1.1 Background

Human society is dependent upon the ecosystem for its sustenance. Ecosystems serve both as a source of raw materials for production of goods, as well as a sink for the absorption of wastes of the socioeconomic systems (Krausmann et al., 2009; Rockstrom et al., 2009). These include various services such as provisioning (e.g., food, raw materials, genetic resources, medicinal resources, energy etc.), regulating (e.g., waste decomposition, carbon sequestration etc.), supporting (e.g., nutrient recycling, soil formation etc.), and cultural (spiritual, historical, aesthetic, therapeutic etc.) (MEA, 2005). From an economic perspective, natural resources derived from the ecosystem are important because they provide raw material base for the economic system, and satisfy the material and energetic needs of society. Societies’ dependence on energy and materials owes to the fact that it is needed for all basic human activities such as cooking, lighting, heating and cooling, communication and mobility, which by extension affect health, education, housing etc. This dependence on energy and materials in itself is not a modern phenomenon. In his 1860 book First Principles, Herbert Spencer describes energy and material usage as the source of societal progress or social evolution (Fischer-Kowalski, 1998). Energy and materials play an important role in societal growth and differentiation and eventually to provision of opportunities of cultural growth through exploration of activities beyond those required for sustenance of basic needs.

As such, access to ecosystem services influences the distribution of benefits (and costs), arising directly, or indirectly through use along with other inputs. The resulting distribution of benefits (and costs), and hence the values derived from it are significant at all levels of human society (household, community, local sub-national, national and supranational or global). It follows that utilization, appropriation and
distribution of natural resources, as well as products thereof are key to socioeconomic progress. Inequitable appropriation and distribution of natural resources, and deprivations of access, or potential thereof to natural resources, can lead to emergence of various degrees of conflicts (Martinez-Alier, 2002). It is expected that, with increase in scale of resource extraction, and the associated alterations in patterns of access to natural resources, resource based conflicts will increase, especially in the Global South (Özkaynak et al., 2012), since a significant share of population residing in this region is directly dependent on natural resources for their livelihood.

It is no surprise that the process of economic growth in India has been accompanied by massive increase in total materials flowing through the economy, with resource flows almost quadrupling between 1961 and 2008. During this time period resource flows of biomass increased by a factor of 2, fossil fuels by 12.2, industrial metals and ores by 8.6, and construction minerals by 9.1 (Singh et al., 2012). As is a common characteristic among industrializing economies, patterns of resource use here also indicate a shift from a largely biomass based one until the 1970s, to an increasing share of mineral and fossil fuel in the economy since the 1980s, corresponding with the period of high economic growth (Singh et al., 2012). Since India is largely self-sufficient in minerals, this increase in resource flows has largely been a result of extraction of resources within the country (Singh et al., 2012). Between 1952 and 2013, annual coal production increased from 37 to 556 million tonnes, iron ore from 4 to 136 million tonnes, and limestone from 5 to 280 million tonnes (Indian Bureau of Mines, 2013).

Increase of extraction often implies pushing the frontiers of commodity extraction or waste disposal into new and previously unused geographical spaces. As these frontiers expand into new territories, in order to meet the material and energy requirements of increasing production, conflicts are likely to emerge due to privations in access by local communities1 to their physical, social, cultural and economic spaces. Access to local ecosystems is often either an important, or the only

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1 While I am aware of the definitional ambiguities of the term ‘community’, for the lack of a better word to describe the population of a single location, however loosely bound, I have used it.
source of livelihood for socioeconomically weaker, marginalized, and indigenous communities (Martinez-Alier, 2002). Given this dependence, changing patterns of access to ecosystem services can disrupt livelihoods by depriving the ability of such communities to acquire sustenance requirements and push them into destitution. Ecological distribution conflicts over access to natural resources in India is well documented in literature (Guha, 1989; Martinez-Alier, 2002; Bhusana et al., 2008; Narula, 2008; DeMaria, 2010).

More often than not, the conflicts owe their origin to the discontent among the people at the receiving end of bads of natural resource appropriation—the benefits of which may have been acquired by private corporations and other such powerful entities mediated by the State. Quite obviously, most such conflicts involves these two. These conflicts have been based around a wide range of issues such as land (e.g. dispossession of and displacement from land), water (e.g. altering patterns of access to livelihood sustaining water resources), forests (e.g. forest degradation which serves as a source of Non-Wood Forest Products (NWFP) collection, livelihood generation and access to forests), cultural commons (e.g. deprivation of access to, destruction of, or desecration of sacred spaces, and spaces of cultural heritage), etc.

