Electronic and electrical waste, generally including everything from mobile phones, computers and their peripherals and accessories to televisions, major appliances, electrical equipment and parts and small e-gadgets such as remote controls. For the purposes of the new e-waste Rules,

E-waste is considered to be all kinds of electronics and their accessories, but not including batteries, and the following 4 kinds of household electrical equipment: televisions, refrigerators, washing machines and air conditioners.

Externalities	Social costs created as a result of corporate activity but not paid for by the corporation. For example, increased health costs created as a result of an industrial process that the government has to pay for from taxation revenue. In these cases, governments often force companies to 'internalize' the costs through regulation, fees and penalties.
IC	Integrated circuits, i.e. computer chips
ICT	Information and Communication Technology
MAIT	Manufacturers Association for Information Technology
Micro-enterprise	Generally, definitions of MSMEs vary. The Micro, Small and Medium Enterprises Development Act, 2006, defines Micro-enterprise as: <ul style="list-style-type: none"><li>● In the case of manufacturing, where the investment in plant and machinery does not exceed Rs. 25 lakh (Rs. 25,000)</li><li>● In the case of service enterprises, where the investment in equipment does not exceed Rs. 10 lakh (Rs. 10,00,000)</li></ul>
MoEF	Ministry of Environment and Forests
MSE	Micro and Small Enterprise
MSME	Micro, Small and Medium Enterprise
NCR	National Capital Region
NEP	National Environmental Policy (of India)
NGO	Non-Governmental Organization
PCB	Printed Circuit Board
POTS	Plain Old Telephone Service
RML	Reuters Market Light

RoHS	Restriction of Hazardous Substances Directive of the European Union, adopted in February, 2003 and in effect since July 2006, it restricts the use of six hazardous materials in the manufacture of EEE: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ether (PBDE)
ROW	Rest of the World
Small -enterprise	Generally, definitions of MSMEs vary. The Micro, Small and Medium Enterprises Development Act, 2006, defines Small-Enterprise as: <ul style="list-style-type: none"> <li>● In the case of manufacturing, where the investment in plant and machinery is more than Rs. 25 lakh (Rs. 25,00,000) but does not exceed Rs. 5 crore (Rs. 5,00,00,000)</li> <li>● In the case of service enterprises, where the investment in equipment is more than Rs. 10 lakh (Rs. 10,00,000) but does not exceed Rs. 2 crore (Rs. 2,00,00,000)</li> </ul>
SPCB	State Pollution Control Board
SVTC	Silicon Valley Toxics Coalition
Up-cycling	Recycling practices that do not result in Downcycling. For example, when a mobile phone that has reached the end of its life for one user is re-used as a mobile phone by another.
WEEE	Waste Electrical and Electronic Equipment

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