Given the multidimensionality of problems associated with natural resource appropriation in India, these issues can be approached from different but complementary perspectives. Some of these include environmental and ecological (Gadgil and Guha, 1994), socioeconomic (Mukhopadhyay and Kadekodi, 2011; Basu, 2014, Basu, 2015; Lahiri-Dutt and Samanta, 2004; Baviskar and Sundar, 2008; Kothari and Shrivastava, 2012; Deb, 2012), gender (Ahmad and Lahiri-Dutt, 2006; Lahiri-Dutt and Macintyre, 2006), social justice (Sundar, 2012; Sundar, 2016; Roy, 2011; Kothari and Shrivastava, 2012; Padel and Das, 2010; Bushan et al., 2008), etc. Although there are various such conflicts in India, their analysis is mostly limited to a few large-scale, popular conflicts. Given the geographical, cultural, linguistic, religious, demographic, and political diversity across India, in-depth assessments of conflicts around various type of resources, is still lacking. This thesis is a step towards filling this gap.
1.2 Research Gaps

There are three key gaps in literature that this thesis seeks to address.

First, to address the gaps in identification, documentation and analysis of ecological distribution conflicts around mineral resource extraction, and disproportionate distribution of externalities generated as a result of such extraction. Globally, ecological distribution conflicts (EDCs) and environmental justice (EJ) movements are increasingly gaining recognition (www.ejolt.org, www.envjustice.org). However, in India, apart from case studies on a few conflicts, documentation and analysis of such conflicts and associated movements is lacking.

Second, to understand social mobilizations against resource extraction, and their role in altering patterns of (socially, economically and environmentally) unsustainable resource extraction, which are some of the foundational issues related to EDCs. This study of social resistance movements helps in developing a nuanced understanding of mobilizations of marginalized, indigenous, local, poor and indigenous communities, which are increasing across the country.

Third, to present alternative pathways to achieving socially, economically and ecologically viable progress of communities residing at current or future frontiers on resource extraction.

This thesis, is weaved around four major recurrent themes which often crisscross: a) that there are regions that serve as resource peripheries within India, b) that EDCs against resource extraction are on the rise in these regions, b) social resistance movements against such resource extraction are an important strand of environmentalism within India, and d) role of such movements in bringing to light the multidimensional issues with the current patterns, and system of extraction, and that they might have a significant role in altering those patterns, and systems.

The research questions have been framed against these research gaps.
1.3 Research Questions

The overarching research question this thesis seeks to address is whether there are regions of predatory extractivism within India, and whether these regions are emerging as spaces of ecological distribution conflicts.

Sub-question 1: whether the nature, form and intensity of conflicts over altering patterns of access to natural resources across India have changed; and if so, identifying the trends thereof.

Sub-question 2: whether there are regions within India that serve as resource peripheries, and undergo predatory extractivism, and so their identification. Whether these spaces are emerging as spaces of EDCs?

Sub-question 3: whether the EDCs have interacted with, and altered the patterns, scales, rates, or operations of unsustainable extractive activities at resource peripheries, and if so, how?

Sub-question 4: what can be alternative pathways towards transition to a system of natural resource utilization which can benefit local communities ecologically, economically, and socially?

The thesis concludes with a set of policy recommendations focusing on mining regulations towards a socio-ecologically viable economic progress for local communities residing at current or potential resource extraction frontiers.

1.4 Method

In order to address the above described research questions, a mix of quantitative and qualitative data, and secondary and primary data has been used. The following flow chart presents the methodology in brief. Each step has been elaborated upon in the following section.
Figure 1.1: Flowchart representing methodology used
**Identification of EDCs:** In order to get an overview of EDCs across India, EDCs across commodities, and across states were identified and documented. 100 cases of EDCs were first identified spread across a 23 year time period (1992 to 2014). The data has been collected from five sources: (i) English-language newspaper reports (both from national and state-level newspapers) as found in the Green Files,² (ii) reports found in the India Environmental Portal,³ (iii) cases documented in the EJAtlas,⁴ (iv) EDCs reported by the online database of Land Conflict Watch,⁵ and (v) cases reported in various websites. This has been further elaborated upon in Chapter 3.

**Analysis of EDCs:** EDCs were analyzed to identify the commodities responsible for generating EDCs, the locations of EDCs with most frequency, the actors involved in them, etc. Towards this end, each of 100 conflicts were characterized by: a) location; b) type of mineral mined; c) whether the protest was related to an already existing mine or to a proposed project; d) the type of mining actor; d) the legality of the mining operation; e) the cited cause(s) of protest; and f) the type(s) of protesters involved. This has been further elaborated upon in Chapter 3.

**Identification of specific mineral of interest:** Following the analysis of EDCs, a specific commodity of interest was isolated. This was due to varying patterns of conflicts across different minerals. This has been explored in further detail in Chapter 3. The selection of commodity followed an iterative process. First step involved a

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² The Green Files are a repository of newspaper report on environmental and development-related issues from across South Asia, maintained by the Centre for Science and Environment (CSE) in New Delhi. Created in 1980, the CSE is an independent, non-governmental, public-interest organization active in social and environmental advocacy.

³ The India Environment Portal maintains an online database of news related to environmental and development issues. It is managed by the CSE and promoted by the National Knowledge Commission, Government of India.

⁴ Launched in 2011, the Environmental Justice Atlas (EJAtlas) documents and catalogues social conflicts around environmental issues worldwide. The Atlas is directed by Leah Temper and Joan Martinez-Alier and coordinated by Daniela Del Bene at the Institute of Environmental Science and Technology, Autonomous University of Barcelona.

⁵ Land Conflict Watch consists of a network of journalists, activists and academics that document land-related conflicts across India. The database relies on a wide variety of sources including newspaper reports, online information, academic sources, government resources and court cases.
preliminary analysis using secondary data on quantities of minerals extracted, to identify the potential mineral of interest. The next step involved examination of frequency of EDCs. The final choice was made based upon the following four criteria: a) quantity and volume extracted; b) strategically significance of the mineral; c) data availability on mineral extraction; and d) number of EDCs around its extraction. Preliminary analysis has been presented below (section 5.1), and has been further elaborated upon in Chapter 3, 4, 5 and 6.

**Locating sites of recurring and ongoing EDCs related to selected mineral:**
Following the selection of the mineral of interest, the sites were identified for specific case studies, for the significant differences in political, social, demographic, and socioeconomic structures of different locations across India. Two states have been selected for further detailed analysis. The decision regarding selection of states was once again, an iterative process. The system boundary of the site was considered similar to the administrative boundary of the state for the constitutional provision of certain powers with them related to extraction of some minerals. As a preliminary exercise, secondary data on extraction of selected mineral were used to identify the possible states. Subsequently, the following criteria were used to compare the states: a) quantity of extraction per year; b) percentage share to total extraction in the country; c) rates of depletion of reserves; d) intensity of extraction per sq km area; and e) number of EDCs around the mineral of interest. The preliminary exercise has been presented below (section 5.2), and has been further elaborated upon in Chapters 3, 4, 5 and 6.

**Analysis of nature of extractive industries and resultant negative externalities at locations of EDCs:** In order to understand the causes behind emergence of EDCs, the nature of extractive industries related to the selected mineral, and the associated negative externalities, were inquired into. It involved the following aspects: how the industries function, what is the scales of operation, who are the multiple actors involved, who are the affected communities and what kind of environmental and social impacts are resulting from the extraction process. This was addressed in both the case-studies through analysis of secondary literature, and conducting semi-structured interviews with multiple stakeholders. This step
contributed towards identifying the presence of: a) features of extractivism; b) environmental and socioeconomic injustices; c) features of resource peripheries; and d) features of predatory extractivism. This has been further elaborated in Chapter 4.

**Analysis of EDCs against extractivism of selected mineral:** In order to develop a general understanding of the scenario of EDCs against the selected mineral within India, first, all cases of EDCs across the country have been analyzed in further detail. Whereas, the analysis of EDCs across the country, conducted in step 2 (see figure 1.1), allows for developing a general understanding of all mineral conflicts, this step enables the development of a more detailed analysis of the specific mechanisms that guide EDCs against the selected mineral. Each case of EDC against the specific mineral is analyzed in finer detail in this stage. This is done through analysis of secondary literature. Broadly, this step would allow the development of understanding on the following: a) common issues related to specific minerals; b) nature, intensity and forms of resistance; c) actors involved; d) perceived economic, social and environmental injustices; e) Demands of affected communities and f) outcomes. This has been further elaborated in Chapter 4.

**Analysis of EDCs against extraction of selected commodity at identified locations:** This step provides detailed case studies of EDCs and social resistance movements against extraction of the specific mineral, at the locations identified in step 4 (see figure 1.1). This allows for the development of a much finer understanding of the mechanisms of extraction, generation of negative externalities, generation of EDCs and social resistance, and impacts thereof. This was done through analysis of secondary literature, and conducting semi-structured interviews with multiple stakeholders. Overall, this step would allow for the development of understanding on the following: a) specific issues related to identified locations; b) local impacts, grievances, environmental injustices; c) unique forms of resistances; d) intensity of conflict and socioeconomic impacts thereof; e) demands, and suggested solutions for resolution of conflicts.

**Alternatives pathways and recommendations:** Finally, the thesis attempts to present recommendations for alternative pathways to achieve socio-ecologically and economically viable progress of local communities residing at resource peripheries.
This is achieved broadly, by incorporating the following: a) exploration of alternative frameworks in existence; b) analysis of laws regulating specific commodities; c) recommendations of local communities; d) provision of recommendations. This is included in Chapters 7 and 8.

1.5 Selection of minerals of interest and site for case-studies

1.5.1 Selection of mineral

From the various major minerals extracted in India, iron ore was selected for the following major reasons:

Globally, iron ore has historically been the metal extracted in largest volumes, representing over 90% of the total global metallic ore extraction since the 1950s (Kraussman et al., 2009). This trend has also been observed within India. Here, iron is the most important mineral in terms of value, most significant metallic ore in terms of the total quantities extracted as well as exported (Indian Bureau of Mines, 2014). Following global trends, iron ore extraction in India has consistently increased since the 1950s. Between 1952-1953, and 2012-13, annual extraction of iron ore increased from 4 MT to 136 MT, peaking at 218 MT in 2009-10 (IMYB, 2013). In terms of global ranking in extraction, India is currently one of the top producers as well as exporters of iron ore. As of 2010, India accounted for 11.2% of total global extraction and ranked 4th in terms of iron ore extraction (Schaffartzik et al., 2016).

Iron ore is a metal of strategic importance from the point of view of an economy in transition (Schaffartzik et al., 2016). It is also distinctly different from fuel-minerals which are single use minerals, as the products of iron ore (steel, etc.) can be partially recycled from existing stocks (infrastructure and buildings, etc.). This has implications for the future availability of iron and steel.

Further, unlike other non-metallic minerals of strategic importance to an economy in transition, such as sand which is extensively used in the construction industry, data availability for major metallic minerals is much more reliable (Hilson et al., 2016).
Finally, in India, iron ore deposits have been found to often coincide with densely forested districts, and with districts that have significant tribal populations (Bhushan et al., 2008). This has implications for local populations who are often dependent upon forests and ecosystems for livelihood opportunities and on their displacement and dispossession.

1.5.2 Selection of states for case studies

The following selection criteria were utilized in order to arrive at the two specific states for conducting further case studies.

a) States with highest quantity of total iron ore extraction: This metric offers a perspective on the absolute quantities of iron ore extracted at the state level in India.6

b) States with highest percentage of extraction: This metric is used to determine which state contribute the highest to the total iron ore extraction within India.7

c) States with highest rates of depletion of iron ore with respect to the total known reserves in the state:8 This metric is used to gauge the rate of extraction with regard to the current known levels of economically mineable iron ore at the state level. By determining the rates of depletion of reserves, this metric indicates the quantities that remain and can further be economically extracted at current levels of technological efficiency. This allows for both, normalizing extraction in each state based upon existing reserves, as well as provides an indication of further possible increase in extraction and expansion of frontiers of iron ore extraction.6

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6 See Annexure I for further details.
7 Calculated as the ratio of extraction in each state/total extraction in India.
8 Calculated by the ratio of total state-wise extraction of iron ore / Total Reserves of iron ore in the state known as of 2010 (as per the United Nations Framework Convention (UNFC), reserves are the economically mineable part of measured and/or indicated mineral resource.
d) States with highest intensity of iron ore extraction with respect to the total geographical area of the state: This metric helps normalize against the geographical area of different states, and determine the state with the highest extraction rates per square kilometer area. This helps gauge the intensity of extractive operations at the state level.

e) Equally weighted index of a, b, c, and d (above): Using the four metrics, an equally weighted index is generated in order to arrive at the states that are highest in terms of iron ore extraction within India.

<p>| Table 1.1: Equally weighted index of iron ore extraction in India using above metrics |
|-------------------------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|</p>
<table>
<thead>
<tr>
<th>Extraction (Million tons)</th>
<th>Percentage contribution to total Indian iron ore extraction</th>
<th>Rate of depletion of Reserves</th>
<th>Iron ore extraction (MT per sq km)</th>
<th>Index (equally weighted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>2.30</td>
<td>1.20</td>
<td>0.13</td>
<td>0.08</td>
</tr>
<tr>
<td>Chhattisgarh</td>
<td>28.82</td>
<td>16.89</td>
<td>3.20</td>
<td>2.13</td>
</tr>
<tr>
<td>Goa</td>
<td>23.65</td>
<td>12.51</td>
<td>4.87</td>
<td>63.91</td>
</tr>
<tr>
<td>Jharkhand</td>
<td>20.93</td>
<td>12.09</td>
<td>0.91</td>
<td>2.63</td>
</tr>
<tr>
<td>Karnataka</td>
<td>25.04</td>
<td>13.37</td>
<td>2.86</td>
<td>1.31</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>1.48</td>
<td>0.87</td>
<td>2.60</td>
<td>0.05</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>1.23</td>
<td>0.74</td>
<td>8.62</td>
<td>0.04</td>
</tr>
<tr>
<td>Odisha</td>
<td>73.02</td>
<td>42.19</td>
<td>2.20</td>
<td>4.69</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>0.20</td>
<td>0.13</td>
<td>1.76</td>
<td>0.01</td>
</tr>
</tbody>
</table>


* Calculated by the ratio of the total state-wise extraction of iron ore/Total geographical area of the state.
The states of Odisha and Goa were selected following this process.

1.6 Outline of thesis

Chapter 2 presents the theoretical framework of political ecology which has been used in the thesis. This is followed by a review of the four central concepts of social metabolism, extractivism, ecological distribution conflicts, and environmentalism of the poor which have been employed in developing an understanding of the natural resource based conflicts occurring in India. Case studies from around the world which link these four major concepts have been provided as examples of how increasing natural resource appropriation, and the resultant increase in social metabolism are associated with EDCs and, in consequence, with movements of environmental justice that include an “environmentalism of the poor”. Finally, three emblematic case studies of what can been recognized as EDCs and which represent environmentalism of the poor have been provided as examples of the political ecology of natural resource conflicts in India.

Chapter 3 documents and inventorizes ecological distribution conflicts related to expansion of the mineral (non-fuel) mining across minerals and across regions.

Chapter 4 presents ecological distribution conflicts related to iron ore mining in India across different regions. 9 important cases of conflicts are analyzed using a political ecology framework.

Chapter 5 examines the EDC related to iron ore mining in the state of Odisha, aided by field work in the districts of Keonjhar, Sundergarh and Mayurbhanj.

Chapter 6 examines the EDC related to iron ore mining in the state of Goa, aided by field work in Quepem and Sanguem talukas of the district of South Goa, and Sattari and Bicholim talukas of the district of North Goa.

Chapter 7 presents a thesis for socio-ecologically viable progress for local communities residing in mineral rich regions in India. This framework has been guided by a) alternatives offered by relevant stakeholders gauged through semi-structured interviews conducted with affected communities, mining agents,
government agents, b) existing literature offering critique of mineral extractivism in India, and c) theories of post-extractivism for mineral-rich regions around the world.

Chapter 8 examines the existing legal framework for the regulation of major minerals in India. Some policy recommendations for a move towards a Radical Mineral Democracy are offered here. These recommendations are based on: a) post extractive proposals presented in Chapter 7; b) problems identified during fieldwork; c) rulings in cases related to social resistance movements by the Supreme Court of India; and d) the MMDRA bill, 2011 which lapsed in 2014 and was replaced by the MMDRAA, 2015.

Chapter 9 presents the conclusions of the thesis.